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COLLEGE OF ENGINEERING

**Research
Activities
Annual Report
1988-1989**



**Circular No. 64
Engineering Experiment Station**

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PREFACE

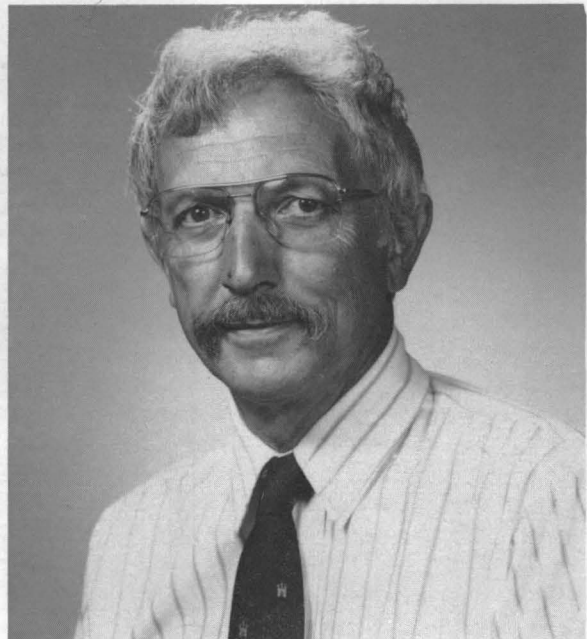
Thirty-six years ago, on September 1, 1953, I joined the faculty of the Department of Civil Engineering at Oregon State College to begin a challenging and satisfying career that will end with my retirement on December 31, 1989. I am particularly pleased to announce Dr. John Owen's appointment as the new Dean of our College. Dr. Owen is a skilled professional engineer with a strong commitment to the College's basic missions of teaching, research, and service. He believes as I do that the fundamental mission of the College of Engineering is to prepare students for a career in the engineering profession, and that the College's associated mission of research and scholarship is both supportive and inseparable from its primary mission of engineering education.

Based upon my 36 years of experience, I am convinced that a vigorous program of engineering research is absolutely essential for the vitality of the teaching programs of the College. Good teaching and good research are mutually supportive. Faculty working at the leading edge of engineering in their research and consulting assignments are those that are best equipped to prepare students for the challenges that they will face after graduation. Nearly two-thirds of the College's faculty members now devote some part of their time to research investigations in addition to their normal classroom teaching responsibilities. The result is a diverse faculty of highly qualified professional engineers which offers a top quality program of engineering education at both the undergraduate and graduate levels. Teaching laboratories for students benefit greatly from research programs since research equipment is also used for teaching. Indeed, many of our teaching laboratories would be obsolete if it were not for the equipment that has been acquired through research projects. Our College of Engineering at Oregon State University has long been known as a quality institution that prepares students for a successful career in the engineering profession. The active involvement of our faculty in research and scholarship to enhance engineering practice and knowledge is vital to the success of the College.

To conclude these remarks: **THANK YOU TO OREGON STATE UNIVERSITY, OSU SUPPORTERS, AND TO THE MANY FACULTY, STAFF, AND STUDENTS WHO HAVE MADE MY 36-YEAR CAREER AT OSU A CHALLENGING, INTERESTING, AND A THOROUGHLY ENJOYABLE EXPERIENCE.**



Fred J. Burgess
Dean of Engineering, 1970-1989



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ENGINEERING RESEARCH: AN OVERVIEW

The research administrative structure for engineering at Oregon State University is illustrated in Figure 1. Key elements of the programs are concentrated in the academic departments, including six departments in the College of Engineering, and the engineering departments in the College of Agricultural Sciences and the College of Forestry. Faculty within each department constitute the research staff, and each of these faculty members has instruction-related duties. Graduate students in the departments assist with the research work. The Engineering Experiment Station has no technical research staff, but provides administrative support service and a central administrative focus. Several institutes and centers are associated with the academic departments or other elements of the University. These have strong ties with engineering, but operate independently from the affiliated departments.



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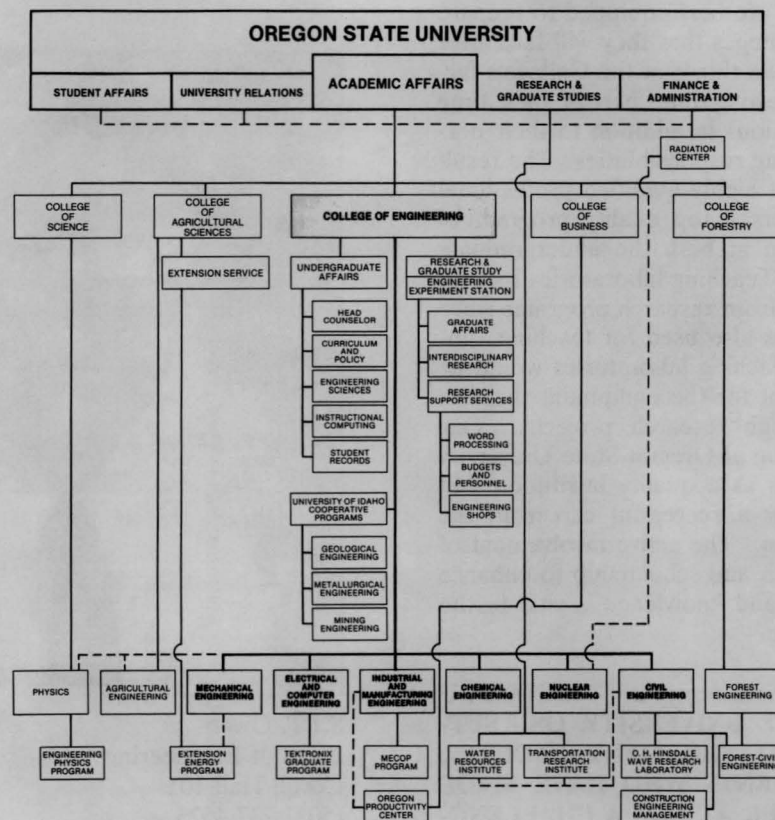


Figure 1. Engineering Research Administration.

Research Expenditures

Table 1 provides a breakdown of actual research expenditures by department, within the College of Engineering, and by Agricultural Engineering. Totals of separate expenditures by certain other units include

Forest Engineering \$936,244

Water Resources Research Institute \$81,838

Extension Energy \$1,061,704

Details for the above expenditures are provided in the RESEARCH CENTERS AND INSTITUTES section of this report. Expenditures by the Transportation Research Institute and the Radiation Center are reported with the departmental data in Table 1. The total of engineering research and extension energy expenditures for the year was \$6,217,536.

Table 1. Actual Research Expenditure Distribution, Dollars, 1988-89.

Expenditure Category	Agricultural Eng.	Chemical Eng.	Civil Eng.	Electrical and Computer Eng.	Industrial and Manufacturing Eng.	Mechanical Eng.	Nuclear Eng.	Engineering Experiment Station	Total
Personnel	196,765	87,055	911,248	301,713	61,948	345,604	84,756	27,493	2,016,582
Payroll Assessments	27,474	19,831	168,620	46,823	14,242	65,005	11,399	4,220	357,614
Supplies & Services	117,888	11,821	125,539	31,719	3,978	43,661	5,929	10,216	350,751
Equipment	20,865	3,444	31,372	20,713	6,559	165,955	10,925	26,309	286,142
Computer	1,612	2,910	1,617	0	0	303	0	0	6,442
Graduate Tuition	33,195	634	55,523	21,096	5,298	24,965	14,477	2,649	157,837
OSU Indirect Costs	34,792	34,963	373,085	132,269	29,501	158,332	40,853	5,906	809,701
Consultants	0	0	9,913	0	0	0	0	0	9,913
Subcontractors	0	0	96,763	0	0	0	0	0	96,763
Travel	28,000	17,345	56,994	20,810	7,106	28,397	8,689	157	167,498
Miscellaneous	0	0	<124,796>	0	0	0	303	3,000	<121,493>
TOTAL	460,591	178,003	1,705,878	575,143	128,632	832,222	177,331	79,950	4,137,750

Research Funding Trends

Engineering research at Oregon State University is supported by grants and contracts obtained on a competitive basis from government agencies and business. No regularly budgeted State of Oregon funds are available for direct research support. Figure 2 summarizes research funding trends over the years since 1972 and shows that new grants and contracts this past year are up slightly over last year. The State of Oregon appropriation for instructional programs in the College for 1988-89 was \$8.2 million. The new research budget of \$7.8 million, therefore, represents a very significant contribution to the overall effort of the College of Engineering. The Federal Government is the leading source of research support, and support from private sources is growing.

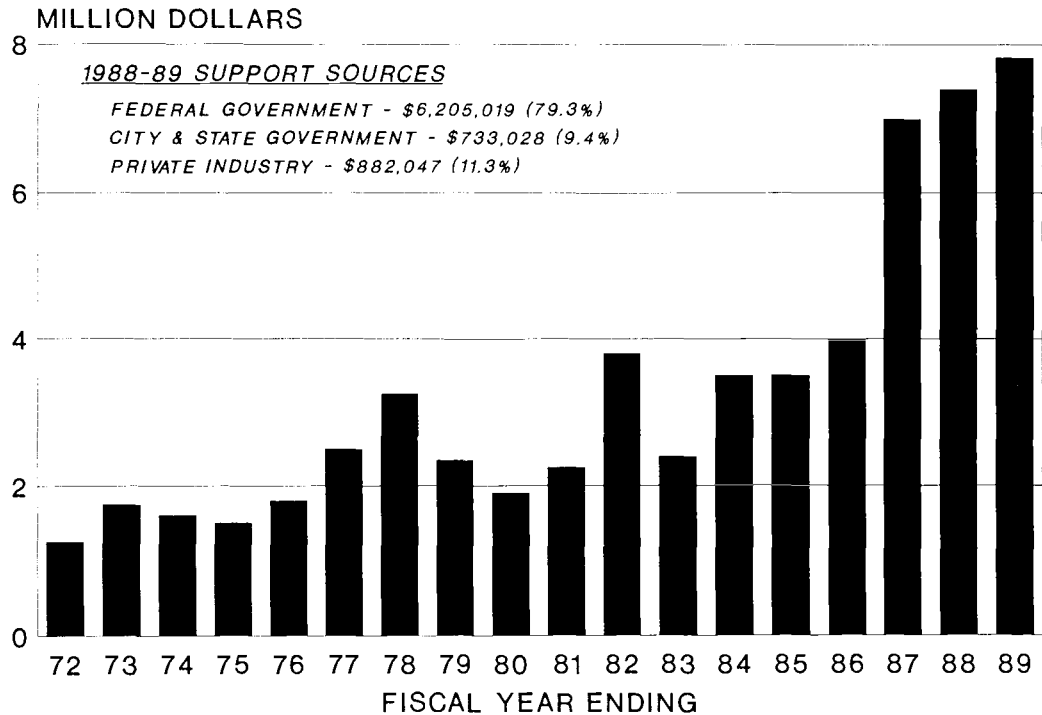


Figure 2. New Research Funding - OSU College of Engineering.

DEPARTMENTAL RESEARCH AND GRADUATE STUDY

Table 2 shows the number of professorial faculty and academic degree production in each department having ABET-accredited undergraduate engineering programs at Oregon State University. New research grant funding received in 1988-89 is also shown. Two-thirds of the faculty were at least partially supported by research grants during the year, 77 graduate students held research appointments, and another 130 held teaching assistantships or fellowships which supported their graduate study. Of the total 403 students enrolled in graduate programs, more than half received financial support for their work.

This section includes a departmental listing of new research grants and contracts, and statements of current research objectives and interests. We have included research data for Forest Engineering because of its close affiliation with our research programs.

Table 2. Faculty, Degrees Granted, and New Research Dollars, 1988-89.

Degree Program	Faculty	Degrees Granted, 1988-89			New Research \$
		Undergraduate	Master's	Doctorate	
Agricultural Engineering*	13	8	4	0	\$ 406,552
Chemical Engineering	8	29	14	4	285,196
Civil Engineering	29	45	21	1	2,888,158
Electric & Computer Engineering	31	82	37	3	2,037,870
Industrial and Manufacturing Engineering	14	46	6	3	183,335
Mechanical Engineering	22	63	21	7	1,274,508
Nuclear Engineering	9	14	5	2	744,469
TOTAL	126	287	108	20	\$7,820,088

*Agricultural Engineering is a department of the College of Agriculture.

Agricultural Engineering

Current Research

The department conducts research in two major thrust areas: **Water and Energy Resource Management** and **Food and Post-Harvest Engineering**. Research in other areas is conducted as needs arise, but the main, long-term thrusts continue to be in these two areas.

Water and Energy Resource Management: Research effort is devoted to water-management techniques. The objective is to promote optimum water and energy use, thus realizing the greatest economic benefit from irrigation practices. Projects are investigating and/or modeling soil-water-atmosphere-plant system relationships, erosion control, and soil drainage. Other projects involve chemigation and irrigation equipment testing and modeling.

A second major research effort is devoted to groundwater resource management. These projects are developing strategies to minimize the impact of agricultural operations on groundwater quality. They also optimize groundwater use in areas of limited groundwater supplies.

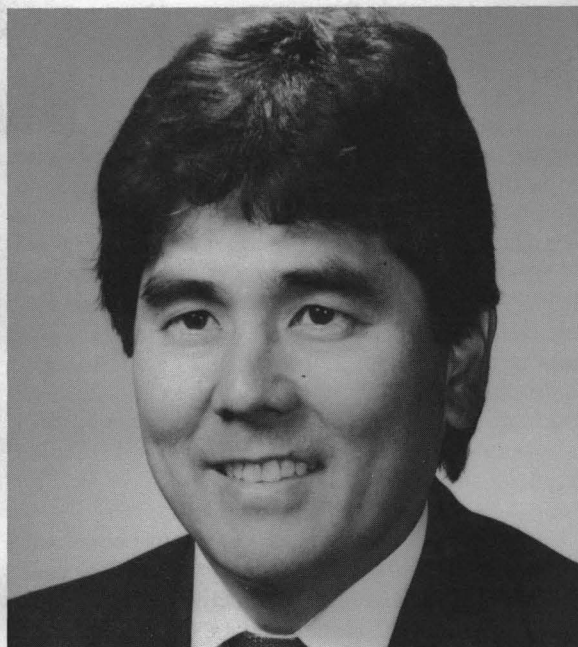
A third major research effort concerns agricultural waste management. Best management practices are being developed and demonstrated. The objective is to minimize the impact of runoff from rangeland, cropland, food handling and processing facilities, animal-holding facilities, and feedlots on the water quality of rivers, lakes, streams, and estuaries.

Graduate Faculty

Bolte, John 1989; Asst Prof; BS Univ of Florida 1977, MS 1983, PhD Auburn 1987.

Cavaletto, Richard Alan 1985; Asst Prof, Extn Agricultural Engineer; BSAE Cal Poly 1981, MS California-Davis 1983, PhD 1986.

Cuenca, Richard H. 1978; Assoc Prof; BS California State Polytechnic 1971, MS California State-Sacramento 1975, PhD California-Davis 1978.



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Food and Post-Harvest Engineering: Research on problems in harvesting, handling, transporting, storing, processing, and/or preserving Oregon's agricultural products. This research is aimed at maintaining the high quality of perishable products for both domestic and overseas markets. Directed studies of physical and thermal properties and biological processes of fresh fruits and vegetables, seeds, nuts, and seafood support this research area. Research continues on development of equipment for growing and harvesting of Oregon's numerous specialty crops.

English, Marshall Joseph 1978; Assoc Prof; BS San Jose State 1965, MS California 1974, PhD 1978.

Hansen, Herbert Eugene 1974; Assoc Prof; BS Iowa State 1952, MS 1970, PhD 1971.

Hansen, Hugh Justin 1974; Prof, Extn Agricultural Engineer; BS North Dakota State 1951, MS Cornell 1952.

Hashimoto, Andrew G. 1986; Prof and Head; BS Purdue 1966, MS 1968, PhD Cornell 1972.

Hellickson, Martin Leon 1975; Assoc Prof; BS North Dakota State 1968, MS South Dakota State 1972, PhD Minnesota 1975.

Istok, Jonathan David 1986; Asst Prof; BS Ohio State 1978, MS Oregon State 1981, PhD 1986.

Kolbe, Edward Robert 1974; Assoc Prof; BME Rensselaer Polytechnic Institute 1964, MSE Case Western Reserve 1966, PhD New Hampshire 1975.

McGuire, Joseph 1987; Asst Prof; BChE Georgia Tech 1980, MS North Carolina State 1983, PhD 1987.

Miner, John Ronald 1972; Prof; BS Kansas 1959, MSE Michigan 1960, PhD Kansas State 1967.

Moore, James A. 1979; Prof., Extn Agricultural Engineer; BS California Polytechnic 1962, MS Arizona 1964, PhD Minnesota 1975.

Tice, Ezra M. 1988; Asst Prof; BS Pennsylvania State 1973, MS 1983, PhD Auburn 1988.

Torres, Antonio 1984; Asst Prof; BS Catholic Univ of Chili 1973, MS MIT 1978, PhD 1984.

Trimmer, Walter Lee 1983; Asst Prof, Extn Irrigation Specialist; BS Colorado State 1974, MS 1975, PhD 1984.

New Research Grants and Contracts: 1988-89

Principal Investigator	Project Title	Agency	Amount
Berlage, A.G.	Legume and Grass Seed Harvesting and Conditioning	USDA	88,825
Cavaletto, R.A.	Detecting Defective Fruits and Vegetables through Light-Scattering Analysis	Ag Engrg Res Found	5,000
Cavaletto, R.A.	Netting	Wine Advisory Bd	4,500
Cavaletto, R.A.	Biological Efficacy and Pesticide Drift from an Air Foil Shrouded Boom Sprayer	U of California	8,028
Cuenca, R.H.	Water Budget Studies with Hapex Mobilhy	USDA	15,000
Cuenca, R.H.	Determination of Crop Water Requirements in the Ebro Valley (Supplement)	USDA	9,292
Cuenca, R.H.	Water Resources	Oregon Water Resources	3,500
English, M.J.	Using Landsat to Provide Potato Production Estimates	NASA	194,370
Hashimoto, A.G.	UNDP/FAO Training Grant		14,875
Istok, J.D.	Prediction of Groundwater Vulnerability	Ag Engrg Res Found	5,000
Kolbe, E.R.	Soil Erosion Control	USDA/STEEP	19,900
Kolbe, E.R.	Alaska Fisheries Development		2,500
Kolbe, E.R.	Sea Grant		30,922
Trimmer, W.L.	Umatilla Basin Study Plan	US Bureau of Reclamation	4,840

Faculty Publications: 1988-89

Cavaletto, Richard A.

"Wear Characteristics of Flat Fan Nozzles," (with M.J. Novak), American Society of Agricultural Engineers, Paper No. 88-1015, 1988.

"Guarding Against Machine Hazards," American Society of Agricultural Engineers, Paper No. 88-1637, 1988.

"Evaluation of New and Old Spray Equipment," *Proceedings of the Oregon Horticultural Society*, 1988.

Agricultural Safety, Bi-monthly Newsletter to all Oregon Extension Agents, 1988-89.

"Bird Damage Control in Grapes," *Oregon Wine Advisory Board Research Journal*, 1989.

Cuenca, Richard H.

"Simple Method of Obtaining Su-Brooks Retention Parameters," (with R.J. Lenhard), American Society of Civil Engineers, *Journal of Irrigation and Drainage Engineering*, Vol. 114, No. 2, 1988, pp. 363-370.

"Hydrologic Balance Model Using Neutron Probe Data," American Society of Civil Engineers, *Journal of Irrigation and Drainage Engineering*, Vol. 114, No. 4, 1988, pp. 644-663.

"Evaporation Over Land-Surfaces: First Results from HAPEX-MOBILHY Special Observing Period," (with J.C. Andre, J.P. Goutorbe, A. Perrier, and others), *Annales Geophysicae*, Vol. 6, No. 5, 1988, pp. 477-492.

"Planning Now for Irrigation and Drainage in the 21st Century," *Proceedings*, Measurement Systems in the HAPEX-MOBILHY Regional Evapotranspiration Experiment, American Society of Civil Engineers Irrigation and Drainage Division Specialty Conference, Lincoln, NE, 1988, pp. 510-519.

"Comparison of Ground-Based Evapotranspiration Measurement Systems in the HAPEX-MOBILHY Regional Experiment," (with W.E. Nichols, O.A. Carrijo, and J. Noilhan), (abstract) Symposium on Large Scale Field Experiments, *EOS Transactions*, American Geophysical Union, Vol. 69, No. 16, 1988, p. 351.

Cuenca, Richard H. (continued)

"Application of Remote Sensing for Evapotranspiration Measurements," (with W.E. Nichols), American Society of Agricultural Engineers, Pacific Northwest Region, September 1988. Pendleton, OR, 1988.

"Use of Soil Moisture Measurements in Hydrologic Balance Studies," (with J. Noilhan), (invited paper) Workshop on Measurement and Parameterization of Land-Surface Evaporation Fluxes, October 1988. Banyuls, France, 1988, 16 pp.

Irrigation System Design - An Engineering Approach. Englewood Cliffs: Prentice-Hall, Inc., 1989.

"Soil Moisture Variations During HAPEX-MOBILHY," (with J.P. Goutorbe, J. Noilhan, and C. Valancogne), *Annales Geophysicae*, Vol. 7, No. 4, 1989, pp. 415-426.

English, Marshall J.

"Irrigation Energy Efficiency: Optimum Crop Irrigation," (Northwest Economics Associates), Energy Conservation Brochure, DOE/BP-21925-11. Bonneville Power Administration, February 1988.

"The Interface of a Remote Sensing and Geographic Information System," (with C.F. Chen), Paper 88-305, ASAE Summer Meeting, 1988.

"The Design of a General Purpose Low Cost Image Processing System," (with C.-F. Chen), Paper 88-3041, ASAE Summer Meeting, 1988.

"Evaluation of Irrigation Schedulers," in *Phase III Report, Partial Irrigation Feasibility Study and Demonstration Project* (Northwest Economic Associates). Portland, OR: Bonneville Power Administration, December 1988.

"Deficit Irrigation; An Analytical Framework," *Journal of the Irrigation and Drainage Division*, ASCE, April 1989.

"Deficit Irrigation; Observations in the Columbia Basin," (with L.G. James and C.-F. Chen), *Journal of the Irrigation and Drainage Division*, ASCE, 1989.

English, Marshall J. (continued)

"Effects of Deficit Irrigation and Irrigation Frequency on Wheat Fields," (with B.C. Nakamura), *Journal of the Irrigation and Drainage Division*, 1989.

Hansen, Hugh J.

Chapter 1 in *Electric Energy in Agriculture Handbook*. Elsevier Science Publishers, 1988.

Hashimoto, Andrew G.

"Thermophilic and Mesophilic Methane Production from Anaerobic Degradation of the Cyanobacterium *Spirulina Maxima*," *Resources, Conservation and Recycling*, Vol. 1, No. 1, 1988, pp. 19-26.

"Modeling Anaerobic Batch Fermentation of Glucose to Methane," *Transactions of ASCE*, Vol. 31, No. 6, 1988, pp. 1855-1859.

"Effect of Moculum/Substrate Ratio on Methane Yield and Production Rate from Straw," *Biological Wastes*, Vol. 28, 1989, pp. 247-255.

Hellickson, Martin L.

"Postharvest Research in the Pacific Northwest," in *Postharvest Pomology Newsletter*, Vol. 6, No. 1 (E. Kupferman and H. Waelti, ed.), 16 pp., March 1988.

"Computer Simulation of Transient Refrigeration Load in a Cold Storage for Apples and Pears," (with N. Adre), ASAE Tech. Paper No. 88-6010, June 1988.

"Biocenvironmental Engineering - Responding to Advanced Environmental Control Needs," (with L.L. Christianson and L.D. Albright), 1988 ASEE Annual Conference Proceedings, June 1988.

"Simulation of the Transient Refrigeration Load in a Cold Storage for Apples and Pears," (with N. Adre), *Transactions of the ASAE*, Vol. 32, No. 3, 1989, pp. 1038-1048.

"Challenges for Changes in the Structures and Environment Division of ASAE - Research," *Transactions of the ASAE*, Vol. 32, No. 4, 1989, pp. 1454-1458.

Istok, Jonathan D.

"Geostatistics Applied to Groundwater Contamination. I: Methodology," (with R.M. Cooper), American Society of Civil Engineers, *Journal of Environmental Engineering*, Vol. 114, No. 2, 1988, pp. 270-286.

"Geostatistics Applied to Groundwater Contamination. II: Application," (with R.M. Cooper), American Society of Civil Engineers, *Journal of Environmental Engineering*, Vol. 114, No. 2, 1988, pp. 287-299.

"Global Estimations of Groundwater Contaminants," (with R.M. Cooper), *Journal of Environmental Engineering*, Vol. 114, No. 4, 1988, pp. 915-928.

"Multivariate Geostatistical Analysis of Groundwater Contamination by Pesticide and Nitrate: A Case History," (with J.D. Smyth), *Proceedings, Third International Congress on Geostatistics*, Avignon, France, September 5-9, 1988.

"A Comparison of Sorption Equilibrium Distribution Coefficients Using Batch and Centrifugation Methods," (with J.A. Celorie, S.L. Woods, and T.S. Vinson), *Journal of Environmental Quality*, Vol. 18, No. 3, 1989, pp. 307-313.

"Modeling Solute Transport by Centrifugation," (with J.A. Celorie, T.S. Vinson, and S.L. Woods), American Society of Civil Engineers, *Journal of Environmental Engineering*, Vol. 115, No. 3, 1989, pp. 513-526.

"A Stochastic Cluster Model for Hourly Rainfall," (with L. Boersma), *Journal of Hydrology*, Vol. 106, 1989, pp. 257-285.

"Three-Dimensional, Cross Semivariogram Calculations for Hydrogeological Data," (with R.M. Cooper and A.L. Flint), *Ground Water*, Vol. 26, 1989, pp. 638-646.

"A Geostatistical Framework for Estimating Rock Matrix Properties and State Variables in the Unsaturated Zone," (with A.L. Flint), *Proceedings, Focus 89*, American Nuclear Society, Las Vegas, NV, September 18-19, 1989.

Kolbe, Edward R.

"Onboard Refrigeration Options," a five part series, *Alaska Fisherman's Journal*.

1. "Icing," Vol. 11, No. 6, June 1988, pp. 50-51.
2. "Refrigerated Seawater," Vol. 11, No. 7, July 1988, pp. 54-56.
3. "Chilled Seawater," Vol. 11, No. 8, August 1988, pp. 50-51.
4. "Partial Freezing," Vol. 11, No. 9, September 1988, pp. 44-45.
5. "Freezing and Frozen Storage," Vol. 11, No. 10, October 1988, pp. 56-58.

"Predicted Energy Consumption in Surimi Processing," Paper 88-6593, American Society of Agricultural Engineers Winter Meeting, Chicago, December 1988.

"The Right Way to Insulate Fish Holds on a Steel Vessel," *National Fisherman*, Vol. 70, No. 2, 1989, pp. 70-71.

"Prediction of Heat Leakage through Fish Hold Wall Sections," *Jl. of Ship Research, SNAME*, Vol. 33, No. 3, September 1989, pp. 229-235.

McGuire, Joseph

"A Predictive Model for Food Particle Interactions with Contact Surfaces," Paper No. 80, IFT Annual Meeting, New Orleans, LA, 1988.

"Surface Characterization of Materials Targeted for Food Contact," (with S.A. Kirtley), Paper No. 43c, AIChE Summer National Meeting, Denver, CO, 1988.

"Surface Characterization for Prediction of Food Particle Behavior at Interfaces: Theoretical Considerations and Limitations," (with S.A. Kirtley), *Journal of Food Engineering*, Vol. 8, No. 4, 1988, pp. 273-286.

"A Predictive Model for Food Particle Interactions with Contact Surfaces," *Journal of Food Science*, Vol. 54, No. 1, 1989, pp. 22-24 and 29.

"On Surface Characterization of Materials Targeted for Food Contact," (with S.A. Kirtley), *Journal of Food Science*, Vol. 54, No. 1, 1989, pp. 224-226.

"Elucidation of the Surface Influence on Irreversible Protein Adsorption," *Biofouling*, Vol. 1, No. 3, 1989, pp. 263-267.

McGuire, Joseph (continued)

"The Influence of Solid Surface Energetics on Macromolecular Adsorption from Milk," (with K.R. Swartzel), *Journal of Food Processing and Preservation*, Vol. 13, No. 2, 1989, pp. 145-160.

"On Differences in Surface Constitution of Dairy Product Contact Materials," (with S.A. Kirtley), *Journal of Dairy Science*, Vol. 72, No. 7, 1989, pp. 1748-1753.

"Post-Adsorptive Behavior of β -lactoglobulin," (with V. Krisdhasima, P. Suttiaprasit, K. Al-malah, and R.D. Sproull), 78th Annual ODI Conference, Eugene, OR, 1989.

"Temperature Influences on Food Contact Surface Energetics," Paper No. 22.20, 5th International Congress on Engineering and Food, Cologne, Federal Republic of Germany, 1989.

"Exploitation of Differences in Surface Constitution of Food Contact Materials," (with S.A. Kirtley), Paper No. 217, IFT Annual Meeting, Chicago, IL, 1989.

"Temperature Influences on Food Contact Surface Properties," (with V. Krisdhasima, E. Lee, and R.D. Sproull), Paper No. 218, IFT Annual Meeting, Chicago, IL, 1989.

"Application of Ellipsometry to the Study of Food Protein Behavior at Interfaces," (with V. Krisdhasima and R.D. Sproull), Paper No. 702, IFT Annual Meeting, Chicago, IL, 1989.

Miner, J. Ronald

"Evaluating Coliform Concentrations in Runoff from Various Animal Waste Management Systems," (with J.A. Moore, J. Smyth, and S. Baker), Special Report 817, Agricultural Experiment Station, Oregon State University, Corvallis, OR, January 1988, 80 pp.

"Water Quality Impacts of Alternate Rangeland Management Systems," (with J.A. Moore and J.C. Buckhouse), Final Report to CSRS, USDA, 85-CSRS2-2718, 1988, 212 pp.

"Rangeland Cattle and Manure Placement: A Link to Water Quality," (with R.E. Larsen, J.C. Buckhouse, and J.A. Moore), *Proceedings*, Oregon Academy of Science, Vol. XXIV, 1988, pp. 7-15.

Miner, J. Ronald (continued)

"Resuspending Organisms from a Rangeland Streambottom," (with B.M. Sherer, J.A. Moore, and J.C. Buckhouse), *Transactions of the ASAE*, Vol. 31, No. 4, 1988, pp. 1217-1223.

"Controlling Odors from Swine Buildings," (with Clyde L. Barth) in *Pork Industry Handbook*. Cooperative Extension Service, Purdue University, June 1988.

"Modeling Bacteria Movement in Livestock Manure Systems," (with J.A. Moore, J.D. Smyth, E.S. Baker, and D.C. Moffitt), *Transactions of the ASAE*, Vol. 32, No. 3, 1989, pp. 1049-1053.

Moore, James A.

"Evaluating Coliform Concentrations in Runoff from Various Animal Waste Management Systems," (with J. Smyth, S. Baker, and J.R. Miner), Special Report 817, Agricultural Experiment Station, Oregon State University, Corvallis, OR, 1988.

"Rangeland Cattle and Manure Placement: A Link to Water Quality," (with R.E. Larsen, J.C. Buckhouse, and J.R. Miner), *Oregon Academy of Science*, Vol. 28, 1988, pp. 7-15.

"Resuspending Organisms from a Rangeland Stream Bottom," (with M. Sherer, J.R. Miner, and J.C. Buckhouse), *Transactions of ASAE*, Vol. 31, No. 4, 1988, pp. 1217-1223.

"Water Quality Impacts of Alternate Rangeland Management Systems," (with J.C. Buckhouse and J.R. Miner), Final Report to CSRS, USDA, 85-CSRS2-2718, 1988, 212 pp.

"Modeling Surface Transport of Microorganisms," *Proceedings*, EPA Biotechnology Risk Assessment Workshop, Breckenridge, CO, January 11-15, 1988.

"New Ideas for Designing an Anaerobic Digester," *Proceedings*, Third International Conference on Environment and Housing of Livestock, Pig Research Institute, Taiwan, April 21-22, 1988.

"Efficiency of Various Solid Separators," *Proceedings*, Third International Conference on Environmental and Housing for Livestock, Pig Research Institute, Taiwan, April 21-22, 1988.

Moore, James A. (continued)

"What Feeds the Weeds in Lake Ellesmere," (with D.N. Borrie), Soil and Water, Department of Scientific and Industrial Research, New Zealand, Spring 1988.

"Obtaining Permits for Livestock Operations," Extension Circular 1273, Oregon State University, October 1988.

"Hovers for Farrowing Buildings," (with G.J. Firelli), Extension Circular 1275, Oregon State University, October 1988.

"Surface Transport of Microorganisms," Chapter 10 in *Assessing Ecological Risks of Biotechnology*. Butterworth Publishers, 1989.

"Modeling Bacteria Movement in Livestock Manure Systems," (with J.D. Smyth, E.S. Baker, J.R. Miner, and D.C. Moffitt), *Transactions of the ASAE*, Vol. 32, No. 3, 1989, pp. 1049-1053.

"Calculating the Fertilizer Value of Manure from Livestock Operations," (with M.J. Gamroth), Extension Circular 1094, Oregon State University, January 1989.

"Thinking of Labor in Animal Housing," (with M.J. Gamroth), *Proceedings*, Lower Columbia Dairy Shortcourse, Washington and Oregon Extension Service, Corvallis, OR, January 1989.

"Flushing Freestall Alleys," *Proceedings*, Dairy Manure Management International Symposium, Northeast Regional Agricultural Engineering Service, Cornell University, Ithaca, NY, February 1989.

"Dairy Manure Solid Separation," *Proceedings*, Dairy Manure Management International Symposium, Northeast Regional Agricultural Engineering Service, Cornell University, Ithaca, NY, February 1989.

Tice, Ezra M.

"Soil Displacement by Rolling Coulters," (with R.L. Schafer and C.E. Johnson), Poster presentation at 11th Conference of International Soil Tillage Research Organization, Edinburgh, Scotland, 1988.

Trimmer, Walter L.

"Stretching Irrigation Water Supplies," Pacific Northwest Regional Extension Publication PNW 323, 1988.

"Computer Aided Visual Aid Cookbook (CAVAC)," *Proceedings*, International Conference on the Use of Computers in Extension, Orlando, FL, 1988, Vol. 1, pp. 161-166.

"Calibration of Irrigation Flow Meters," USDOE Bonneville Power Administration Report in completion of Order No. AI79-86BP71980, February 1988, 43 pp.

"Ultrasonic Flow Meters Testing," (with A. Taylor and H. West), *Proceedings*, ASCE Irrigation and Drainage Division, Specialty Conference, Lincoln, NE, July 1988, pp. 643-650.

"Partial Irrigation and Its Application in Pakistan," Washington State University Report to University of Idaho Irrigation Systems Management Research Project, September 1988, 56 pp.

"Understanding Your Right to Irrigation Water," Oregon State University Extension Publication EC 1274, October 1988.

Applying Partial Irrigation in Pakistan," *ASCE J. Irrigation and Drainage*, 1989, 27 pp.

"Easy Lawn Renewal," (with V. Osis, L. Long, K. Holleman, and L. Ketchum), Oregon State University Extension Service Video Tape, 1989 (14:00).

Trimmer, Walter L. (continued)

"The Heat's On: Protect Your Motor for Longer Life," (with H. Hansen), *Opflow*, American Water Works Association, 1989, (15:6), 1, 6, 7.

"Increase Pumping Plant Efficiency to Save Energy," (with H. Hansen), *Opflow*, American Water Works Association, 1989, (15:9) 3-5.

"Managing Irrigation with Computers," *Proceedings*, Oregon Horticultural Society Annual Meeting, Portland, OR, 1989, Vol. 80, pp. 238-242.

"Selecting Center Pivot Operating Speed," *Irrigation Energy News*, Oregon State University Energy Extension Service, May 1989, pp. 2-3.

"New Copy Program Saves Time, Wear," *Communicads Shift F1*, Oregon State University Agricultural Communications, June 1989, p. 2.

"Option Switches Ease Copying and Archiving," *Communicads Shift F1*, Oregon State University Agricultural Communications, July 1989, p. 2

"Using a Microcomputer to Prepare Visual Aids," ASAE Paper PNR89-301, Pacific Northwest Regional Meeting of ASAE, Penticton, BC, Canada, September 26, 1989.

Chemical Engineering

The Department of Chemical Engineering research programs reflect not only the traditional chemical engineering interests but also new technologies important to Northwest industries. Significant contributions have been made in chemical reactor engineering, heat transfer, mass transfer, fluidization, and thermodynamics. With the addition of new faculty members, research activities have expanded into areas of computer-aided design and control of chemical processes, biomass conversion, toxic waste treatment, and high-temperature materials.

Current Research

Heat Transfer--Scaling characteristics in cooling tower waters; fouling of heat transfer surfaces during evaporation of spent pulping liquor scale deposition under boiling conditions; transient heat transfer treatment to preserve wooden poles.

Chemical Reactor Engineering--Production of furfural from hemicellulose hydrolyzate; production of ethylene glycol from cellulose; nitridation of silicon powder in fluidized bed reactors; fluidization of fine powder; production of organic acids from carbohydrates by zeolite catalysts; enzymic hydrolysis of sugar-oligomers; and gas-phase HF solvolysis of finely-ground lignocellulose in a fluidized bed.

Process Control--Distributed control of chemical processes; design and robustness of multivariable controllers; control of staged fluidized beds; adaptive control of polymer reactors.

Computer-Aided Design--Modeling and design of complex separation processes; integrated fuel/chemical plant for complete utilization of biomass.

Thermodynamics--Solubility in supercritical fluids; temperature dependence of ionic activity coefficients in aqueous solutions; modeling chemical equilibrium in aqueous ionic solutions, thermodynamics of polyelectrolyte solutions.

Mass Transfer--Absorption with simultaneous chemical reaction; use of ozone in wastewater treatment; neutralization of acidic gases (H_2S and H_2Se); facilitated transport through membranes.



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Coal Cleanup--Microbial desulfurization and demineralization of high-sulfur coals; kinetics of pyrite solubilization; bioaccumulation of metals from aqueous solutions.

Gas Conversion--Conversion of synthesis gas to methanol and methyl formate via the BNL liquid-catalyzed process.

Toxic Wastes--The use of activated carbon in the absorption of toxic metals from wastewater; routine treatment of unreacted toxic gases used in the production of photovoltaic cells; bioleaching of toxic metals from geothermal sludge.

High Temperature Materials--Mass production of fine and engineering ceramics including silicon nitride; control of morphology of product solid in gas-solid reactions.

Chemical Engineering Kinetics -- Diffusion and reaction in solids; flash pyrolysis of biomass and coal.

Graduate Faculty

Frederick, W. James Jr. 1983; Assoc Prof; BS Maine 1967, MS 1969, PhD 1973.

Kimura, Shoichi 1989; Assoc Prof; BS Osaka 1967, MS Oregon State 1976, D Eng. Osaka 1982.

Levenspiel, Octave 1968; Prof; BS California-Berkeley 1947, MS Oregon State 1949, PhD 1952.

Levien, Keith L. 1985; Asst Prof; BS Iowa State 1970, BS Wisconsin 1975, PhD Wisconsin 1985.

Mrazek, Robert V. 1960; Interim Department Head and Prof; BS Purdue 1957, PhD Rensselaer Polytechnic Institute 1960.

Rorrer, Gregory L. 1989; Asst Prof; BS Michigan 1983, MS Michigan State 1985, PhD 1989.

Sproull, Robert D. 1986; Asst Prof; BS Purdue 1973, MS 1974, PhD 1986.

Way, J. Douglas 1989; Asst Prof.; BS Colorado 1978, MS 1980, PhD 1986.

New Research Grants and Contracts: 1988-89

Principal Investigator	Project Title	Agency	Amount
Frederick, W.J.	Black Liquor Combustion	Weyerhaeuser	12,000
Frederick, W.J.	Combustion Processes in Black Liquor Recovery	IPC/DOE	54,000
Kimura, S.	Shin Etsu Faculty Development Grant	Shin Etsu Chemical	7,440
Knudsen, J.G.	Heat Transfer - Fouling	HTRI	16,700
Levenspiel, O.	A Critical Experiment in Fluidized Bed Heat Transfer (Extension)	NSF	54,311
Levenspiel, O.	The Development of a Magnetic Filter for Fine Slurry Solids (Extension)	NSF	72,645
Sproull, R.D.	Union Oil Company Untenured Faculty Grant	Union Oil	7,000
Sproull, R.D.	Treatment of Waste Gases Containing Hydrogen Selenide	Arco Solar	23,700
Sproull, R.D.	Bioleaching of Geothermal Solids	Brookhaven Nat. Lab/DOE	37,400

Faculty Publications: 1988-89

Frederick, William J.

"Black Liquor Properties," TAPPI Kraft Recovery Operations Seminar, Orlando, FL, January 12-16, 1987; also January 10-15, 1988.

"The Use of CREN as a Relaxation Agent for ics," (with K.P. Wilson and M.L. Laver), Oregon Acad. Sci. Ann. Mtg., February 6, 1988.

Frederick, William J. (continued)

"Modeling Electrolyte Behavior in Pulp and Paper Processes," (with B. Kelly, H.C. Kim, M.J. McIntyre, and J.P. Danko), *AIChE For. Prod. Symp. Ser.*, Vol. 2, 1988.

"The Solubility of Aluminosilicates in Alkaline Pulping Liquors," (with R.C. Streisel and H.A. Gasteiger), *AIChE For. Prod. Div. Symp. Ser.*, Vol. 2, 1988.

Frederick, William J. (continued)

"Solute Rejection in the Ultrafiltration of Polydisperse Organics from Natural Products," (with K.P. Wilson, M.L. Laver, and S.A. Sinquefeld), *Chem. Eng. Comm.*, 1988.

"Evaluation of Pitzer Ion Interaction Parameters of Aqueous Electrolytes at 25 C. 1. Single Salt Parameters," (with H.T. Kim), *J. Chem. and Eng. Data*, Vol. 33, No. 2, 1988, p. 177.

"Evaluation of Pitzer Ion Interaction Parameters of Aqueous Electrolytes at 25 C. 2. Ternary Mixing Parameters," (with H.T. Kim), *J. Chem. and Eng. Data*, Vol. 33, No. 3, 1988.

Kimura, Shoichi

"Oxidation Kinetics of Polycrystalline Zinc Sulfide Grains," *AIChE J.*, **35** (2), 339, 1989.

"Magnetic Filter for Solids: Theory and Experiment" (with O. Levenspiel), *Ind. Eng. Chem. Res.*, **28** (6), 803 (1989).

Levenspiel, Octave

"Extended Monod Kinetics for Substrate, Product and Cell Inhibition," (with K. Han), *Biotechnol. and Bioeng.*, **32**, 430 (1988).

"Chemical Engineering's Grand Adventure," *Chem. Eng. Sci.*, **43**, 1427 (1988); Reprinted in *Chem. Eng. Res. Dev.*, **66**, 387 (1988).

"An Experimental Method to Determine the Heat Transfer Coefficient between Fine Fluidized Particles and Air via Changes in Magnetic Properties," (with R. Turton and T.J. Fitzgerald), *Int. J. Heat Mass Transfer*, **32**, 289 (1989).

"Comments on 'Optimization of Consecutive Reactions with Recovery and Reuse of Unconverted Reactant,'" (with C. Kambitsis and R. Turton), *Ind. Eng. Chem. Res.*, **27**, 212 (1988)

"Drag Coefficient and Terminal Velocity of Spherical and Non-Spherical Particles" (with A. Haider), *Powder Technol.*, **58**, 63 (1989).

"Magnetic Filter for Solids: Theory and Experiment" (with S. Kimura), *Ind. Eng. Chem. Res.*, **28**, 803 (1989).

Levenspiel, Octave (continue)

"Effect of Pore Diffusion Resistance on the Deactivation Kinetics of Porous Catalyst" (with Zhang Guo-Tai), *J. East China Inst. Chem. Tech.*, **15**, 40 (1989).

"An Experimental Investigation of Gas-Particle Heat Transfer Coefficients in Fluidized Beds of Fine Particles" (with R. Turton), in *Fluidization VI* (Grace et al, eds), p. 669, Engineering Foundation, 1989.

New corrected and expanded printing for *Chemical Reactor Omnibook*, OSU Bookstores, 1989.

Featured in the article "The Man behind the Man behind the Lectern" in *The Chemical Engineer*, p. 16, Jan. 1989.

Levien, Keith L.

"Internal Temperature in Douglas Fir Poles During Treatment with Ammoniacal Copper Arsenate or Pentachlorophenol" (with M.A. Newbill and J.J. Morrell), *Proceedings, American Wood Preservers' Association*, Minneapolis, MN, May 9-11, 1988, Vol. 84, pp. 48-54.

Rorrer, Gregory L.

"Adsorption and Reaction Processes of the Solvolysis of Wood and Pure Cellulose by Anhydrous Hydrogen Fluoride Vapor" (with W. Mohring, M.C. Hawley, and D.T.A. Lamport), *Energy & Fuels*, **2**, 1988, pp. 556-566.

"A Detailed Kinetic and Heat Transport Model for the Hydrolysis of Lignocellulose by Anhydrous Hydrogen Fluoride Vapor" (with M.C. Hawley and D.T.A. Lamport), *Chemical Engineering Science*, **43**, 1988, pp. 1831-1836.

"Anhydrous Hydrogen Fluoride and Cell Wall Analysis" (with A.J. Mort, P. Komalivilas, and D.T.A. Lamport), in *Modern Methods of Plant Analysis, Vol. 10: Plant Fibers*, H.F. Linskens and J.F. Jackson, eds. Berlin: Springer Verlag, 1989.

"Anhydrous Hydrogen Fluoride in Polysaccharide Solvolysis and Glycoprotein Deglycosylation" (with M.C. Hawley, P.M. Dey, and D.T.A. Lamport), in *Methods in Plant Biochemistry, Vol. I: Carbohydrates*, P. Dey, ed. Academic Press, 1989.

Sproull, Robert D.

"Specifying Environmental Control Systems for Toxic Gases: A Case Study for Hydrogen Selenide and Hydrogen Sulfide," (with V.M. Fthenakis and P.D. Moskowitz), *J. of Loss Prevention*, 1, 206 (1988).

"The Utilization of Douglas Fir Bark for Production of Oxalic Acid and High Density Carbon Pellets" (with A.M. Aslam, C.J. Biermann, and M.L. Laver), *Applied Biochem. and Biotech.*, 20/21, 135-148 (1989).

"Biobleaching of Coal in a Fluidized Bed" (with J.A. Knott), *Proceedings*, Biological Processing of Coal and Coal-Derived Substances Workshop, Electric Power Research Institute, Palo Alto, CA, May 16-17, 1989.

Way, J. Douglas

"A Theoretical Comparison of Facilitated Transport and Solution-Diffusion Membrane Modules for Gas Separations" (with D.E. Gottschlich and D.L. Roberts), *Gas Separation & Purification*, 2, 65, 1988.

"CO₂ Separation Using Facilitated Transport Ion Exchange Membranes" (with R.D. Noble, J.J. Pellegrino, E. Grosogeat, and D. Sperry), *Separation Science and Technology*, 23, 1595, 1988.

"Liquid Membranes" (with R.D. Noble and A.L. Bunge), in *Solvent Extraction and Ion Exchange*, 10, Y. Marcus, ed. New York: Marcel Dekker, 1988.

Wicks, Charles E.

Fundamentals of Wastewater Engineering, Universidad de las Americas-Puebla Press, 1989.

Civil Engineering

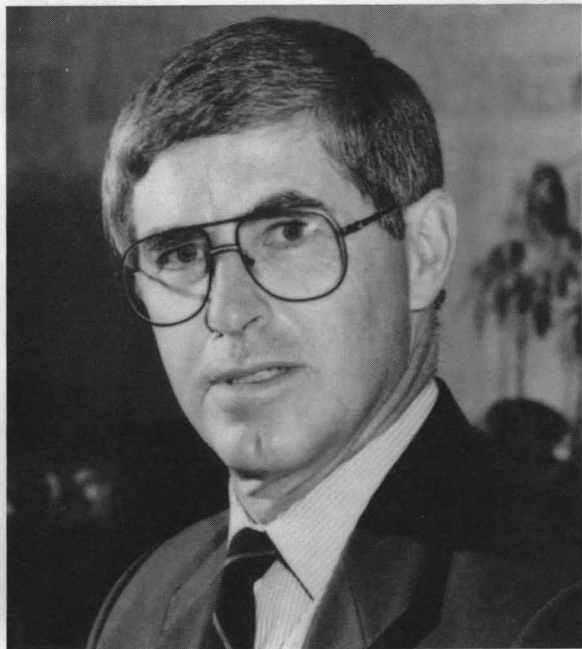
Current Research

The **environmental engineering** faculty are active in hazardous substances research, including a recent award from the U.S. EPA to establish the Western Region Hazardous Substance Center in cooperation with Stanford University. Investigations include degradation processes for chlorinated organic compounds, *in situ* remediation of metals and organics-contaminated soils, and the transport and fate of hazardous substances in soils and groundwaters. Additional studies deal with wastewater treatment systems and acid rain.

Research funding in **transportation engineering** has exceeded \$1 million for 1989 with projects in materials research, polymer asphalt and cold recycling, modulus testing, rutting in asphalt pavements, human factors, automatic vehicle identification, and technical assistance.

Research projects in **structural engineering** include the dynamic behavior of cable systems with ocean loadings, visco-elastic and wrinkling response of tensional fabric structures, deployment of lightweight ocean cables, motions of flexible hoses on the ocean bottom, chaotic and overturning response of free-standing objects during earthquakes, strength and stability of large glue-laminated beams, dynamic response of skyline logging systems, and behavior of reinforced concrete joints.

Sponsored research in **geotechnical engineering** involves contaminant transport in soils using centrifugation techniques, development of a hazard-based methodology for coastal landslides, root reinforcement of soil slopes, performance of grouted rock anchors used in cable logging operations, evaluation of subgrade performance in low volume roads, and the performance of pavement structures under cold temperatures and other environmental loadings.



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The **ocean engineering** program is in its fourth year of a University Research Initiative from the Office of Naval Research which has provided \$8 million over a 5-year period to examine the fundamental dynamics of ocean structures and nearshore circulation. Approximately one-third of the funding from this grant has been used to develop, construct, and test new permanent physical research facilities at the O.H. Hinsdale Wave Research Laboratory. These facilities are the best in the United States for ocean engineering research. The URI grant supports 8 faculty and 18 graduate students. Some specific research projects are the implementation of a rational design procedure for rubble mound coastal structures, ocean outfall behavior, a seabed drifter study, and an examination of chaos in ocean structure systems.

Graduate Faculty

Bell, Christopher A. 1981; Assoc Prof; BSc U of Nottingham 1972, PhD 1978.

Bell, J. Richard 1962; Prof; BSCE Purdue 1952; MSCE 1956, PhD 1963.

Bella, David A. 1967; Prof; BS Virginia Military Institute 1961, MS New York U 1964, PhD 1967.

Burgess, Frederick J. 1953; Prof, Dean of College of Engineering; BS Oregon State 1950, MS Harvard 1955.

Garrison, C. James 1988; Prof; BS Univ of Nebraska 1960, MS 1962, PhD Univ of Washington 1968.

Hernreid, Alan G. 1989; Assoc Prof; BSCE University of California-Berkeley, 1977, MSCE 1978, PhD, 1982.

Hicks, R. Gary 1975; Prof; Director of Transportation Research Institute; BS California-Berkeley 1963, MS 1965, PhD 1970.

Hudspeth, Robert T. 1974; Prof; BS U.S. Naval Academy 1963, MSCE Washington 1966, PhD Florida 1974.

Hunter-Zaworski, Katharine 1988; Asst Prof; BS Univ of British Columbia 1978, MS Univ of Tennessee 1980, PhD Oregon State 1988.

Istok, Jonathan 1986; Asst Prof; BS Ohio State 1978, MS Oregon State 1981, PhD 1986.

Klingeman, Peter C. 1966; Prof; Director of Water Resources Research Institute. BS Northwestern 1957, MS 1959; PhD California-Berkeley 1965.

Laursen, Harold I. 1963; Prof; BS Oregon State 1958, MS 1960, PhD California-Berkeley 1964.

Layton, Robert D. 1972; Assoc Prof; BSCE Colorado State 1959, MSCE Kansas State 1965, PhD California-Berkeley 1970.

Leonard, John W. 1979; Prof; BS Tufts 1962, MS Illinois 1963, PhD 1966.

McDougal, William G. 1981; Assoc Prof; BS Humboldt State 1976, MCE Delaware 1977, PhD Oregon State 1981.

Miller, Thomas H. 1989; Asst Prof; BS Cornell University, MECE 1981, PhD 1990.

Nath, John H. 1970; Prof Emer; BSCE Colorado 1952, MSCE 1960, PhD MIT 1967.

Nelson, Peter O. 1975; Assoc Prof; BS Cornell 1968, MS 1972, PhD 1975.

Peterson, John 1964; Assoc Prof; BS South Dakota State 1951, MS Illinois 1959, PhD Wisconsin 1964.

Phelps, Robert E. 1968; Assoc Prof; BS Alaska 1957, MS Stanford 1958.

Pritchett, Harold D. 1957; Prof; BS Oregon State 1957, MS 1961, DE Stanford 1965.

Rogge, David F. 1982; Asst Prof; BS Nebraska 1970, MS 1971, PhD Texas 1981.

Schaumburg, Frank D. 1967; Prof, Head of Department; BSCE Arizona State 1961, MSCE Purdue 1964, PhD 1966.

Schroeder, W. Lee 1967; Prof, Assoc Dean of Engineering; BSCE Washington State 1962, MSCE 1963, PhD Colorado 1967.

Schultz, Robert J. 1962; Prof; BSCE Worcester Polytechnic Institute 1955, MSCE 1960; Professional Engineer, Massachusetts 1959, Oregon 1963, Professional Land Surveyor Oregon 1974.

Sollitt, Charles K. 1972; Assoc Prof; BSCE Washington 1966, MSCE 1968, PhD MIT 1972.

Terrel, Ronald L. 1989; Prof; BSCE Purdue Univ 1960, MSCE 1961, PhD Univ of California-Berkeley 1967.

Vinson, Ted S. 1976, Prof; BS California-Berkeley 1966, MS 1967, PhD 1970.

Williamson, Kenneth J. 1973; Prof; BS Oregon State 1968, MS 1970, PhD Stanford 1973.

Woods, Sandra L. 1984; Asst Prof; BS Michigan State 1976, MS Washington 1980, PhD 1984.

Yim, Solomon C.S. 1987; Asst Prof; BSCE Rice Univ 1976; MSCE Univ of California-Berkeley 1977, MA 1981, PhD 1983.

New Research Grants and Contracts: 1988-89

Principal Investigator	Project Title	Agency	Amount
Hicks, R.G.	In-Depth Study of Cold In-Place Recycled Pavement Performance	OSDT	62,000
Hicks, R.G.	Rutting of Asphalt Concrete Pavement	ADTPF	10,230
Hicks, R.G.	Road Technology Programs	OSDT	25,000
Hicks, R.G. Vinson, T.S. Bell, C.A. Terrel, R.C.	Performance Related Testing and Measuring of Asphalt-Aggregate Interactions	SHRP	493,417
Hudspeth, R.T.	Dynamics of Ocean Structures and Nearshore Circulation	ONR	1,462,820
Hudspeth, R.T.	Siting of Marine Diffusers	NOAA/State	45,600
Layton, R.D.	Highway Engineering and Safety: Short Courses and and Technical Assistance	OTSC	68,186
Layton, R.D.	Highway Engineering and Safety: Short Courses and and Technical Assistance	OTSC	80,000
Leonard, J.W.	Dynamic Stress Analysis of Hybrid Aircraft	Aerolift, Inc.	40,000
Leonard, J.W.	Simulation of Lightweight Cables in the Ocean Environment	NCEL	30,477
Leonard, J.W.	Assignment to NCEL (IPA)	NCEL	33,775
McDougal, W.G.	Rational Analysis and Design - Coastal Structures	NOAA/State	93,700
Nath, J.H.	Breaking Waves - Their Influence on Wave Spectra	ONR	33,713
Rogge, D.F.	Public Performance in Contracting	OSDT	12,500
Schultz, R.J.	"Road Manual" Update 1988	OSDT	12,500
Sollitt, C.K.	Ocean Outfall Performance	EPA	60,000
Sollitt, C.K.	Seabed Drifters in Wave and Current Environments	USACOE	25,795
Vinson, T.S.	Resilient Modulus Testing Workshop	OSDT	20,000
Washburn, J.L.	Cumulative Effects of Diving Equipment on Diver Safety	Dreyfus Foundation	12,500
Williamson, K.J.	Hazardous Substances Research Center	EPA/Stanford	265,487
Woods, S.L.	Matching Funds for Presidential Young Investigator Award from General Electric	GE	30,000

Woods, S.L.	Matching Funds for NSF Presidential Young Investigator Program	ARCO	10,000
Yim, S.C.	Chaotic and Random Dynamic Response of Ocean Structures (PYI Award)	ONR-PYI	181,649
Yim, S.C.	Frequency Domain Stochastic Analysis of Nonlinear Dynamic Systems	ONR-NCEL	29,421
Yim, S.C.	Frequency Analysis of Nonlinear Dynamic Systems	NCEL	15,055

Faculty Publications: 1988-89

Bell, C.A.

"Experiences with the Corbett-Swarbrick Procedure for Separation of Asphalt into Four Generic Fractions (with G. Thenoux, J.E. Wilson, D. Eakin, and M. Schroeder), *Transportation Research Record 1171*, Transportation Research Board, January 1988, pp. 66-70.

"Evaluation of Physical and Fractional Properties of Asphalt and Their Interrelationships," (with G. Thenoux and J.E. Wilson), *Transportation Research Record 1171*, Transportation Research Board, January 1988, pp. 82-97.

"Measurement and Analysis of Truck Tire Pressures in Oregon," (with O-K. Kim), *Transportation Research Board*, January 1988, 31 pp.

"Study on Mix Design Criteria for Controlling the Effect of Increased Tire Pressure on Asphalt Pavement," (with O-K. Kim, J.E. Wilson, and G. Boyle), *Transportation Research Record 1171*, Transportation Research Board, January 1988, pp. 149-159.

"Evaluation of the Coordination of Weigh-in-Motion Data," Volumes 1, 2, and 3, (with Y. Abwahab, S. Davis, and G. Burgess), for Federal Highway Administration, January 1988, 24 pp.

"Evaluation of Asphalt Properties and Their Relationship to Pavement Performance," Parts 1 and 2, (with G. Thenoux, J.E. Wilson, D. Eakin, M. Schroeder, J. Kliever, and B. Kramer), *FHWA-OR-RD-88-02*, May 1988, 103 pp.

"Procedures for Controlling the Effect of Increased Tire Pressures on Asphalt Pavement Damage," (with O-K. Kim and J.E. Wilson), *FHWA-OR-RD-88-1*, June 1988.

Bell, C.A. (continued)

"Evaluation of Pavement Damage Caused by Single-Tired Axles," for Oregon Department of Transportation, Permits and Weighmasters Section, June 1989.

"Effect of Increased Truck Tire Pressure on Asphalt Concrete Pavements," (with O-K. Kim), *ASCE Transportation Journal*, July 1989.

"Aging of Asphalt Aggregate Systems," *SR-OSU-A-0034-89-2*, Strategic Highway Research Program, National Research Council, September 1989.

"Development of a New Procedure for Bituminous Mix Design," (with S.F. Brown), for Science and Engineering Research Council, London, England, September 1989.

"Development of a New Procedure for Bituminous Mix Design," (with S.F. Brown, K.E. Cooper, and J.N. Preston), Eurobitume, Madrid, October 1989.

Bella, David A.

"Technocracy and Trust: Nuclear Waste Controversy," (with C.D. Mosher and S.N. Calvo), *Journal of Professional Issues in Engineering*, Vol. 114, No. 1, January 1988, pp. 27-39.

"Establishing Trust: Nuclear Waste Disposal," (with C.D. Mosher and S.N. Calvo), *Journal of Professional Issues in Engineering*, Vol. 114, No. 1, January 1988, pp. 40-50.

"Solutions to Nuclear Waste Disposal - The Question of Trust," (with C.D. Mosher, S.N. Calvo, and J.L. Creighton), *Frontiers in Public Service*, 49th National ASPA Conference, Portland, OR, April 19, 1988.

Bella, David A. (continued)

"Why Two Ballistic Missile Defenses Could Be Dangerous," (with Dean V. Babst), *Global Security Study No. 3*, Nuclear Age Peace Foundation, May 1988.

"Strategic Defense: Catastrophic Possibilities and Their Implications," *Annual Meeting, Pacific Division of the American Association for the Advancement of Science*, Corvallis, OR, June 1988.

"Fault Tolerant Ballistic Missile Defense: Defining Constraints," *IEEE Technology and Society*, Vol. 7, No. 3, September 1988, pp. 22-25.

Book Review of "Calculated Risks: A Century of Arms Control, Why It Has Failed, and How It Can be Made to Work," by Bruce D. Berkowitz, *IEEE Technology and Society*, Vol. 7, No. 3, September 1988, pp. 26-27.

"Organizational Systems: A General Model and Its Application to the Military Industrial Complex," *The Military Industrial Complex: Eisenhower's Warning Three Decades Later*, Oregon State University, Corvallis, OR, October 13-15, 1988.

"Catastrophic Possibilities of Space-Based Defenses," *Philosophy of Technology*, Paul T. Durbin (ed.), Vol. 6, 1989, pp. 27-40.

"Ethics, Values and Organizations: Beyond Functional Behavior," *Annual Meeting, American Association for the Advancement of Science*, San Francisco, CA, January 1989.

"Strategic Defense: Catastrophic Loss of Control," *Journal of Peace Research*, Vol. 26, No. 3, August 1989, pp. 297-306.

Garrison, C.J.

Technical Note, "Effects of a Narrow Gap Between a Structure and the Seabed," *Applied Ocean Research*, Vol. 10, No. 4, 1988, pp. 219-221.

Hicks, R.G.

"Development of Improved Mix and Construction Guidelines for Rubber Modified Asphalt Pavements," (with H. Takallou), *Transportation Research Record 1171*, Transportation Research Board, 1988, pp. 113-120.

Hicks, R.G. (continued)

"State-of-the-Art on Rutting in Asphalt Concrete," *Proceedings, Third International Road Federation Meeting*, Riyadh, Saudi Arabia, February 1988, pp. 6.119-6.144.

"Evaluation of Emulsified Asphalt Treated Mixes," (with H.I. Al-Abdul Wahhab), *Proceedings, Third International Road Federation Meeting*, Riyadh, Saudi Arabia, February 1988, pp. 3.159-3.174.

"Performance Update of Open Graded Emulsified Asphalt Pavements in the Pacific Northwest," (with K. Valdez and D. Decker), *Proceedings, 15th Annual Meeting of Asphalt Emulsion Manufacturers Association*, Maui, HI, March 1988.

"Economic Analysis of Rubber-Modified Asphalt Mixes," (with J. McQuillen, H. Takallou, and D. Esch), *Journal of Transportation Division*, ASCE, pp. 259-277, May 1988.

"Performance of Rubber Modified Asphalt Pavements in Cold Climates," (with H. Takallou, T. Vinson, and D. Esch), *Proceedings, ASCE Cold Regions Engineering Specialty Conference*, St. Paul, MN, June 1988.

"Development of Improved Mix Design and Construction Procedures for Cold In-Place Recycled Pavements - Vols. III and IV," (with T. Scholz and D. Allen), *OR-89-14, 1B*, June 1988.

"Evaluation of Polymer Modified Asphalt in the Hot Mix Pavements - Interim Report," (with D. Rogge, C. Ifft, and L. Scholl), *FHWA/OR-89-02*, Federal Highway Administration, June 1988.

"Use of Cold In-Place Recycled Asphalt Mixes for Road Surfaces," (with T. Scholz and D. Allen), *Proceedings, 5th Conference on Asphalt Pavements in Southern Africa*, Swaziland, July 1988.

"Pavement Design and Pavement Methodology, The New United States AASHTO Pavement Design Guide," (with F.N. Finn and C.L. Monismith), *Proceedings, 5th Conference on Asphalt Pavements in Southern Africa*, July 1988.

"Development of Drainage Coefficients for the 1986 AASHTO Guide for Design of Pavement Structures," (with S. Seeds), *Proceedings, 68th Annual Meeting of Transportation Research Board*, August 1988.

Hicks, R.G. (continued)

"Evaluation of the 1986 AASHTO Overlay Design Method," (with H. Zhou and J. Huddleston), *Proceedings*, 68th Annual Meeting of Transportation Research Board, August 1988.

"Mix Design Practices for Cold In-Place Recycled Pavements," (with T. Scholz and D. Allen), *Proceedings*, Symposium of Asphalt Emulsions, American Society of Testing and Materials, September 1988.

"Use of Improved Design Procedures for Asphalt Concrete Overlays," (with H. Zhou), *Proceedings*, Caltrans Research and Development Conference, Sacramento, CA, September 1988.

"Development of an Improved Overlay Design Procedure for the State of Alaska - Vols. III and IV," Field Manual and Computer Program, *FHWA/AK-88-06B, 06C*, Federal Highway Administration, October 1988, 43 pp. and 303 pp.

"Backcalculation of Layer Moduli and Roadway Overlay Design: U.S. Coast Guard Air Station, Kodiak, Alaska," (with T.S. Vinson and H. Zhou), *Proceedings*, CRREL Colloquium on Performance Monitoring Systems for Roads and Airfields, Hanover, NH, March 1989.

"NDT in Cold Regions: A Review of the State-of-the-Art of Deflection Testing," (with N.F. Coetzee), *Proceedings*, CRREL Colloquium on Performance Monitoring Systems for Roads and Airfields, Hanover, NH, March 1989, 68 pp. and 49 pp.

"Effectiveness of Antistripping Additives - Vols. I and II," (with J. Shute and J.E. Wilson), *FHWA/OR 89-03A, 03B*, Federal Highway Administration, April 1989.

"Repeatability of Testing Procedures for Resilient Modulus and Fatigue," (with T. Scholz and L. Scholl), *FHWA-OR/RD-89-07*, Federal Highway Administration, April 1989.

"MECHOD: A Mechanistic Overlay Design Program for Flexible Pavements," (with H. Zhou and B. Connor), *Proceedings*, ASCE Conference "Microcomputers in Transportation," June 1989.

Hicks, R.G. (continued)

"Use of Rubber Modified Asphalt for Snow and Ice Control," (with H.B. Takallou and M.B. Takallou), *Proceedings*, International Conference, SHRP and Traffic Safety on Two Continents, Gothenburg, Sweden, September 1989.

Hudspeth, Robert T.

"Earthquake Response of Circular Cylindrical Structures in Water," (with Y. Tanaka), *Earthquake Engineering and Structural Dynamics*, Vol. 16, January 1988, pp. 99-119.

"Wave Phase/Amplitude Effects on Force Coefficients," (with J.H. Nath and P. Khare), *ASCE, Journal of Waterway, Port, Coastal and Ocean Engineering Division*, Vol. 114, No. 1, (ASCE Proc. Paper 22095), January 1988, pp. 34-49.

"Loading and Response of Deep-Ocean Compliant Platforms," (with J.W. Leonard), Special Lecture, Symposium on Fundamental Study on Dynamic Failure and Design of Ocean Structures, Daido Institute of Technology, Nagoya, Japan, February 19, 1988, pp. 39-64.

"Mass Transport in Wave Flumes," (with W. Sulisz), Abstract, *Proceedings*, Third International Workshop on Water Waves and Floating Bodies, Swope Center, Woods Hole, MA, April 10-13, 1988.

"Wave Group Analysis by the Hilbert Transform," (with J.R. Medina), *Proceedings*, 21st International Conference Coastal Engineering, Torremolinos, Spain, June 20-24, 1988.

"Mass Transport in Finite Amplitude Waves," (with T-I Kim), *Proceedings*, Sixth Congress Asian and Pacific Div. IAHR, Kyoto, Japan, July 20-22, 1988, pp. 17-24.

"Buoy System Analysis Technology," (with S.R. Karnoski, D.R. Shields, R.J. Taylor, J.H. Nath, and J.W. Leonard), *Proceedings*, Ocean Structural Dynamics Symposium '88, Oregon State University, September 13-14, 1988.

"Analysis of Wave Groups in Random Fields," (with J.R. Medina), *Proceedings*, Ocean Structural Dynamics Symposium '88, Oregon State University, September 13-14, 1988, pp. 104-118.

Hudspeth, Robert T. (continued)

"Longshore Current and Sediment Transport on Composite Beach Profiles," (with W.G. McDougal), *Journal of Coastal Engineering*, Vol. 12, 1989, pp. 315-338.

Hunter-Zaworski, Katharine M.

"A Synopsis of Accessibility Features of Skytrain the Advanced Light Rapid Transit System in Vancouver, B.C.," *Proceedings*, 1988 Annual Meeting of the Institute of Transportation Engineers, Vancouver, September 1988.

Hunter-Zaworski, Katharine M. (continued)

Study of Human Factors in Public Transportation Safety, (with R. Layton and R. Safford). Washington, DC: U.S.D.O.T. Urban Mass Transportation Administration, March 1989.

"A Study of Human Factors of Elderly and Handicapped Passengers in Public Transportation Safety," *Proceedings*, 5th International Conference on Mobility and Transport for Elderly and Disabled Persons, Stockholm, Sweden, May 1989.

"The Performance of Drivers with Physical Limitations at T-Intersections," *Proceedings*, 5th International Conference on Mobility and Transport for Elderly and Disabled Persons, Stockholm, Sweden, May 1989.

Klingeman, Peter C.

"Ensuring the Security of Public Water Supplies," (with P.J. Ownbey and F.D. Schaumburg), *Journal of the American Water Works Association*, Vol. 80, No. 2, February 1988, pp. 30-34.

Layton, Robert D.

"Making Better Tree-Bucking Decisions: A Network Solution," (with J. Sessions and Li Guangda), *The Compiler*, Vol. 6, Issue 1, January/February 1988.

Leonard, John W.

Tension Structures: Behavior and Analysis. New York: McGraw-Hill Book Co., 1988.

"Response of Guyed Offshore Towers to Stochastic Loads: Time Domain vs. Frequency Domain," (with S. Brynjolfsson), *Engineering Structures*, Vol. 10, No. 2, 1988, pp. 106-116.

Leonard, John W. (continued)

"Effects of Currents on the Stochastic Response of MDOF Models of Guyed Towers," (with S. Brynjolfsson), *Engineering Structures*, Vol. 10, No. 3, 1988, pp. 194-203.

"A Finite Element Model of Wave-Structure Interactions in the Time Domain," (with J.F. Lee), *Engineering Structures*, Vol. 10, No. 4, 1988, pp. 229-238.

"Loading and Response of Deep-Ocean Compliant Platforms," (with R.T. Hudspeth), Symposium on Fundamental Study of Dynamic Failure and Design of Ocean Structures, Nagoya, Japan, February 1988, pp. 37-64.

"Combined Tension and Torsion in Long Oceanic Cables," (with R. Simpson), *Proceedings*, Ocean Structural Dynamics Symposium '88, September 1988, pp. 206-230.

"Buoy System Technology," (with S.R. Karnoski, D.R. Shields, R.J. Taylor, J.H. Nath, and R.T. Hudspeth), *Proceedings*, Ocean Structural Dynamics Symposium '88, September 1988, pp. 270-294.

"Free Vibrations of Oceanic Cables," (with T-Y Yoon), *Steel Structures Proceedings*, Structural Congress '89, San Francisco, May 1989, pp. 1-10.

McDougal, William G.

"Wave-Induced Forces on Buried Pipelines," (with S.H. Davidson, P.L. Monkmeyer, and C.K. Sollitt), *Journal of Waterway, Port, Coastal, and Ocean Engineering*, 114, 1988, pp. 220-236.

"Wave Force on Concrete Armor Units," (with J.A. Melby and J.W. Tedesco), *Journal of Waterway, Port, Coastal, and Ocean Engineering*, ASCE, 114, 1988, pp. 582-598.

"Coastal Erosion and Engineering Structures: The Oregon Experience," (with P.D. Komar), *Journal of Coastal Research*, 4, 1988, pp. 77-92.

"Hydrodynamic Analysis of Variable Draft Spiral Wavemaker," (with A.N. Williams), *Proceedings*, Ocean Structural Dynamics Symposium '88, Corvallis, OR, 1988, pp. 90-103.

"Structural Response of Dolos in Waves," (with J.W. Tedesco and P.B. McGill), *Proceedings*, 21st International Conference on Coastal Engineering, Torremolinos, Spain, 1988.

McDougal, William G. (continued)

"Articulated Concrete Mat Slope Protection," (with C.B. Leidersdorf, and P.E. Gadd), *Proceedings*, 21st International Conference on Coastal Engineering, Torremolinos, Spain 1988.

"Wave Interaction with a Composite Breakwater," (with W. Sulisz), *Proceedings*, Conference on Computer Modelling in Ocean Engineering, Venice, Italy, 1988, pp. 715-721.

"Sea Bed Stability Near Fixed and Floating Structures," (with W. Sulisz), *Proceedings*, Soil-Wave-Structure Interaction Conference '88, Delft, The Netherlands, 1988, pp. 56-60.

"Wave Induced Pore Water Pressure Accumulation in Marine Soils," (with Y.T. Tsai, P.L-F Liu, and E.C. Clukey), *Journal of the Offshore Mechanics and Arctic Engineering Division*, ASME, 111, 1989, pp. 1-11.

"Longshore Current and Sediment Transport on Composite Beach Profiles," (with R.T. Hudspeth), *Coastal Engineering*, 12, 1989, pp. 315-318.

Nath, John H.

"Wave Phase/Amplitude Effects on Force Coefficients," (with R.T. Hudspeth and P. Khare), *Journal of Waterway, Port, Coastal and Ocean Engineering Division*, ASCE, January 1988.

"Biofouling and Morison Equation Coefficients," Symposium of Offshore Mechanics and Arctic Engineering, ASME, Houston, TX, February 1988.

"Periodic Waves on Horizontal Cylinders," (with C.C. Teng), *Symposium of Offshore Mechanics and Arctic Engineering*, ASME, Houston, TX, February 1988.

"Kinematics and Return Flow in a Closed Wave Flume," (with J.D. Ramsden), *Proceedings*, 21st International Conference on Coastal Engineering, Spain, June 1988.

"In-Line Wave Force Time History on Vertical Cylinders," (with M.K. Hsu), Ocean Structural Dynamics Symposium, Oregon State University, September 1988.

Schaumburg, Frank D.

"Fundamentals of Engineering (FE) Examination Review, 1986," A Discussion Paper in *Journal of Professional Issues in Engineering*, January 1990.

"Banning Use of Trichloroethylene (TCE): Responsible Reaction or Environmental Overkill?" *Environmental Science & Technology*, January 1990.

Schroeder, W.L.

"Underwater Construction of an Impervious Dam Core," (with R. Phelps and A. Tigoulet), *Proceedings*, 24th Annual Symposium on Engineering Geology and Soils Engineering, Coeur d'Alene, ID, March 1988, pp. 391-407.

"Bulkhead Failure Investigation and Redesign," (with R.D. Rieke and J.C. Crowser), *Journal of the Geotechnical Engineering Division*, American Society of Civil Engineers, Vol. 114, No. 10, October 1988, pp. 1110-1125.

"Rockbolts for Anchors in Southeast Alaska," (with P. Cole and V. Henry), *Proceedings*, International Mountain Logging and Pacific Northwest Skyline Symposium, Portland, OR, December 1988, pp. 49-53.

"Capacity of Epoxy-Grouted Rock Anchors for Use in Cable Logging Applications in Southeast Alaska," (with V. Henry and P. Cole), Oregon State University, Civil Engineering Department, February 1989, 96 pp.

Vinson, Ted S.

"Effect of Test Condition Parameters on IRM_r ," (with J. Heinicke), *J. of Transportation Engineering*, ASCE, 114:2, March 1988.

"Physical Model Study of Arctic Pipeline Settlement," (with A. Palmer), *Proceedings*, Fifth International Conference on Permafrost, Trondheim, Norway, August 1988.

"Bethel Airport CTB Pavement Performance Analysis," (with C. Vita and J. Rooney), *Proceedings*, Fifth International Conference on Permafrost, Trondheim, Norway, August 1988.

"Effect of Environmental Factors on Pavement Deterioration - Background and Methodology," (with G. Ordonez), *Report 88-12*, Transportation Research Institute, Oregon State University, November 1988.

Vinson, Ted S. (continued)

"Effect of Environmental Factors on Pavement Deterioration - PBA Users Manual and Source Code," (with G. Ordonez), *Report 88-31*, Transportation Research Institute, Oregon State University, November 1988.

"Performance of Rubber-Modified Asphalt Pavements in Cold Climates," (with H. Takallou, R.G. Hicks, and D. Esch), *Proceedings, Fifth International Cold Regions Engineering Specialty Conference*, ASCE, St. Paul, MN, February 1989.

"Backcalculation of Layer Moduli and Runway Overlay Design: U.S. Coast Guard Air Station, Kodiak, Alaska," (with H. Zhou, R. Alexander, and R.G. Hicks), *Proceedings, State of the Art Symposium on Pavement Response Monitoring Systems for Roads and Airfields*, USCACRREL, New Hampshire, March 1989.

Vinson, Ted S. (continued)

"Fundamentals of Resilient Modulus Testing," *Proceedings, Workshop on Resilient Modulus Testing: State of the Practice*, Oregon State University, Corvallis, OR, March 1989.

"Modeling Solute Transport by Centrifugation," (with J. Celorie, S. Woods, and J. Istok), *J. of Environmental Engineering*, ASCE, 115:3, June 1989.

"A Comparison of Sorption Equilibrium Distribution Coefficients Using Batch and Centrifugation Methods," (with J. Celorie, S. Woods, and J. Istok), *J. of Environmental Quality*, 18:3, July-September 1989.

"Settlement of Arctic Submarine Pipelines: Theoretical Considerations and Physical Model Test Results," (with A.C. Palmer), *Proceedings, International Symposium on Geocryological Studies in Arctic Regions*, Nady, U.S.S.R., August 1989.

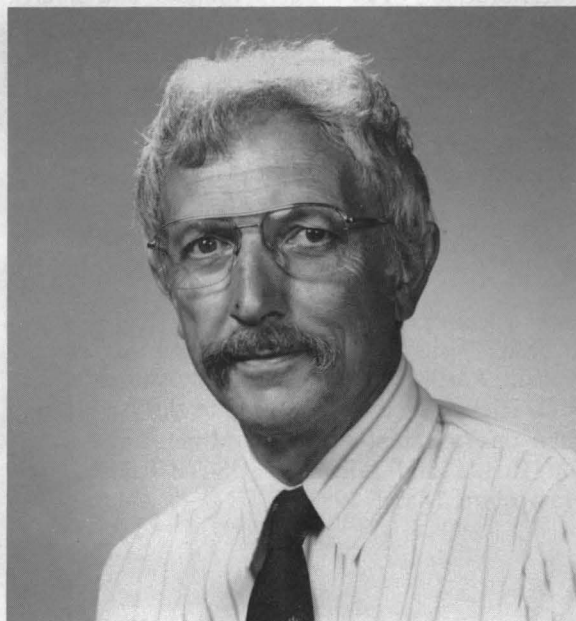
Electrical and Computer Engineering

Current Research

Research in the department is sponsored by agencies such as the National Science Foundation, Department of Energy, Office of Naval Research, Air Force Office of Scientific Research, etc., and by private industry. The department enjoys particularly close relationships with the Bonneville Power Administration and with the Oregon electronics industry, including Tektronix, Hewlett-Packard, Intel, N-Cube, Triquint, Planar Systems, Mentor Graphics, etc. Although research is concentrated in four main areas -- energy systems, computer engineering, systems and control, and electrophysics -- many projects involve faculty from more than one group and interdisciplinary efforts with other engineering and science departments, e.g., Computer Science, Physics, etc., also occur. Our new building, occupied in the fall of 1988, provides excellent facilities and a significant growth in our research has occurred over the past few years.

Energy Systems -- The implications of solid state high power electronic converters for both the production and utilization of electrical energy are the focus of analytical and laboratory studies. Support from the Bonneville Power Administration and Pacific Power has promoted work in variable speed generation, adjustable speed drives, and power quality at converter-utility interfaces. The interactions of converters employing novel topologies (including high-frequency series-resonance) and both rotating and linear machines of unusual configurations (including permanent-magnet and doubly-fed) are being investigated. These studies are directed towards detailed component designs based on overall system requirements. Conceptual studies in these areas recently have established areas of technical viability and economic potential. Future work will be directed towards the technological development needed for industrial application.

Computer Engineering -- Computer architecture research includes digital system design, microprocessor systems, and applications and design of parallel system architecture. Research in the parallel and distributed systems area involves both hardware and software aspects of parallel processing. Dynamic load balancing methods for parallel systems, distributed operating systems, synthesis methodologies for automatic derivation of parallel algorithms is investigated. Recently, research



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in distributed neural computing has been initiated. Studies of local area networks concentrates on applications and implementations for distributed control, robotics, and system communications. System design methods for VLSI implementation of ASICs is investigated. The work consists of VLSI implementation of digital signal processor arrays and systolic and wavefront arrays. Computer aided design tools for VLSI systems have been developed. Within the area of digital signal processing, research is in progress on parallel signal and image processing, real-time implementation of signal processing algorithms, and neural signal processing. VLSI system design for signal processing and implementation of DSP algorithms on recent DSP processors is investigated. Parallel implementation of estimation, filtering, and image enhancement algorithms on N-cube, Hypercube, and other systems is examined.

Systems, Control, and Signal Processing -- For some years, the department has enjoyed an international reputation for its research in nonlinear systems, control, and signal processing. This work evolved primarily from pioneering research on bilinear systems theory and its application to problems in engineering and medicine. Recent projects include adaptive nonlinear control and signal proc-

essing with applications to biomedicine, power networks, high-performance aircraft, and receiver data arrays. These projects involve extensive international collaboration.

Electrophysics -- This is the largest group in the department with a wide research interest ranging from theoretical studies of semiconductors through devices, integrated circuits, microwave and optical devices and propagation, and several members of the faculty have international reputation for their contributions to research.

Custom-designed clean rooms, fabrication, test, measurement, and characterization laboratories in our new building provide excellent facilities for research, much of which is carried out in close

cooperation with the electronics industry. Research includes studies of molecular beam epitaxy, superlattices, quantum well devices, microdefects, a.c. electroluminescence, defect thermodynamics, semiconductor interfaces, optical detectors, semiconductor lasers, traveling wave structures, microwave devices and propagation, and the design of high speed silicon and gallium arsenide integrated circuits. New laboratories are being developed for microwave circuit design and microwave network measurements. Computer-aided integrated circuit design facilities are used to study high-speed integrated circuits. Silicon integrated circuits designed in the department have been fabricated through the MOSIS services and gallium arsenide circuits, based on 0.25 μ m gate devices, have been fabricated in a cooperative research effort with the electronics industry.

Graduate Faculty

Alexander, Gerald Corwin 1955; Assoc Prof; BS Oregon State 1951, ScM MIT 1959, PhD California-Berkeley 1973.

Allstot, David J. 1986; Assoc Prof; BSES University of Portland, MSEE Oregon State 1974, PhD California-Berkeley 1979.

Amort, Donald Louis 1959; Assoc Prof; BS Oregon State 1954, MS 1960.

Arthur, John Read 1983; Prof; BS Iowa State 1954, PhD 1961.

Engelbrecht, Rudolf S. 1977; Assoc Prof; BSEE Georgia Institute of Technology 1951, MSEE 1953, PhD Oregon State 1979.

Forbes, Leonard 1983; Prof; BS Alberta at Edmonton 1962, MS Illinois 1963, PhD 1970.

Goodnick, Stephen Marshall 1986; Asst Prof; BS Trinity 1973, MS Colorado State 1977, PhD 1983.

Herzog, James Herman 1967; Assoc Prof; BS Northwestern 1962, MS Michigan 1963, PhD 1967.

Kinai, Sajfe 1987; Asst Prof; BS Washington State 1982, MS 1984, PhD 1987.

Kolodziej, Wojciech J. 1980; Asst Prof; MS Technical U of Warsaw 1974, PhD Oregon State 1980.

Lauw, Hlan 1978; Assoc Prof; BSEE Delft U (Holland) 1966, MSEE 1968, PhD 1977.

Lenders, Patrick M. 1986; Asst Prof; ENG Univ Libre (Bruxelles) 1972, PhD Colorado State 1985.

Looney, James Chester 1957; Assoc Prof; BS Oregon State 1954, MS 1960, EE 1963.

Magana, Mario Edgardo 1989; Asst Prof; BS Iowa State 1979, MS Georgia Tech 1980, PhD Purdue, 1987.

Mohler, Ronald Rutt 1972; Prof; BS Penn State 1956, MS Southern California 1958, PhD Michigan 1965.

Murray, John M. 1987; Assoc Prof; BS Southern Florida 1970, MS 1970, PhD Clemson 1974.

Owen, Sydney John Thomas 1975; Prof and Head; BSc Nottingham (England) 1957, PhD 1961.

Plant, Thomas Kent 1978; Assoc Prof; BS Kansas State 1968, MS Iowa State 1969, PhD Illinois 1975.

Rathja, Roy C. 1977; Assoc Prof; BS California-Davis 1969, MS Oregon State 1973, PhD 1980.

Saugen, John Louis 1964; Assoc Prof; BSEE Washington 1955, MSEE 1958, PhD 1964.

Spée, René Frank 1988; Asst Prof; Vordiplom Stuttgart 1979, MS Oregon State 1984, PhD 1988.

Tripathi, Vijai Kumar 1974; Prof; BSc Agra U 1958, MSc Tech Allahabad U 1961, MSEE Michigan 1964, PhD 1968.

Van Vechten, James A. 1985; Prof; AB California-Berkeley 1965, MA Chicago 1967, PhD 1969.

Wallace, Alan Keith 1984; Assoc Prof; BEng Sheffield (England) 1963, PhD 1966.

Wager, John Fisher III 1984; Asst Prof; BS Oregon State 1977, MS Colorado State 1978, PhD 1981.

Weber, Leonard Joseph 1954; Prof; BS Oregon State 1952, MS Washington 1962.

New Research Grants and Contracts: 1988-89

Principal Investigator	Project Title	Agency	Amount
Allstot, D.J.	Engineering Initiation Award: GaAs Analog Integrated Circuits for Data Acquisition	NSF	30,183
Allstot, D.J. Arthur, J.R. Goodnick, S.M.	InGaAs/GaAs Pseudomorphic HEMT's for High-Speed Circuit Applications	NSF	340,958
Allstot, D.J.	MOS Switched-Current Analog Integrated Circuits	NSF/ Wash. CADIC	52,000
Allstot, D.J.	High-Speed Integrated Circuits	NEC America	15,000
Arthur, J.R.	In Situ Patterning of MBE Films Using Ion-Assisted Etching	NSF	22,372
Arthur, J.R.	MBB Structures for High-Speed Electronic and Opto-electronic Device	Tektronix	40,000
Goodnick, S.M.	High Energy Electron Injection into Semiconductor Superlattices, Quantum Wells, and Quantum Wires	ONR	87,156
Goodnick, S.M. Tripathi, V.K. Van Vechten, J.A. Jansen, H. (Physics)	Simulation and Visualization of Electronic and Molecular Systems	ONR	150,000
Goodnick, S.M. Lenders, P.	Parallelization of Monte Carlo Algorithms in Semiconductor Device Physics	NSF	229,063
Kiaei, S.	MOS Current Mode Digital Circuits	NSF/ Wash. CADIC	46,000
Kiaei, S.	Flash Filters for AID Conversion	Tektronix	10,000
Kolodziej, W.J.	Nonstationary Signal Processing Using TEK 3052 Digital Spectrum Analyzer	Tektronix	39,576
Lauw, H.K.	Variable-Speed Generation Research	USDE-BPA	89,934
Mohler, R.R.	Nonlinear Statistical Analysis and Signal Processing	ONR	41,992
Mohler, R.R.	Analysis of Convenient Structurally Decomposed Models in Immunology	NSF	50,000

Murray, J.M.	Silicon Compile Revised Sandia Authenticator	USDE/Sandia	10,027
Murray, J.M.	Alternative Approaches to Chip Implementation of Authenticator to that Using Silicon Compiler, Power Analysis Study and Cost Study	USDE/Sandia	4,984
Plant, T.K.	Optoelectronics and Fiber Optics Laboratory Upgrade	NSF	100,000
Plant, T.K.	Novel HEMT Compatible Laser Diodes	NSF	29,917
Tripathi, V.K.	Computer Models for the MIMIC Phase I Program	Texas Inst./ DARPA	99,855
Tripathi, V.K.	Moment Method Techniques in Microwave and Millimeter Wave Circuits	EESOF	19,598
Van Vechten, J.A. Arthur, J.R. Plant, T.K. Wager, J.F.	Optically Controlled Dislocation Climb and Glide to Remove Defects	NSF	80,000
Van Vechten, J.A.	Atomistic Approaches to Defect Thermochemistry	DOD (AFOSR)	316,409
Wager, J.F.	Identification of the Instability Mechanism of ZnS:Mn Electroluminescent Devices	Planar Systems, Inc.	19,201
Wallace, A.K.	A Technology-Based Assessment of the Emerging Power Quality Problem in Electrical Power Distribution Systems	PPL	50,000
Wallace, A.K.	Brushless Doubly-Fed Machines	Puget Power	10,000
Wallace, A.K.	Instrumentation for Contemporary Energy Conversion Teaching Laboratory	NSF	53,645

Faculty Publications: 1988-89

Allstot, David J.

"Design Techniques for MOS Switched-Capacitor Ladder Filters," (with G.M. Jacobs, R.W. Brodersen, and P.R. Gray), Reprint, *Analog MOS Integrated Circuits, II*, P.R. Gray, B.A. Wooley, and R.W. Brodersen, Eds., IEEE Press, 1988.

"A High-Performance Low-Power CMOS Channel Filter," (with W.C. Black, Jr. and R.A. Read), Reprint, *Analog MOS Integrated Circuits, II*, P.R. Gray, B.A. Wooley, and R.W. Brodersen Eds, IEEE Press, 1988.

"A Precision Variable-Supply CMOS Comparator," Reprint, *Analog MOS Integrated Circuits, II*, P.R. Gray, B.A. Wooley, and R.W. Brodersen Eds, IEEE Press, 1988.

Allstot, David J. (continued)

"Technological Design Considerations for Monolithic MOS Switched-Capacitor Filtering Systems," (with W.C. Black, Jr.), Reprint, *Analog MOS Integrated Circuits, II*, P.R. Gray, B.A. Wooley, and R.W. Brodersen Eds, IEEE Press, 1988.

"A Class-AB CMOS Operational Amplifier," (with C. Yu and J.J. Yang), *Digest of the IEEE International Symposium on Circuits and Systems*, Helsinki, Finland, June 1988, pp. 151-153.

"An Equivalent-Circuit Model for Two-Stage Operational Amplifiers," (with H.C. Yang), *Digest of the IEEE International Symposium on Circuits and Systems*, Helsinki, Finland, June 1988, pp. 635-638.

Allstot, David J. (continued)

"GaAs Buried-Channel MESFET Analog Integrated Circuits," (with H.C. Yang and P.C. Canfield), *Digest of the IEEE International Symposium on Circuits and Systems*, Helsinki, Finland, June 1988, pp. 1607-1610.

"Improved Self-Bootstrapped Gain Enhancement Techniques for GaAs Amplifiers," (with H.C. Yang), *IEE Electronics Letters*, August 1988, pp. 1101-1102.

"Operational Amplifier Compensation Using Doublet Decompression for Switched-Capacitor Circuits," (with S. Jen and H.C. Yang), *Digest of the IEEE Midwest Symposium on Circuits and Systems*, St. Louis, August 1988, pp. 4-6.

"A CAD Noise Model for Chopper-Stabilized SC Filters," (with T. Fiez, S-H. Ann, and U.R. Shenoy), *Digest of the IEEE Midwest Symposium on Circuits and Systems*, St. Louis, August 1988, pp. 20-23.

"CMOS Analog Design Using a Digital Gate Array," (with T.C. Liu), *Digest of the IEEE Midwest Symposium on Circuits and Systems*, St. Louis, August 1988, pp. 371-374.

"A High-Swing Adaptively-Biased CMOS Amplifier," (with T. Fiez), *Digest of the IEEE Midwest Symposium on Circuits and Systems*, St. Louis, August 1988, pp. 852-854

"A Model of GaAs MESFET Output Conductance," (with S. Lam and P.C. Canfield), *Digest of the IEEE GaAs IC Symposium*, November 1988, pp. 203-206.

"A GaAs MESFET Voltage Reference," (with P.C. Canfield, P.K. Or, and H.C. Yang), *Digest of the IEEE International Electron Devices Meeting*, December 1988, pp. 774-777.

"A One-Transistor GaAs Voltage Reference Circuit," (with H.C. Yang and P.C. Canfield), *IEE Electronics Letters*, March 1989, pp. 464-465.

"Gate and Drain Transient Measurements of Conventional and Buried-Channel MESFETs," (with P.C. Canfield and A.J. McCamant), *Workshop on Instabilities in III-V Devices*, Sedona, AZ, April 1989.

Allstot, David J. (continued)

"A Switched-Capacitor Circuit for Neural Network Applications," (with J.E. Hansen and J.K. Skelton), *Digest of the 1989 IEEE International Symposium on Circuits and Systems*, Portland, OR, May 1989, pp. 2177-2180.

"High Performance BiCMOS Circuit Techniques," (with T.S. Fiez), *Digest of the 1989 IEEE International Symposium on Circuits and Systems*, Portland, OR, May 1989, pp. 655-658.

"Analysis and Design of a Fast-Settling Folded Cascade CMOS Operational Amplifier for Switched-Capacitor Applications," (with H.C. Yang and M.A. Abu-Dayeh), *Digest of the IEEE Midwest Symposium on Circuits and Systems*, August 1989.

"Potential Applications of Switched-Current Analog Integrated Circuits," (with A. Begisi and T.S. Fiez), *Digest of NORTHCON*, Portland, OR, October 1989.

Arthur, J.R.

"Optical Absorption Coefficient in $\text{In}_{1-x}\text{Ga}_x\text{As}/\text{InP}$," (with F.R. Bacher, J.S. Blakemore, and J.T. Ebner), *Phys. Rev.*, *B37*, 2551, 1988.

"Quantum Lifetime Measurements of the Two-Dimensional Electron Gas at the Inverted AlGaAs/GaAs Interface," (with K/P. Martin, R.J. Higgins, J.J.L. Rascol, and H. Yoo), *Surface Science* *196*, 323, 1988.

Goodnick, Stephen M.

"Electron-Electron Scattering During Photoexcitation in Quantum Wells," (with P. Lugli), *Solid State Electronics* *31*, 463, 1988.

"The Effect of Electron-Electron Scattering on Nonequilibrium Transport in Quantum Well Systems," (with P. Lugli), *Phys. Rev.* *B37*, 2578, 1988.

"Structure of the Si/Oxide Interface," in *Properties of Silicon*, EMIS Datareviews Series 4, Institute of Electrical Engineers, 647-649, 1988.

"The Influence of Electron-Hole Scattering on Subpicosecond Carrier Relaxation in AlGaAs/GaAs Quantum Wells," (with P. Lugli), *Phys. Rev.* *B38*, 10135, 1988.

Goodnick, Stephen M. (continued)

"Monte Carlo Studies on Nonequilibrium Phonon Effects in Polar Semiconductors and Quantum Wells, part 1. Laser Photoexcitation," (with P. Lugli, P. Bordone, L. Reggiani, M. Rieger, and P. Kocevar), *Phys. Rev. B* 39, 7852, 1989.

"Monte Carlo Studies on Nonequilibrium Phonon Effects in Polar Semiconductors and Quantum Wells, part 2. Nonohmic Transport in n-Type Gallium Arsenide," (with M. Rieger, P. Kocevar, P. Lugli, P. Bordone, and L. Reggiani), *Phys. Rev. B* 39, 7866, 1989.

"The Influence of Interfacial Roughness on Parallel Transport at Oxide-Semiconductor and Heterojunction Interfaces," (with J. Lary, R. Owen, O. Sri, and C.W. Wilmsen), *J. Vac. Sci. Tech. B* 7, 4, 1035, 1989.

"Monte Carlo Simulation of Intersubband Relaxation in Semiconductor Quantum Wells," (with P. Lugli), *Superlattice and Microstructures*, 5, 5616, 1989.

Herzog, James H.

"Concurrent Token Ring Protocol," (with M. Xu), *Proceedings, IEEE Infocom 88*, New Orleans, LA, March 27-31, 1988, pp. 145-154.

"Concurrent Transmission and Short Loop Latency Protocol," (with M. Xu), *Proceedings, 13th Conference on Local Computer Networks*, Minneapolis, MN, October 10-12, 1988, pp. 238-245..2.

"A Study of a Class of Distributed Control Mesh-Structured Local Networks," (with C.S. Kang), *Proceedings, IEEE 13 Conference on Local Area Networks*, Minneapolis, MN, October 1988.

"A Mesh/Token Ring Hybrid-Architecture LAN," (with C.S. Kang), *ACM Computer Communication Review* (Special Issue on SIGCOMM 88 Symposium, "communications Architectures and Protocols," Stanford University, Stanford, CA, August 16-18, 1988), Vol. 18, No. 4, pp. 146-154.

Kiaei, Sayfe

"CCA Approach for ARMA Spectral Analysis," (with L. Luo), *IEEE Int. Symposium on Circuits and Systems*, Portland, OR, May 1989.

Kiaei, Sayfe (continued)

"VLSI Design of Dynamically Reconfigurable Array Processors-DRAP," (with J. Durgam), *Int. Conf. on Acct. Spch. and Sig. Proc.*, Glasgow, Scotland, May 1989.

"VLSI Design of Bit/Serial Adaptive IIR Filters," *IEEE Pac. Conf. on Comm. Sig. Proc. and Comp.*, Victoria, Canada, June 1989.

Lenders, Patrick M.

"A Generalized Message-Passing Mechanism for Communicating Sequential Processes," *IEEE Transactions on Computers*, June 1988.

"Distributed Computing with Single Read-Single Write Variables," *IEEE Transactions on Software Engineering*, May 1989.

"Microprogramming Instruction Systolic Arrays," (with H. Schroder and P. Strazdins), *22nd Annual International Symposium on Microprogramming*, Dublin, August 14-16, 1989.

"Systolic Implementations of r-Dimensional Transforms for Image Processing," (with H. Schroder), *IREE Image Processing Conference*, Canberra, December 18, 1989.

Mohler, Ronald R.

Nonlinear Signal Processing and Time Series Analysis, (Editor). New York: Springer-Verlag, 1988.

"Nonlinear Data Observability and Information," *J. Franklin Inst.*, 321, 1988, pp. 443-464.

"On Structurally Decomposing Processes," *IEEE Trans. Circuits & Sys.*, 110, 1988, pp. 1417-1424.

"On Immune Process Stochastic Structure," pp. 327-346 in *Theoretical Immunology I*, (Perelson, ed.). Reading, MA: Addison-Wesley, 1988.

"Structural Choices of 2 vs. 1 Pursuit-Evasion Games," *ASME J. Dyn. Sys., Meas. & Cont.*, 110, 1988, pp. 160-167.

"Bilinear Time Series: Theory and Application," pp. 43-58 in *Nonlinear Time Series and Signal Processing*. New York: Springer-Verlag, 1988.

Mohler, Ronald R. (continued)

"Nonlinear Processing with m th-Order Signals," pp. 119-129 in *Nonlinear Time Series and Signal Processing*. New York: Springer-Verlag, 1988.

"Stochastic Circulatory Lymphocyte Models, pp. 130-145 in *Nonlinear Time Series and Signal Processing*. New York: Springer-Verlag, 1988.

"On Bilinear Time Series and Estimation," *Proceedings*, IEEE Conf. on Decis. & Control, Austin, December 1988.

"Nonlinear Eigenstructures in Array Processing," *Proceedings*, Adv. in Communic. & Control Sys. (COMCON 88), Baton Rouge, 1988.

"Distribution Models of Recirculating Lymphocytes," *IEEE Trans. Biomed. Engr.*, 36, 1989, pp. 355-362.

"Distribution of Recirculating Lymphocytes: A Stochastic Model Foundation," *Acta Applic. Math.*, 14, 1989, pp. 143-153.

"A Second-Order Eigenstructure Array Processor," *Proceedings*, Workshop on Higher-Order Spectral Analysis (IEEE, ONR, NSF), Vail, CO, 1989.

"On Tumor Modeling and Control," *Proceedings*, IFIP Workshop on Math. Modeling in Immunology & Medicine, Kiev, 1989.

"A Nonlinear System Prospective and Guaranteed State Estimation," *Proceedings*, IEEE Int'l Sympos. Cct. & Sys., Portland, OR, May 1989.

"Dynamic Analysis and Control of Cancer," *Proceedings*, IEEE Int'l Conf. Engr. in Medicine & Biol., Seattle, November 1989.

"Stability of Discrete Bilinear Systems with Random Parameters," *Proceedings*, IEEE Conf. Decis. & Cont., Tampa, FL, December 1989.

Owen, John

"Studies of a High Frequency Hysteresis Phenomenon in ZnS:Mn ACTFEL Devices," (with C.C. Zhu and R.C. McArthur), *Journal of Luminescence*, 40/41, 775, 1988.

Plant, Thomas K.

"Strained Layer InGaAs GRIN-SCH Lasers Grown by MBE," (with J.T. Ebner and J.R. Arthur), *Proceedings*, Quantum Wells for Optics and Optoelectronics Topical Meeting, Salt Lake City, UT, March 6-8, 1989.

Spée, René

"Performance Characteristics of Brushless DC Drives," (with A.K. Wallace), *IEEE Transactions on Industry Applications*, Vol. IA 24, No. 4, 1988, pp. 568-573.

"The Simulation of Brushless DC Drive Failures," (with A.K. Wallace), *Proceedings*, IEEE Power Electronics Specialists Conference, Kyoto, Japan, 1988, pp. 199-206.

"Current Harmonics and Acoustic Noise in AC Adjustable Speed Drives," (with A.K. Wallace and L.G. Martin), *IEEE IAS Annual Meeting Conference Record*, 1988, pp. 483-488.

"Remedial Strategies for Brushless DC Drive Failures," (with A.K. Wallace), *IEEE IAS Annual Meeting Conference Record*, 1988, pp. 493-499.

"Dynamic Modeling of Brushless Doubly-Fed Machines," (with A.K. Wallace and H.K. Lauw), *IEEE IAS Annual Meeting Conference Record*, San Diego, CA, October, 1989.

"Performance Simulation of Brushless Doubly-Fed Adjustable Speed Drives," (with A.K. Wallace and H.K. Lauw), *IEEE IAS Annual Meeting Conference Record*, San Diego, CA, October 1989.

Tripathi, Vijai K.

"Applications of Method of Lines to Multiple Celled Planar Propagation Structures Having Inhomogeneous Layers," (with M. Thornburn), National Science Radio Science Meeting, Boulder, January 1988.

"Equivalent Circuit Modelling of Losses and Dispersion in Single and Coupled Lines in Integrated Circuits," (with A. Hill), *IEEE Transactions on Microwaves Theory and Tech.*, February 1988, pp. 256-262.

Tripathi, Vijai K. (continued)

"Analysis and Modeling of Interconnections and Propagation Structures in High Speed and High Frequency Circuits," (with A. Hill), SPIE - Advances in Semiconductors and Superconductors - No. 947-12, March 1988.

"Frequency Dependent Propagation Characteristics of Microstrip Structures in Inhomogeneous Substrates," (with M. Thornburn), National Radio Science Meeting, Boulder, January 1989.

"Spectral Domain Computation with Characteristic Impedances and Multiport Parameters of Multiple Coupled Microstrip Lines," (with H. Lee), *IEEE Trans. Microwave Theory and Tech.*, January 1989, pp. 215-221.

"Transverse Resonance Analysis of Three Coupled Transmission Lines," (with G. Bartolucci), *Proceedings, ACES Symp.*, March 1989, pp. 114-120.

"Adaptive Algorithm for the Analysis of Microstrip Discontinuity Inductance," (with A. Hill), *Proceedings, ACES*, March 1989, pp. 183-188.

"Quasi Harmonic Analysis and Applications of Coupled Schottky Lines," (with A.S. Mohammed), *Proceedings, IEEE Int'l Symp. Circuits, Systems*, May 1989.

"Analysis and Design of Ideal Nonsymmetrical Coupled Microstrip Directional Complexes," (with Y. Chia, T. Emery, and H. Lee), *Proceedings, IEEE Int'l Microwave Symp.*, June 1989.

"Analysis and Modeling of Coupled Microstrip Bend Discontinuities," (with A. Hill), *Proceedings, IEEE Int'l Microwave Symp.*, June 1989.

"Frequency Dependent Transmission Characteristics of Curved Microstrip Bends, (with A. Weisshaar), *Electronics Letters*, August 1989, pp. 1138-1139.

"Quasi-TEM Spectral Domain Analysis of Thick Microstrips for Microwave and Digital Integrated Circuits," (with R. Kollipara and L. Hayden), *Electronics Letters*, August 1989, pp. 1253-1254.

"Modeling of Interconnections in Hybrid and Monolithic Circuits," *Northcon Digest*, October 1989.

Van Vechten, James A.

"Self-Diffusivity in Si," *EMIS Data Review*, No. 4, 1988. Properties of Si (Inspect, Institution of Electrical Engineers, London; 1988), p. 47.

"First-Overtone Response in Modulated Photoluminescence Emission in Silicon at Room Temperature," (with D. Guidotti, J.S. Batchelder, and A. Finkel), *Phys. Rev. B* 38, 1988, 1569.

"Phosphorous Vacancy Nearest-Neighbor Hopping Induced Instabilities in InP Capacitors: Part I. Experimental," (with M.T. Juang and J.F. Wager), *J. Electrochem. Soc.* 135, 1988, 2019.

"Phosphorous Vacancy Nearest-Neighbor Hopping Induced Instabilities in InP Capacitors: Part II. Computer Simulation," (with M.T. Juang and J.F. Wager), *J. Electrochem. Soc.* 135, 1988, 2023.

"Activation Enthalpy of Recombination Enhanced Vacancy Migration," *Phys. Rev. B* 38, 1988, 9913.

Reply to Comment on "Atomic Model for EL2 Defect in GaAs," by G.Y. Wang et al., (with J.F. Wager), *Phys. Rev. B* 38, 1988, 10956.

Reply to Comment on "Atomic Model for EL2 Defect in GaAs," by H.J. von Bardeleben et al., (with J.F. Wager), *Phys. Rev. B* 39, 1989, 1967.

"Entropy of Migration for Atomic Hopping," (with T.W. Dobson and J.F. Wager), *Phys. Rev. B* 40, 1989, 2962.

"Temperature Dependence of the Mercury Telluride-Cadmium Telluride Band Offset," (with K.J. Malloy), *Appl. Phys. Lett.* 54, 1989, 937.

"Mossbauer Spectra and the DX-Centre Complex in AlGaAs," *J. Phys.* 1, 1989, 5171.

"Vacancy First and Second Neighbor Hopping at a Compound Semiconductor Interface: Insights from Computer Simulation," (with U. Schmid), *J. Vac. Sci. Technol. B* 7, 4, 1989, 837.

"Modeling of Luminescence Phase Delay for Non-destructive Characterization of Si Wafers," (with D. Guidotti, J.S. Batchelder, A. Finkel, and P.D. Gerber), *J. Appl. Phys.* 66, 6, 1989, 2542.

Van Vechten, James A. (continued)

"Resolving Defect Mega-Controversy by GIGA-Event Monte Carlo Simulation of the Macro-Consequences of Atom-Level Assumptions on Microcomputers at Nano-Cost," (with U. Schmid and N.C. Myers), Plenary invited talk given at the Int'l. Conf. on the Science and Technology of Defect Control in Semiconductors, IC-STDCS, celebrating the 100th anniversary of the founding of the port of Yokohama, Japan. Proceedings edited by Prof. K. Sumino and published by North-Holland, 1989.

"A Simple Man's View of the Passivation of Semiconductors," Plenary invited talk given at the 6th Int'l. Symp. on Passivity at Sapporo, Japan, September 24, 1989 to be published both as a Supplement to *Solid State Electronics* and to *Corrosion Science*. Edited by Prof. H. Hasegawa and Prof. N. Sato.

Wager, John F.

"Phosphorous Vacancy Nearest-Neighbor Hopping Induced Instabilities in InP Capacitors, Part I: Experimental," (with M.T. Juang and J.A. Van Vechten), *J. Electrochem. Soc.* 135, 1988, 2019-2023.

"Phosphorous Vacancy Nearest-Neighbor Hopping Induced Instabilities in InP Capacitors, Part II: Computer Simulation," (with M.T. Juang and J.A. Van Vechten), *J. Electrochem. Soc.* 135, 1988, 2023-2027.

Reply to "Comment on 'Atomic Model for the EL2 Defect in GaAs,'" (with J.A. Van Vechten), *Phys. Rev. B* 38, 1988, pp. 10,956-10,957.

Reply to "Comment on 'Atomic Model for the EL2 Defect in GaAs,'" (with J.A. Van Vechten), *Phys. Rev. B* 39, 1989, pp. 1967-1969.

"Electroluminescence in Diamond-Like Carbon Films," (with S.B. Kim), *Appl. Phys. Lett.* 53, 1988, pp. 1880-1881.

"Entropy of Atomic Hopping in Diffusion and Defect Transformations," (with T.W. Dobson and J.A. Van Vechten), *Mat. Res. Soc. Proc.*, 1988.

"Electron Energy-Loss Spectroscopy Analysis of Low-Temperature Plasma-Enhanced Chemically Vapor Deposited a-C:H Films," (with A.J. Nelson, D.J. Benson, C.E. Tracy, and L.L. Kazmerski), *J. Vac. Sci. Technol. A1*, 1989, pp. 1350-1352.

Wager, John F. (continued)

"Improved Stability of ZnS:Mn ACTFEL Devices," (with R. Khormaei and C.N. King), *SID 89 Digest*, 1989, pp. 65-67.

"Entropy of Migration for Atomic Hopping," (with T.W. Dobson and J.A. Van Vechten), *Phys. Rev. B* 40, 1989, 2962-2967.

"Experimental Confirmations of the Donor-Like Nature of DX in AlGaAs," (with T.W. Dobson), *Mat. Res. Soc. Proc.*, 1989.

"Enthalpy of Formation of Antisite Defects and Antistructure Pairs in III-V Compound Semiconductors," (with T.W. Dobson), *J. Appl. Phys.*, 1989.

Wallace, Alan K.

"Control Technique of Active Power Filter for Harmonic Elimination and Reactive Power Control," (with G-H Choe), *IEEE Industrial Applications Society Annual Meeting*, Pittsburgh, 1988.

"The Simulation of Brushless DC Drive Failures," (with R. Spée), *IEEE Power Electronics Specialist Conference*, Japan, Kyoto, April 11-14, 1988.

"Performance Characteristics of Brushless DC Drives," (with R. Spée), *Trans. IEEE IAS*, July/August 1988, pp. 568-573.

"Current Harmonics and Acoustic Noise in AC Adjustable Speed Drives," (with R. Spée), *IEEE Industrial Applications Society Annual Meeting*, August/September 1988.

"Remedial Strategies for Brushless DC Drive Failures," (with R. Spée), *IEEE Industrial Applications Society Annual Meeting*, August/September 1988.

"An Improved PWM Technique for AC Choppers," (with G-H Choe), *Trans. IEEE, Power Electronics*, August/September 1989.

"Dynamic Modeling of Brushless Doubly-Fed Machines," (with R. Spée and H.K. Lau), *IEEE Industrial Applications Society Annual Meeting*, October 1989.

"Performance Simulation of Brushless Doubly-Fed Adjustable Speed Drives," (with R. Spée), *IEEE Industrial Applications Society Annual Meeting*, October 1989.

Industrial and Manufacturing Engineering

Current Research

The Department of Industrial Engineering is involved in Research in the design of new systems integrating robotics and computer-aided manufacturing and in the improvement of productivity in existing organizations. The development and installation of new systems involves the integration of many critical elements. Product design, equipment evaluation and selection, production scheduling, inventory management, information systems, process control, and the assurance of high quality are all concerns of the industrial engineer.

Recent research activities within the Department have involved the development of hardware for both robotic materials handling systems and automatic test equipment along with the design of decision support systems for operators and maintenance personnel. Currently, work is being performed in areas concerned with the automatic assembly of electronic components, interactive control systems for robots, and the design of operator-computer interfaces involving artificial intelligence. Recent acquisition of additional computer-aided design equipment has enhanced the development of an integrated manufacturing laboratory. Future research will make use of this facility to investigate the optimum configuration and content of manufacturing cells designed to minimize production costs.

Graduate Faculty

Burhanuddin, Sheikh 1989; Asst Prof; BS University of Karachi (Pakistan) 1976, MS University of Manitoba (Canada) 1980, MS West Virginia 1983, PhD 1988.

Fichter, Eugene Frank 1977; Assoc Prof; BME Rensselaer Polytechnic Institute 1967, MS U of New Brunswick 1973, PhD Monash U 1977.

Funk, Kenneth H. II 1980; Asst Prof; BA Taylor U 1975, MS Ohio State 1977, PhD 1980.

Logendran, Rasaratnam 1989; Asst Prof; BS University of Sri Lanka 1975, M Engr Asian Institute of Technology (Thailand) 1980, PhD Oklahoma State 1984.



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McDowell, Edward David 1974; Assoc Prof; BS Ohio State 1965, MS Ohio U 1970, PhD Ohio State 1974.

Olsen, Eldon A. 1980; Assoc Prof; BS Utah 1966, MS Montana State 1969, PhD Oregon State 1979.

Randhawa, Sabah Uddin 1983; Assoc Prof; BS U of Engineering and Technology (Pakistan) 1976, MS Oregon State 1980, PhD Arizona State 1983.

Safford, Robert Reese 1985; Assoc Prof; BIE Ohio State 1964, MSc 1965, PhD 1971.

West, Thomas Moore 1976; Assoc Prof, Head of Department; BS Tennessee-Knoxville 1963, MS 1965, PhD Oregon State 1976.

New Research Grants and Contracts: 1988-89

Principal Investigator	Project Title	Agency	Amount
Funk, K.H.	Intelligent Air Attack System	CSC	52,408
Randhawa, S.U.	Design of a Simulation-Based Decision Support System for Timber Harvesting	USDA	15,000
Randhawa, S.U.	Modeling Sawmill Operations	FRL	8,500
Safford, R.R. Saremi, A.R.	Research Fellowship: Driver Identification of Highway Signs Under Artificial Lighting Conditions		22,201
Safford, R.R.	Implementation of Total Quality Control in Bend, Oregon, Operations	PPL	38,726
West, T.M.	Manufacturing Engineering Cooperative Program	MECOP Board	46,500

Faculty Publications: 1988-89

Burhanuddin, Sheikh

"Economics of Coal Fired Slab Preheaters with Limestone Injection," 10th International Cost Engineering Congress and AACE 32nd Annual Meeting, New York, July 10-13, 1988, pp. T.4.1-T.4.6. Morgantown, WV: AACE, 1988.

Fichter, Eugene

"A Survey of Legs of Insects and Spiders from a Kinematic Perspective," (with B. Fichter), *Proceedings*, IEEE Intern. Conf. on Robotics and Automation, Philadelphia, PA, April 24-29, 1988, pp. 984-986.

"Towards an Expert System for FMS Scheduling: A Knowledge Acquisition Environment," (with J. Kim and K. Funk), *Proceedings*, 2nd Intern. Conf. on Expert Systems and the Leading Edge in Production Planning and Control, Charleston, SC, May 3-5, 1988.

"Building an Expert System for FMS Scheduling," (with J. Kim and K. Funk), *Proceedings*, U.S.A.-Japan Symp. on Flexible Automation, Minneapolis, MN, July 18-20, 1988, pp. 845-852.

"Determining Kinematic Parameters of Arthropod Legs," (with S. Albright and B. Fichter), *Proceedings*, 20th Biennial ASME Mechanisms Conference, Orlando, FL, DE-Vol. 15-3, September 25-28, 1988, pp. 247-251.

Fichter, Eugene (continued)

"Analyzing Dynamics of Arthropod Walking," (with V. Moyer and B. Fichter), *Proceedings*, IEEE Engineering in Medicine and Biology 10th Annual International Conference, New Orleans, LA, November 4-7, 1988, pp. 710-711.

Funk, Kenneth H.

"A Knowledge-Based System for Tactical Situation Assessment," *Annals of Operations Research*, Vol. 12, 1988, pp. 285-296.

"Building on Expert System for FMS Scheduling," (with J. Kim and E.F. Fichter), *Proceedings*, USA-Japan Symposium on Flexible Automation, Minneapolis, MN, July 18-20, 1988.

"Development of a Decision Support System for Submarine Approach Officers: A Progress Report," (with J.L. Kaiwi), NPRDC TN88-56, Navy Research and Development Center, San Diego, CA, September 1988.

"The IAAS Task Support Subsystem: A Task-Oriented Pilot-Vehicle Interface," *Proceedings*, IJCAI-89 Workshop on Human-Machine Intelligence in Aerospace Systems, Detroit, MI, August 21, 1989, pp. 100-111. Minneapolis, MN: Honeywell Systems and Research Center.

Funk, Kenneth H. (continued)

"Development of a Task-Oriented Pilot-Vehicle Interface," *Proceedings*, 1989 IEEE International Conference on Systems, Man, and Cybernetics, Cambridge, MA, November 14-17, 1989.

"Development and Validation of a Theory of Human Operator Behavior in a Multitask Environment," (with C.D. Chou), *Proceedings*, 1989 IEEE International Conference on Systems, Man, and Cybernetics, Cambridge, MA, November 14-17, 1989.

Logendran, Rasaratnam

"Microcomputer Implementation of a Program Planning Network Using Simulation," ORSA/TIMS Conference, Denver, CO, October 1988.

"Uncapacitated Plant Location-Allocation Problems with Price Sensitive Stochastic Demands," (with M.P. Terrell), *International Journal of Computers and Operations Research*, Vol. 15, No. 2, 1988, pp. 189-198.

"Workload Based Model for Minimizing Total Moves Contributed by Both Intercell and Intracell Moves in Cellular Manufacturing," International CORS/ORSA/TIMS Conference, Vancouver, BC, Canada, May 1989.

McDowell, Edward D.

"A Simulation Analysis for a Transtainer-Based Container Handling Facility," (with S. Randhawa and Y. Chen), *Computers and Industrial Engineering*, Vol. 14, No. 2, February 1988.

"Containerized Container-Ship Load Planning: A Methodology and Evaluation," (with S. Randhawa and G. Martin), *Computers and Industrial Engineering*, Vol. 14, No. 4, 1988.

Engineering Design in the IE Curricula," *Proceedings*, 1988 American Society for Engineering Education Conference, Portland, OR, June 1988.

Olsen, Eldon D.

"Logging Incentives Systems," *OSU FRL Bulletin* No. 62, 1988, 19 pp.

"Determining Costs of Logging-Crew Labor and Equipment," (with S. Bushman), *OSU FRL Bulletin* No. 63, 1988, 22 pp.

Olsen, Eldon D. (continued)

"Economic Evaluation of Commercial Thinning Alternatives in a Western Hemlock-Sitka Spruce Forest," (with L.D. Kellogg), *Western Journal of Applied Forestry Technical Notes*, January 1988.

"Soil Compaction: An Economic Model," (with R. Stewart and H. Froehlich), *Western Journal of Applied Forestry Technical Notes*, January 1988.

"Value Recovery from Trees Bucked on a Landing and at the Stump," (with G.E. Murphy), *Forest Products Journal*, Vol. 38 No. 9, September 1988, pp. 49-52.

"Economic Comparison of Alternative Sites for Final Log Manufacturing in Steep-Country Plantations," (with G.E. Murphy and J. Sessions), *Applied Engineering in Agriculture*, Vol. 4, No. 4, 1988, pp. 319-322.

"Value Loss from Errors in Computer-Aided Bucking at the Stump," (with J. Garland and J. Sessions), *Applied Engineering in Agriculture*, Vol. 5, No. 2, 1989, pp. 283-285.

"Testing Computer-Aided Bucking at the Stump," (with J. Sessions and J. Garland), *Journal of Forestry*, Vol. 87, No. 4, 1989, pp. 43-46.

"Logs Manufactured Using Computer-Aided Bucking at the Stump," (with J. Garland and J. Sessions), *Forest Products Journal*, Vol. 39, No. 3, pp. 62-66.

Randhawa, Sabah U.

"A Search Space Algorithm for Site Selection of Biomass-Fueled Power Plants," (with T.M. West and J.N. Kim), *AI Applications in Natural Resources Management*, Vol. 2, 1988, pp. 443-446.

"A Simulation Model for Mechanized Log Harvesting Systems," (with E. Olsen and C. Wiese), *Simulation*, Vol. 51, Mo. 3, 1988, pp. 120-126.

"Computerized Containership Load Planning: A Methodology and Evaluation," (with G. Martin and E. McDowell), *Computers and Industrial Engineering*, Vol. 14, No. 4, 1988, pp. 429-440.

"A Simulation Analysis for a Transtainer-Based Container Handling Facility," (with Y. Chung and E. McDowell), *Computers & Industrial Engineering*, Vol. 14, No. 2, 1988, pp. 113-125.

Randhawa, Sabah U. (continued)

"Managing Information Through Expert Systems," (with R.H. Rucker), *Engineering Management International*, Vol. 5, No. 2, 1988, pp. 137-142.

"A Simulation Model to Study the Impact of Resource Change on Motor Vehicle Division Field Offices," (with N. Mills and A. Mechling), *Proceedings*, 10th Conference on Computers & Industrial Engineering, March 1988.

"Site Selection to Minimize Fuel Handling and Transportation Costs," (with T. West and N. Mills), *Proceedings*, Institute of Industrial Engineers International Conference, May 1988.

"Multicriteria Evaluation of Manufacturing Systems," (with T. West), *Proceedings*, 3rd International Conference on CAD/CAM, Robotics and Factories of the Future, August 1988.

"A Decision Support System to Evaluate Potential Power Plant Locations," (with T.M. West and J.N. Kim), ORSA/TIMS Joint National Meeting, Denver, CO, October 1988.

"A Multi-Phase Approach to Siting Convention Facilities," (with N.L. Mills and T.M. West), ORSA/TIMS Joint National Meeting, Denver, CO, October 1988.

"A Simulation-Based Production Planning Support System for Printed Circuit Board Falsification," (with E.D. McDowell), *Journal of Manufacturing Systems*, Vol. 8, No. 3, 1989, pp. 225-234.

"An Economic Comparison of X, Cumulative Sum and Geometric Moving Average Control Charts," (with C. Nantawong and E.D. McDowell), *International Journal of Production Research*, Vol. 27, 1, 1989.

"Dental Equipment Maker Uses Microcomputer-Based Data Management and Production Planning System," (with E.D. McDowell, R. Pendakur, C.N. Cook, T.A. Welch, and C. Garbler), *Industrial Engineering*, Vol. 21, 1, 1989.

"Surface Mount Technology (SMT) Placement: Capacity Planning Using Simulation," (with E.D. McDowell), *Proceedings*, 4th International Electronics Assembly Conference, January 1989.

Randhawa, Sabah U. (continued)

"S³ - A Microcomputer-Based Simulation Model for Sawmill Design and Evaluation," (with G. Zhang, C.C. Brunner, and J.W. Funck), *Proceedings*, ISMM International Conference: Computer Applications in Design, Simulation and Analysis, February 1989.

"Economic Modeling and Sensitivity Analysis of Alternative Power Plant Designs," (with T.M. West and N.L. Mills), *Proceedings*, 11th Annual Conference on Computers and Industrial Engineering, March 1989.

"The Role of Product Design in the Evaluation of New Manufacturing Technologies," (with T.M. West and S.D. Brings), *Proceedings*, Institute of Industrial Engineers International Conference, May 1989.

"Process Planning in Automated Manufacturing Systems," (with T. West), *Proceedings*, Institute of Industrial Engineers Integrated Systems Conference, Atlanta, GA, 1989.

"Economic Sensitivity of Manufacturing Equipment Selection and Implementation Schedules," (with T. West), *Proceedings*, Society of Integrated Systems National Conference, Atlanta, GA, 1989.

"Uncertainty Modeling in CIM Investment Analysis," (with T. West), *CIM Review*, 1989.

"Capacity Planning in a Flexible Manufacturing Environment," (with T. West), Chapter in *Justification Methods for Computer Integrated Manufacturing Systems*, H. Parsaei and T. Ward, eds. New York: Elsevier Publishing, 1989.

"Comparing the Effectiveness of Variables Control Chart," (with N. Chokethaworn), *Thailand Engineering Journal*, Vol. 42, 2, 1989.

West, Thomas M.

A Summary of the Tax Reform Act of 1986, McGraw-Hill Book Company, New York, NY, 1988.

"A Search Space Algorithm for Site Selection of Biomass-Fueled Power Plants," (with S. Randhawa and J. Kim), *AI Applications in Natural Resource Management*, Vol. 2, 1988, pp. 443-46.

West, Thomas M. (continued)

"Site Selection to Minimize Fuel Handling and Transportation Costs," (with S. Randhawa and N. Mills), *Proceedings*, Institute of Industrial Engineers International Conference, Orlando, FL, 1988.

"Multicriteria Evaluation of Manufacturing Systems," (with S. Randhawa), *Proceedings*, Third International Conference on CAD/CAM, Robotics and Factories of the Future, Detroit, MI, 1988.

"A Multi-Phase Approach to Siting Convention Facilities (with N. Mills and S. Randhawa), ORSA/TIMS Joint National Meeting, Denver, CO, 1988.

"A Decision Support System to Evaluate Potential Power Plant Locations," (with S. Randhawa and J. Kim), ORSA/TIMS Joint National Meeting, Denver, CO, 1988.

"Capacity Planning in a Flexible Manufacturing Environment," (with S. Randhawa), Chapter in *Justification Methods for Computer Integrated Manufacturing Systems*, H. Parsaei and T. Ward, eds. New York: Elsevier Publishing, 1989.

"Economic Modeling and Sensitivity Analysis of Alternative Power Plant Designs," (with N. Mills and S. Randhawa), *Proceedings*, 11th Annual Conference on Computers and Industrial Engineering, Orlando, FL, 1989.

West, Thomas M. (continued)

"Combining Monetary and Non-Monetary Desirability Measures in Multi-Criteria Site Selection," (with N. Mills), *Proceedings*, Institute of Industrial Engineers International Conference, Toronto, Ontario, Canada, 1989.

"The Role of Product Design in the Evaluation of New Manufacturing Technologies," (with S. Randhawa and S. Brings), *Proceedings*, Institute of Industrial Engineers International Conference, Toronto, Ontario, Canada, 1989.

"Process Planning in Automated Manufacturing Systems," (with S. Randhawa), *Proceedings*, Institute of Industrial Engineers Integrated Systems Conference, Atlanta, GA, 1989.

"Economic Sensitivity of Manufacturing Equipment Selection and Implementation Schedules," (with S. Randhawa), *Proceedings*, Society of Integrated Systems National Conference, Atlanta, GA, 1989.

"Uncertainty Modeling in CIM Investment Analysis," (with S. Randhawa), *CIM Review*, 1989.

Mechanical Engineering

Current Research

The department has a strong on-going research program in the traditional areas: design, mechanics, materials, thermal engineering, and fluid mechanics. The specific applications motivating our research change over the years and the distribution of activity among the specific areas fluctuates, but the basic fundamental thrusts have remained relatively constant. Energy has traditionally been a major research focus within the department; work in this area continues with significant projects in wind, biomass, fluidized beds, and fundamental combustion. In the last several years we have had increased activity in the design, robotics, and materials areas.

We continue to constantly explore the many possibilities which come to our research attention. Three elements are common to all research problems we undertake: the problem must be scientifically exciting to an individual faculty member, technologically relevant to society, and pedagogically suited for a master's or doctoral thesis.

Current research thrusts are in:

Design - machine design, design methodology, computer-aided design (CAD), and expert systems.

Materials - advanced composite micromechanical and thermo physical properties, study of dimensional stability of solids, "smart materials," composite design for superconductors, effect of microstructure on properties in superconductors.

Mechanics - composites (including embedded sensor technology, micropolar and nonlocal elastic solids, laser/material interactions, dynamics of mechanical systems (specifically, mechanical manipulators, cable systems, and rotors), stability analysis, and digital control.

Graduate Faculty

Baker, Warren S. 1980; Asst Prof, Extn Energy Specialist; BA Illinois 1964, PhD Edinburgh 1976.

Bushnell, Dwight J. 1976; Assoc Prof; BS Utah 1967, MS 1968; PhD Brigham Young 1974.



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Thermal Engineering and Fluid Mechanics - heat transfer - convection studies including gas fluidized beds, electronic circuit board cooling, and liquid metals; **thermodynamics** - heat pump and power plant design, ice and frost formation, and second law analysis; **combustion** - solid, liquid, and gas fuel burning in fires and combustors, flame stabilization and quenching phenomena, experimental investigation of ionic and atomic species of combustion, and biomass combustion; **fluid mechanics** - aerodynamics of wind turbines, buoyant jets, fluidization of particle beds, and fluid flow in casting processes.

Calder, Clarence A. 1978; Assoc Prof; BSME Oregon State 1960, MS Brigham Young 1962, PhD California-Berkeley 1969.

Davis, Lorin R. 1969; Prof; BA Brigham Young 1958, BSME 1959, MSME Purdue 1961, PhD Illinois 1964.

Kanury, A. Murty 1985; Prof, BEng Andhra U Waltair (India) 1961, MS Minnesota 1963, PhD 1969.

Kennedy, Timothy C. 1976; Assoc Prof; BS SUNY at Buffalo 1968, MS Stanford 1969, PhD 1972.

Larson, Milton B. 1952; Prof; BS Oregon State 1950, MEngr Yale 1951, MS Oregon State 1955, PhD Stanford 1961.

Olas, Andrzej 1984; Asst Prof; MS Warsaw Technological U 1962, PhD Polish Academy of Sciences 1973.

Peterson, Richard B. 1985; Assoc Prof; BS Nevada-Reno 1979, MS California-Berkeley 1982, PhD 1984.

Philbrick, David A. 1983; Assoc Prof, Extn Energy Specialist; AB Brown U 1970, PhD California-Berkeley 1976.

Reistad, Gordon M. 1970; Prof and Department Head; BS Montana State 1966, MS Wisconsin 1967, PhD 1970.

Smith, Charles E. 1961; Prof; BSME Oregon State 1955, MSME Rensselaer Polytechnic Institute 1958, PhD Stanford 1962.

Ullman, David G. 1984; Assoc Prof; BS Cincinnati 1968, MS 1970, PhD Ohio State 1978.

Walker, Stel N. 1984; Asst Prof; BS Oregon State 1970, PhD 1976.

Warnes, William H. 1986; Asst Prof; BA Univ of Cal-San Diego 1979, MS Wisconsin-Madison 1981, 1983, PhD 1986.

Welty, James R. 1958; Prof; BSME Oregon State 1954, MSME 1959, PhD 1962.

Wheeler, George M. 1980; Asst Prof, Extn Energy Specialist; BS MIT 1967, MS California-Berkeley 1970, PhD 1972.

Wilson, Robert E. 1957; Prof; BS Oregon State 1955, MS Illinois 1956, PhD Oregon State 1963.

Wolff, Ernest G. 1987; Assoc Prof; BSc Massachusetts Inst of Tech 1956, PhD Imperial College (London) 1961.

New Research Grants and Contracts: 1988-89

Principal Investigator	Project Title	Agency	Amount
Bushnell, D.J. Kanury, A.M.	Fuel Standards Development: Testing and Evaluating the Combustion Characteristics of Selected Biomass Fuels	USDE-BPA	88,639
Calder, C.A.	Development of Embedded Sensor Technology for Graphite-Epoxy Composite Structures	UESI	19,981
Kanury, A.M.	Expedited Awards for Novel Research: Combustive Synthesis of Solids Such as Titanium Carbide	NSF	29,711
Peterson, R.B.	Spontaneous Raman System for the Study of Enhanced Combustion and Non-Thermal Plasmas (DURIP)	AFOSR	91,100
Peterson, R.B.	Gas Phase Energy Deposition by Electron Impact Processes	NSF	228,178
Philbrick, D.A.	Provide Energy Savings Evaluation Services to Portland's Multi-Family and Block-by-Block Weatherization Assistant Program	Portland	8,254
Philbrick, D.A.	Training in Support of the Super Good Cents Program	PP&L	338

Reistad, G.M.	Curriculum Improvement and Faculty Development	Westinghouse	15,000
Reistad, G.M. Larson, M.B.	Study of Centrifugal Casting Gating Design (Extension)	Precision Castparts Corp.	45,270
Ullman, D.G.	Conceptual Design Capture System	Hewlett-Packard	3,100
Ullman, D.G.	The Measure of Usability of Parametric Tools in Mechanical Engineering Design	Tektronix	30,000
Ullman, D.G. Dietterich, T.G.	Development of Mechanical Design Process Understanding	Schlumberger	5,000
Ullman, D.G. Dietterich, T.G.	Understanding and Improving the Mechanical Design Process	NSF	118,123
Wade, J.E. Walker, S.N.	Regional Wind Energy Data Base Management and Wind Forecasting	USDE-BPA	117,360
Wade, J.E.	Wind Energy Data Base Management and Energy Forecasting an Additional Task 6	USDE-BPA	14,996
Warnes, W.H.	Drop Weight Impact Study of the Fracture Properties of Injection Molded Fe	Omark	5,000
Warnes, W.H.	Mechanical Properties Testing of Composite Superconducting Wires	Supercon	2,000
Warnes, W.H.	Impact Fracture Characterization of Injection Molded Fe-Ni Alloys	Omark	5,527
Warnes, W.H. Gardner, J.A.	Mossbauer Measurement of DX Phenomena in III-V Semiconductors	NSF	52,843
Welty, J.R.	Development of Diagnostic Tools for High Temperature Fluidized Beds	NSF	134,998
Wheeler, G.M.	Energy Analysis and Diagnostic Program	UCSC	189,650
Wheeler, G.M.	Two Industrial Energy Audits: T.L. Hutchins Lumber, Inc., and Konkol Planer Mill	USDE-BPA	6,000
Wilson, R.E.	Aerodynamic Transient and Yaw Effects on HAWT Loads and Performance	SERI/USDE	38,841
Wolff, E.G.	Thermal and Moisture Expansion of Polymer Based Composites	Hercules	17,877
Wolff, E.G.	Thermal Response Characterization of MMC Heat Sink Material	ROI	5,797
Wolff, E.G.	Graphite/Aluminum Tubes for CTE Measurement	DWA	925

Faculty Publications: 1988-89

Baker, Warren S.

"An Event Recorder to Determine Lighting Fixture "ON" Time During Unoccupied Periods," (with Andrew Golay and Art Neeley), *Proceedings*, Third National Conference on Microcomputer Applications in Energy, November 1988.

"Using Microcomputers to Improve the Energy Code Revision Process," *Proceedings*, Third National Conference on Microcomputer Applications in Energy, November 1988.

"Using Microcomputer Spreadsheets to Improve Lighting Energy Audits and Auditor Training," *Proceedings*, Third National Conference on Microcomputer Applications in Energy, November 1988.

Bushnell, Dwight J.

"System and Parameter Evaluation of Combined-Cycle Biomass-Fueled Powerplants," (with G. Reistad, T. Bauer, S. Brynjolfson, and S. Fox), *International Journal of Energy Systems*, Vol. 8, No. 7, 1988.

"Combustion Characteristics of Densified Biomass Fuel," (with C. Haluzak and A. Dadkhah-Nikoo), *Environmental Management of Biomass Combustion and Utilization Conference*, Denver, CO, June 6 and 7, 1989.

Calder, Clarence A.

"Stress Analysis of a Helical Automobile Spring Using Rosettes," (with C. Jenkins), *Experimental Techniques*, Vol. 12, No. 2, February 1988, pp. 17-20.

"An In-Situ Transducer for Dynamic Racket String Tension," (with E. Ball), *Experimental Techniques*, Vol. 12, No. 6, June 1988, pp. 22-25

"Stroboscopic Study of Deformable Thin-Shelled Spheres Impacting a Plane Surface," (with H. Freund), *Proceedings*, 6th International Congress on Experimental Mechanics, Portland, OR, June 1988, pp. 2-6.

"Transient Analysis of a Tennis Racket Using PC-Based Finite Elements and Experimental Techniques," (with C. Jenkins), *Proceedings*, 6th International Congress on Experimental Mechanics, Portland, OR, June 1988, pp. 398-403.

Calder, Clarence A. (continued)

"Study of Embedded Sensors in Graphite-Epoxy Composites," (with J.L. Koury), *Proceedings*, 1989 SEM Conference on Experimental Composites, Cambridge, MA, June 1989, pp. 451-456.

Davis, Lorin R.

"An Experimental Investigation of the Properties of Magnetic Fluids in Thermal Rejection Applications," *Proceedings*, 23rd Intersociety Energy Conversion Engineering Conference, ASME, Denver, CO, July 1988.

"Experimental Verification of a Drilling Mud Plume Model," (with S. Albright, B. Mohebbi, and J. Herron), *Experimental Thermal and Fluid Science*, International Journal of Experimental Heat Transfer, Thermodynamics, and Fluid Mechanics, Vol. 2:00-00, April 1989.

"Application of EPA Computer Models in Buoyant Plume Prediction," Plenary Lecture in *Heat Transfer in Convective Flows*, ASME HTD-Vol. 107, pp. 1-8, August 1989.

Kanury, A. Murty

"Ignition of Liquid Fuels," Section 1/Chapter 20 in *SFPE Handbook of Fire Protection Engineering*, P.J. DiNenno, ed. Boston, MA: Society of Fire Protection Engineers, National Fire Protection Association, 1988, pp. 1-315 to 1-325.

"Flaming Ignition of Solid Fuels," Section 1/Chapter 21 in *SFPE Handbook of Fire Protection Engineering*, P.J. DiNenno, ed. Boston, MA: Society of Fire Protection Engineers, National Fire Protection Association, 1988, pp. 1-326 to 1-339.

"Self-Propagating High-Temperature Synthesis of Materials Employing Combustion Reactions of the Type Solids \rightarrow Solid," in *Heat Transfer - Houston 1988*, AIChE Symposium Series, No. 263, Vol. 84. New York: American Institute of Chemical Engineers, 1988, pp. 44-49.

"A Generic Delineation of CVD Processes," in *Heat Transfer - Houston 1988*, AIChE Symposium Series, No. 263, Vol. 84. New York: American Institute of Chemical Engineers, 1988, pp. 73-78.

Kanury, A. Murty

"Analysis of Superheated Steam-Air Mixtures as Drying Media," (with A. Hernandez-Guerrero), *Proceedings*, 3rd Latin American Congress on Heat and Mass Transfer, Guanajuato City, Mexico, July 1988, pp. 112-120.

Combustion, by I. Glassman, 2nd Edition, Book Review, *Combustion and Flame*, Vol. 71, pp. 107-108, 1988.

"Chemical Kinetics of Reactions of the Type: Solids \rightarrow Solid," (with Z. Huque), *Western States Section/The Combustion Institute*, WSS/CI 89-2, Washington State University, March 1989.

Kennedy, Timothy C.

"Finite Element Analysis of Cracks in Ceramic Composites," (with M. Wang), *Computers in Engineering 1988*, Vol. 3, Patton (Ed.), ASME, 1988, pp. 121-125.

"Micromechanical Analysis of Short Cracks in Fiber-Reinforced Ceramics," (with M. Wang), *Journal of the American Ceramic Society*, Vol. 71, No. 12, 1988, pp. C490-C491.

"The Effect of Fiber Properties on Fracture Strength in Continuous-Fiber Ceramic Composites," (with G. Laird), *Computers in Engineering 1989*, Vol. 2, 1989, pp. 291-296.

"Crack Wake Toughening Mechanisms in Whisker-Reinforced Ceramic," (with G. Laird), *ANSYS Conference Proceedings*, Pittsburgh, 1989, pp. 13.24-13.40.

Larson, Milton B.

"Natural Convection to Water from Arrays of Short Wall-Attached Cylinders," (with Luc Fries), *Experimental Thermal and Fluid Science*, Vol. 1, No. 3, July 1988, pp. 253-258.

Olas, Andrzej

"Recursive Lyapunov Functions: Properties, Linear Systems," Chapter 14 in *Advances in Control and Dynamic Systems*, Vol. XXXIV. Academic Press, 1989.

"Recursive Lyapunov Functions for Linear Systems," 2nd Workshop on Control Mechanics, University of Southern California, January 1989.

Olas, Andrzej (continued)

"Recursive Lyapunov Functions," *Journal of Dynamic Systems, Measurements, and Control*, December 1989.

Ogwubiko, Chinyere

"Piston Rod Design Using Johnson's Method of Optimum Design," *Journal of Mechanisms, Transmissions, and Automation in Design*, Vol. 110, September 1988, pp. 362-365.

"Computer-Aided Design Model for Undergraduate Mechanical Engineering Curriculum," *Computers in Engineering 1988*, Vol. 2, pp. 497-501.

Peterson, Richard B.

"Characterization of a Simple, High Reynolds Number Droplet Generator for Combustion Studies," *Rev. Sci. Instrum.*, 59, 960 (1988).

"Improved Direct Sampling Electron Impact Fluorimetry Apparatus for Combustion Studies," *Rev. Sci. Instrum.*, 59, 815 (1988).

"Application of Atomic Resonance Absorption Spectroscopy (ARAS) to Direct Sampling of Combustion for the Detection of Free Radicals," (with J. Herron), poster paper, 22nd Symposium (Intl.) on Combustion, Seattle, WA, August 14-19, 1988.

"Time Resolved Concentration Measurements of Nitrogen, Oxygen, and Water in a Freely Propagating Hydrogen/Air Flame by Direct Sampling Electron Impact Fluorimetry," (with J. Herron), Paper presented at the 1988 Winter Annual Meeting, ASME, Chicago, IL, November 28-December 2, 1988.

"Time Resolved Measurements of Atomic Hydrogen Using Direct Sampling and Resonance Absorption," (with J. Herron), Spring Technical Meeting, Western States Section/The Combustion Institute, Pullman, WA, March 20-21, 1989.

Rawers, James C.

"Oxidation Study of Fe-8Cr-10Ni-(0-3)Si-(0-8)Mo Alloys," *Oxidation of Metals*, Vol. 29, No. 516, 1988, p. 371.

"Corrosion Study of Laser Processed Zirconium," TMS-ASM Annual Meeting, Phoenix, AZ, January 25-28, 1988.

Reistad, Gordon M.

"Analysis of a Wood-Fueled Trimburner System for Use in a Combined-Cycle, Wood-Fired Power Plant," (with J. Stephenson), *ASME, J. of Solar Energy Engineering*, Vol. 110, May 1988.

"Laminar Heat Transfer in Circular Tubes with Freezing by Using Periodic Flow Reversal," (with H. Nakamura, S. Aceves-Saborio, and A. Matusura), *The Second International Symposium on Heat Transfer*, Beijing, China, August 1988.

"An Extension to the Irreversibility Minimization Analysis Applied to Heat Exchangers," (with S. Aceves-Saborio and J. Ranasinghe), *ASME, J. Heat Transfer*, Vol. 111, No. 1, February 1989.

"Analysis of Ice Formation with Flow Reversal for Application to a Water Source Heat Pump," (with S. Aceves-Saborio and H. Nakamura), *ASHRAE Transactions*, Vol. 95, Pt. 2, 1989.

Ullman, David G.

"A Comparison of the Results of Empirical Studies into the Mechanical Design Process," (with L. Stauffer), *Design Studies*, Vol. 9, No. 2, Butterworths Ltd., April 1988.

"A Model of the Mechanical Design Process Based on Empirical Data," *AIEDAM*, Vol. 2, No. 1, pp. 33-52. Academic Press, 1988.

"A Model of the Mechanical Design Process Based on Empirical Data: A Summary," (with T.G. Dieterich and L. Stauffer), in *Artificial Intelligence in Engineering: Design*, J.S. Gero, ed., *Proceedings of AIEng 88 Conference*, Palo Alto, August 1988, pp. 193-216.

"Data Representations for Mechanical Design Based on Empirical Data," (with J. Tikerpuu), *Proceedings, International Computers in Engineering Conference*, San Francisco, August 1988.

"The Importance of Drawing in the Mechanical Design Process," (with S. Wood and D. Craig), *1989 NSF Engineering Design Research Conference*, June 11-14, 1989.

"The Evolution of Commitments in the Design of a Component," (with B. McGinnis), *Proceedings, International Conference on Engineering Design*, Harrogate, UK, August 1989, pp. 467-495.

Ullman, David G. (continued)

"A Taxonomy of the Mechanical Design Process," *Proceedings, ASME Conference on Mechanical Design Theory and Methodology*, Montreal, September 1989, pp. 23-36.

Wade, John E.

"Biological Wind Prospecting in Third World Countries," (with S.N. Walker), presented at the *9th Annual American Wind Energy Conference*, Honolulu, HI, September 1988.

Walker, Stel N.

"Local Flow Measurements for Micrositing," (with J.E. Wade), *Final Report, Solar Energy Research Institute*, Contract DE-FC02-86CH10251, *PWE Report 87-823*, January 1988.

"Biological Wind Prospecting in Third World Countries," (with J.E. Wade), *Proceedings, American Wind Energy Association, Windpower 88*, Honolulu, HI, September 18-22, 1988, pp. 433-441.

"A Comparison of Wind Turbulence Simulation Models for Stochastic Loads Analysis for Horizontal Axis Wind Turbines," (with T.L. Weber and R.E. Wilson), *Solar Energy Research Institute, SERI/STR-217-3463*, June 1989.

"Regional Wind Energy Assessment Progress Report June 1987-May 1988," (with J.E. Wade), *Bonneville Power Administration Report 88-28*, September 1989.

"Uncertainties in Long-Term Energy Predictions Using Actual and Theoretical Wind Speed Distributions," (with R.W. Baker and J.E. Wade), *Proceedings, American Wind Energy Association, Windpower 89*, San Francisco, CA, September 25-28, 1989.

Warnes, William H.

"A Model for the Resistive Critical Current Transition in Composite Superconductors," *Advances in Cryogenic Engineering: Materials*, Vol. 34, 697. New York: Plenum Press, 1988.

"Current Transfer Effects and Their Influence on the Experimental Critical Current Density of Multifilamentary and Monofilamentary Composites," (with L. Cooley and D.C. Larbalestier), *Advances in Cryogenic Engineering: Materials*, Vol. 34, 1009. New York: Plenum Press, 1988.

Warnes, William H. (continued)

"A Model for the Resistive Critical Current Transition in Composite Superconductors," *J. Appl. Phys.*, Vol. 63 No. 5, 1988, 1651.

"Zirconia Dynamics Studied by PAC Spectroscopy," (with J.A. Gardner, H. Jeager, and H.T. Su), *Physica B*, Vol. 150, 1988, 223.

"Processing Induced Variations of $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ Microscopic Structure: A PAC Study," (with H.T. Su, A.G. McKale, S.S. Kao, L.L. Peng, J.A. Gardner, and J.A. Sommers) in *Ceramic Superconductors II*, Man F. Yan, ed. Westerville: Amer. Ceramic Soc., 1988.

"Temperature Dependence of $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ Local Structure: A PAC Study," (with J.A. Gardner, H.T. Su, A.G. McKale, S.S. Kao, L.L. Peng, J.A. Sommers, K. Athreya, H. Franzen, and H.J. Kim), *Phys. Rev. B*, Vol. 38, 1988, 11317.

"The Tetragonal Phase of $\text{YBa}_2\text{Cu}_3\text{O}_{6+x}$ - Does it Really Exist for $X > 0$?" (with A.G. McKale, H.T. Su, S.S. Kao, J.A. Gardner, and J.A. Sommers, presented at Amer. Phys. Soc., March 1988.

"Impact Properties and Fracture Characterization of Iron-Nickel Alloys," (with P. Bhawe and J. Rawers), in *Advances in Powder Metallurgy*, Vol. 3. Princeton: Metal Powder Industries Federation, 1989.

Welty, James R.

"Direct-Contact Heat Transfer in Solid-Gas Systems," Chapter 10 in *Direct-Contact Heat Transfer*, R.L. Boehm and F. Kreith, eds. New York: Hemisphere Publishing Co., 1988.

"Tube Array Heat Transfer in Fluidized Beds: A Study of Particle Size Effects," *AIChE Journal*, Vol. 35, No. 7, July 1989, pp. 1170-1176.

Wolff, Ernest G.

"Prediction of the Microyield Strength of Polymer Matrix Composites," (with S.T. Crane), *J. Composites Technology & Research*, Vol. 10, No. 4, pp. 165-172, 1988.

"Radiation Effects on Low Expansion Coefficient Glasses and Ceramics," (with E.J. Friebele, Paige Higby, et al.), *J. American Ceramic Society*, November 1988.

"Low Expansion Materials," Part 6, Chapter 3, pp. 6-16 to 6-21 in *Handbook of Applied Thermal Design*, (Eric C. Guyer, editor-in-chief), McGraw-Hill Book Co., New York, 1989.

"Creep in Composites," pp. 511-521 in *International Encyclopedia of Composites*, (S.M. Lee, ed.), VCH Publications, Inc. (1989).

"The Synthesis and Fabrication of Ceramics for Special Applications; Preparation of Boron Nitride," Vol. 17 of *Inorganic Reactions and Methods*, (J.J. Zuckerman and A.P. Hagen, eds.), VCH Publishers, Inc. (1989).

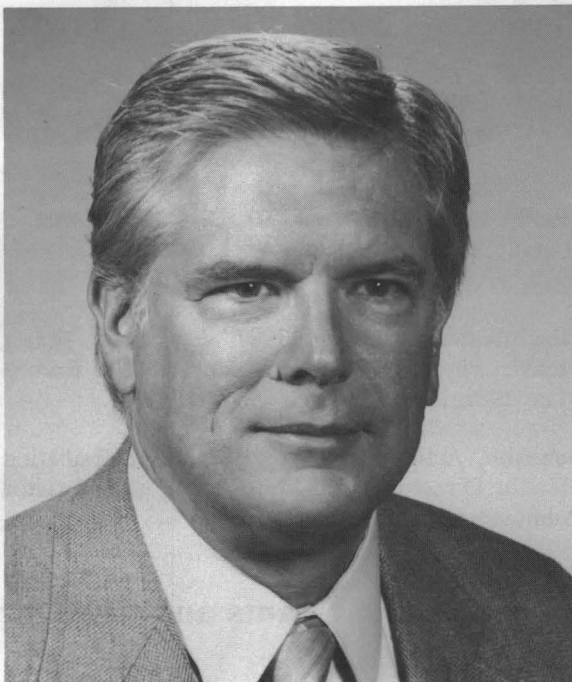
Nuclear Engineering

Current Research

Current areas of research interest in Nuclear Engineering are oriented toward the nuclear power industry and space reactors. Topics include reactor thermal hydraulics, transient behavior, safety problems, waste management, nuclear fuel management, environmental monitoring, transportation of radioactive materials, and reactor materials. Some specific projects are: (1) the development of expert systems for in-core fuel management and the classification of nuclear reactor accidents, (2) best estimate thermal hydraulic analyses of nuclear reactor components and system transients, (3) scaled models of nuclear reactor system components for flow visualization, (4) the study of zirconium corrosion in light water reactors, and (5) space reactor neutronics design.

The Department of Nuclear Engineering is equipped with state-of-the-art nuclear instrumentation and computing facilities. Micro- and mini-computers including two COMPAQ DeskPro 386/25 computers, an Apollo 3000, IBM ATs, and two microcomputer laboratories. The department's computers also provide access through the network to larger computers, such as off-site Crays.

The department is housed in the Radiation Center. This center is an instructional and research facility especially designed to accommodate programs involving the use of radiation and radioactive materials. This unique facility was designed and established to accommodate internal and off-campus instructional and research programs involving nuclear engineering, nuclear science, radiation protection, and other related areas. Major nuclear and radiation devices are housed in the center including: a 1-MW thermal TRIGA Mark II research reactor; a 300-curie cobalt-60 irradiator; a 300-kVp X-ray generator; gamma ray spectrometers and associated Ge(Li) detectors; neutron diffraction equipment; a neutron radiography facility capable of taking still or very high speed radiographs (20,000 frames per second); a variety of instruments for radiation measurement and monitoring, and a facility for calibrating this instrumentation. The center is equipped to package radioactive materials for transportation to both national and international destinations.



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Graduate Faculty

Binney, Stephen E. 1973; Assoc Prof; BS Oregon State 1964, MS California-Berkeley 1966, PhD 1970.

Dodd, Brian 1978; Prof, Reactor Administrator, Radiation Center. BS U of London 1969, PhD 1973.

Higginbotham, Jack F. 1987, Asst Prof, Senior Health Physicist, Radiation Center. BS Kansas State 1981, MS 1983, PhD 1987.

Johnson, Arthur G. 1966; Prof, Prof Radiation Health, Director, Radiation Center, and Reactor Administrator. BS Missouri 1956, MS 1958.

Klein, Andrew C. 1985; Asst Prof; BS Penn State 1977, MS Wisconsin 1979, PhD 1983.

Reyes, José N. Jr. 1987; Asst Prof; BS U of Florida 1978, MS 1984, PhD U of Maryland 1986.

Ringle, John C. 1966; Prof, Assoc Dean Graduate School. BS Case Institute of Technology 1957, MS 1959, PhD California-Berkeley 1964.

Robinson, Alan H. 1966; Prof, Head of Department. BS Swarthmore 1956, MS Stanford 1961, PhD 1965.

New Research Grants and Contracts: 1988-89

Principal Investigator	Project Title	Agency	Amount
Binney, S.E.	Clean Use of Reactor Energy (CURE) High Level Waste Program	Westinghouse	5,000
Binney, S.E.	Preparation Work for Study on Public Attitudes About HLW: A Model Case Study of Public Acceptance of Radioactive Waste Transportation	DOE	19,562
Binney, S.E. Dodd, B.	Public Attitudes about Radioactive Waste and Its Transportation	ODOE	200,000
Dodd, B.	Radioactive Material Transportation and Emergency Response in the State of Oregon	DOE	9,604
Dodd, B.	University Reactor Use Sharing Program	USDE	35,000
Higginbotham, J.F.	Determination of Selenium Concentrations in Blood Water and Vegetation Using Neutron Activation Analysis	Kuwait	6,674
Johnson, A.G.	Irradiation and Analysis of Samples	Battelle/USDE	3,000
Klein, A.C.	Innovative Fusion Reactor Design Analysis	USDOE	10,000
Klein, A.C.	Materials Compatibility Issues for Fabric Composite Radiators (Rotating Bubble Membrane Radiator)	USDE-Battelle	19,193
Klein, A.C.	Fabric Composite Radiators for Space Nuclear Power Applications	DOE	75,000
Klein, A.C.	Design Study of In-Core Thermionic Space Reactors	Universal Energy Systems/ Air Force	182,500

Klein, A.C.	Cold Fusion Research Project	OSU	4,000
Klein, A.C.	University Laboratory Cooperative FAC2	UW/USDE	2,000
Klein, A.C. Robinson, A.H.	Study of Corrosion Behavior of Fuel Cladding Materials Under Nuclear Power Reactor Operating Conditions and Environments (Supplement)	Teledyne	50,000
Robinson, A.H. Pauley, K.A.	Fellowship in Nuclear Engineering in Behalf of Keith A. Pauley	INPO	9,500
Reyes, J.N.	Thermal Hydraulic Research Program	PGE	49,996
Reyes, J.N.	Two-Phase Natural Circulation Experiments in a Flow Visualization Loop	OSU	4,000
Robinson, A.H.	An Expert System for Classification of Emergencies	PGE	49,940
Robinson, A.H.	Fellowship in Nuclear Engineering in Behalf of Todd Miles	INPO	9,500

Faculty Publications: 1988-89

Binney, Stephen E.

"Stability Analysis for Distributed Systems," (with S.T. Luo and W.J. Kolodziej), *International Journal of Systems Science*, 19, 377 (1988).

"In-vivo Counting of Americium-241 in Human Lung and Tracheobronchial Lymph Nodes," (with A.R. Northcutt and H.E. Palmer), *Health Physics*, 54, 73 (1988).

"Compositional Variations of Coastal Placers in the Pacific Northwest, USA," (with C.D. Peterson), *Marine Mining*, 7, 397 (1988).

"Application of PC's to a Nuclear Reactor Laboratory Course," *Trans. American Nuclear Society*, 57, 24 (1988).

"Application of the Point Kinetics Equations to the Design of a Reactivity Meter," (with A.J.M. Bakir), *Trans. American Nuclear Society*, 57, 312 (1988).

"An On-line Reactivity and Power Monitor for a Triga Reactor," (with A.J. Bakir), 11th Triga Owner/User Conference, Rockville, MD, (1988).

"Elemental Composition of the Very Heavy Non-Magnetic Fraction of Pacific Northwest Beach Sands," (with B. Azim and C.D. Peterson), *Oregon Geology*, 51 (6), 123 (1989).

Binney, Stephen E. (continued)

"Design and Development of a PC-Based Reactivity Meter for a Research Reactor," (with A.J.M. Bakir), *Nuclear Technology*, 85, 12 (1989).

"Qualitative Assessment of the Value of the OSU TRIGA Reactor," (with A.G. Johnson), *Trans. American Nuclear Society* (1989).

Dodd, Brian

"Radioactive Material Transportation Accident Emergency Response - The Oregon Experience," Emergency Response - ANS Topical Meeting, Charleston, SC, 1988.

"Evidence of Possible Flooding of the Reflector at the Oregon State University TRIGA Reactor," (with A.G. Johnson and J.V. Anderson), 11th TRIGA Users Conference, Bethesda, MD, 1988.

"Protective Action Guide for Radioactive Material Transportation Accidents," (with L.L. Humphries), *Health Physics*, Vol. 55, No. 6, 1988, pp. 957-962.

"Hazards Assessment of Worst Case Transportation Accidents Involving Radioactive Materials," (with L.L. Humphries), *Health Physics*, Vol. 55, No. 6, 1988, pp. 963-983.

Dodd, Brian (continued)

"The Risks of Radioactive Material Transportation Accidents in the State of Oregon," (with L.L. Humphries), *Health Physics*, Vol. 57, No. 1, 1989, pp. 131-139.

Higginbotham, Jack F.

"Argon-41 Production and Evolution at the Oregon State University TRIGA Reactor (OSTR)," (with L.G. Anellis and A.G. Johnson), TRIGA Owner/User Conference XI, Bethesda, MD, April 1988.

"Neutron Detection and Spectrometry in Support of Cold Fusion Experiments," (with S.E. Binney), Health Physics Society Annual Meeting, Albuquerque, NM, June 1989.

Johnson, Arthur G.

"Evidence of Possible Flooding of the Reflector at the Oregon State University TRIGA Reactor," (with T.V. Anderson and B. Dodd), 11th TRIGA User's Conference, Rockville, MD, 1988.

"Argon-41 Production and Evolution at the Oregon State University TRIGA Reactor (OSTR)," (with L.G. Anellis and J.F. Higginbotham), 11th TRIGA User's Conference, Rockville, MD, 1988.

Klein, Andrew C.

"Design of a Laboratory Autoclave to Evaluate the Oxidation Rate of Fuel Cladding Under Isothermal and Thermal Gradient Conditions," (with M.A. Maguire), in *Environmental Degradation of Materials in Nuclear Power Systems--Water Reactors*, G.J. Theus and J.R. Weeks (eds.). The Metallurgical Society, 1988.

"Assessment of Nuclear Reactor Concepts for Low Power Space Applications," (with S.R. Gedeon and D.C. Morey), *Transactions of the Fifth Symposium on Space Nuclear Power Systems*, CONF-880122, Summs., M.S. El-Genk and M.O. Hoover (eds.), Albuquerque, NM, January 1988, pp. 167-170.

"Microgravity Thaw Experiment (MITEX)," (with K. Stump, G. Wallis, W.J. Krotuik, and B.J. Webb), *Transactions of the Fifth Symposium on Space Nuclear Power Systems*, CONF-880122, Summs., M.S. El-Genk and M.O. Hoover (eds.), Albuquerque, NM, January 1988, pp. 317-324.

Klein, Andrew C. (continued)

"Zircaloy Oxidation in Nuclear Systems, A Literature Review," (with S.R. Gedeon and J.A. VanWinkle), *OSU-NE-8802*, Oregon State University, Corvallis, OR, April 1988.

"Scanning Electron Microscopy of Zircaloy-4 Oxides," (with A.I.A. Almarshad), *OSU-NE-8803*, Oregon State University, Corvallis, OR, April 1988.

"Thermal-Hydraulic Design Analysis of the Thermal Gradient Test Facility (TGTF)," (with A.Y. Lafi and J.N. Reyes), *OSU-NE-8804*, Oregon State University, Corvallis, OR, May 1988.

"Thermionic Space Reactor Design Study," (with S.R. Gedeon), *OSU-NE-8807*, Oregon State University, Corvallis, OR, July 1988.

"First Interim Report: Phase II of a Study of Corrosion Behavior of Fuel Cladding Materials Under Nuclear Power Reactor Operating Conditions and Environments," (with J.N. Reyes, Jr., A.Y. Lafi, J.A. VanWinkle, and A.I.A. Almarshad), *OSU-NE-8809*, Oregon State University, Corvallis, OR, September 1988.

"Nuclear Design Analysis of In-Core Thermionic Reactor Systems," (with S.R. Gedeon and P.T. Choong), Sixth Symposium on Nuclear Power Summaries, Albuquerque, NM, January 1989.

"Innovative Fusion Reactor Design Analysis," *OSU-NE-8901*, Oregon State University, Corvallis, OR, January 1989.

"Second Interim Report: Phase II of a Study of Corrosion Behavior of Nuclear Fuel Cladding Materials under Nuclear Power Reactor Operating Conditions and Environments," (with J.N. Reyes, Jr., J.A. VanWinkle, A.I.A. Almarshad, and A.Y. Lafi), *OSU-NE-8902*, Oregon State University, Corvallis, OR, January 1989.

"Zircaloy Oxidation Database User's Manual," (with J.A. VanWinkle), *OSU-NE-8907*, Oregon State University, Corvallis, OR, June 1989.

"Third Interim Report: Phase II of a Study of Corrosion Behavior of Nuclear Fuel Cladding Materials under Nuclear Power Reactor Operating Conditions and Environments," (with J.N. Reyes, Jr., J.A. VanWinkle, A.I.A. Almarshad, and A.Y. Lafi), *OSU-NE-8908*, Oregon State University, Corvallis, OR, June 1989.

Klein, Andrew C. (continued)

"Microgravity Thaw Experiment (MITEX), Description of the Experimental Package and Proposed Test Plan," *OSU-NE-8909*, Oregon State University, Corvallis, OR, July 1989.

"Thermal Gradient Effects on the Oxidation of Zircaloy Fuel Cladding," (with J.N. Reyes, Jr. and M.A. Maguire), *OSU-NE-8910*, Oregon State University, Corvallis, OR, September 1989.

Reyes, José N., Jr.

"Thermal-Hydraulic Design Analysis of the Thermal Gradient Test Facility (TGTF)," (with A.C. Klein and A.Y. Lafi), *OSU-NE-8804*, Oregon State University, Corvallis, OR, May 1988.

"Spent Fuel Consolidation Analysis," (with K. Pauley and T. Eichenberg), *OSU-NE-8808*, Oregon State University, Corvallis, OR, July 1988.

"First Interim Report: Phase II of a Study of Corrosion Behavior of Fuel Cladding Materials Under Nuclear Power Reactor Operating Conditions and Environments," (with A.C. Klein, A.Y. Lafi, J.A. VanWinkle, and A.I.A. Almarshad), *OSU-NE-88-09*, Oregon State University, Corvallis, OR, September 1988.

"ECC Bypass Research," Compendium of ECCS Research for Realistic LOCA Analysis, U.S. Nuclear Regulatory Commission, *NUREG-1230*, December 1988.

Reyes, José N., Jr. (continued)

"OLAPS: A Microcomputer Based Thermal-Hydraulic Code for Transient Reactor Analysis, Volume 1: Field Equations and Constitutive Models," (with J. Samuels), *OSU-NE-8810*, Oregon State University, Corvallis, OR, January 1989.

"Second Interim Report: Phase II of a Study of Corrosion Behavior of Fuel Cladding Materials Under Nuclear Power Reactor Operating Conditions and Environments," (with A.C. Klein, et. al.), *OSU-NE-8902*, Oregon State University, Corvallis, OR, June 1989.

"Third Interim Report: Phase II of a Study of Corrosion Behavior of Fuel Cladding Materials Under Nuclear Power Reactor Operating Conditions and Environments," (with A.C. Klein, et. al.), *OSU-NE-8908*, Oregon State University, Corvallis, OR, June 1989.

Robinson, A.H.

"A Knowledge-Based System Framework for Real-Time Monitoring Applications," (with J.O. Heaberlin), *Transactions of the American Nuclear Society*, San Francisco, CA, November 1989.

"Hybrid Expert System Implementation to Determine Core Reload Patterns," (with K.J. Greek), *Transactions of the American Nuclear Society*, San Francisco, CA, November 1989.

Forest Engineering

College of Forestry

Research activities in the Forest Engineering Department focus on harvesting methods, logger training, logging technology, road construction, and the environmental impacts of forestry activities upon soil and water. The primary goal of the Forest Engineering research program is to provide new knowledge about forest operations and how they perform technologically, economically, and environmentally. A companion goal is to prepare scientists for careers in research through graduate education and the application of research results. Research programs tend to focus on problems and practices related to forested lands of Oregon and the Pacific Northwest. In addition to the undergraduate degree program in Forest Engineering, the department offers graduate degrees with specialties in logging engineering and forest hydrology. The department also has an active extension program dealing with forest harvesting and environmental impacts.



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Forest Engineering
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Research Expenditures: 1988-89

Faculty	Subject Area	State* of Oregon	Research Grants
Adams, P.W.	Soil and Water	\$ 19,936	\$ 10,423
Atkinson, W.A.	Administration	98,843	0
Beschta, R.L.	Channel Characteristics/Riparian Zones	70,866	82,000
Froehlich, H.A.	Stream Protection/Landslides	72,029	72,000
Kellogg, L.D.	Mechanical Harvesting	21,669	65,000
Kliwer, J.E.	Soil Subgrade Behavior	0	15,000
Kramer, B.	Transportation Network Analysis	24,768	0
Mann, J.W.	Overstory Removal	29,818	0
Mann, J.W./Pyles, M.R.	Skyline Mechanics	0	75,000
McMahon	Woody Debris in Streams	0	30,000
McNabb, D.H.	Machine Site Preparation	0	60,000
Olsen, E.D./Garland, J.J.	Logging Labor Force	0	45,308
Olsen, E.D./Garland, J.J.	Optimal Bucking	0	25,000
Pyles, M.R.	Slope Stability	49,295	0
Sessions, J.	Transportation Systems	39,289	0
Skaugset, A.E.	Roots and Forest Soils	0	30,000
	Totals	\$426,513	\$509,731
	TOTAL		\$936,244

*Forest Research Laboratory

RESEARCH CENTERS AND INSTITUTES

Programs for the centers and institutes shown in Figure 1 are described in this section, along with research and extension budgets that are administered outside the normal department channels. These centers and institutes have a public interaction role, or are multidisciplinary in

nature. They typically are advised by a governing board of directors drawn from both outside and within the University itself. The role is an important one because of the direct tie provided between the University and the public it serves.

Water Resources Research Institute

The Water Resources Research Institute was organized to coordinate the multidisciplinary efforts required for solution of critical water problems. The Institute goal is to foster, encourage, and facilitate research and education related to all factors that affect the quantity and quality of water resources in Oregon. The Institute is administered under the Vice President for Research and Graduate Studies, through the Colleges of Agricultural Sciences, Engineering, and Forestry. The membership, which includes all people in higher education in Oregon who are engaged in water resources research and training, currently numbers about 200 persons in 31 different departments.

Extensive facilities are available to Institute members and students for research and training. These include forested watershed lands and associated field equipment, soil laboratories, water and waste treatment facilities, water science laboratories, branch agricultural experiment stations, experimental streams, computer programs, a hydraulics laboratory, and a radiation center. Research assistantships and fellowships are available through many of the member departments. The Institute provides support for selected portions of the research and training programs in water resources at universities in Oregon.

The Institute works closely with federal and state agencies in research coordination and information transfer. Seminars are sponsored during fall and spring terms to address water issues. Research reports are given wide distribution through the Institute's information dissemination program. Research projects are conducted in the areas of water supply and quality, planning and management, systems analysis, legal and institutional complexities, and water uses and use impacts.



B.P. Warkentin, Director
Water Resources Research Institute
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Research Expenditures: 1988-89

Faculty	Subject Area	Research Grants
Clark, P. Rosenfeld, C.	Mass Balance Study of the Collier Glacier, Oregon Cascades	\$11,915
Gregory, S.	Riparian and Geomorphic Regulation of Abundance and Distribution of Salmonids	18,480
Klingeman, P.*	Application of Economic Analysis to Water Allocations for Fish Habitat Enhancements, John Day Basin	9,029
Lamberti, G. Li, H. Buckhouse, J.	Cumulative Impact of Riparian Cover on the Thermal Loading, Trophic Processes, and Juvenile Steelhead Trout in Small Streams of the John Day Basin	17,805
Myrold, D. Moore, J.	Quantifying Dentrification Losses of Nitrogen from Land-Applied Dairy Manures Streams	24,609
	TOTAL	\$81,838

*1988-89 Civil Engineering portion of a total grant of \$131,490

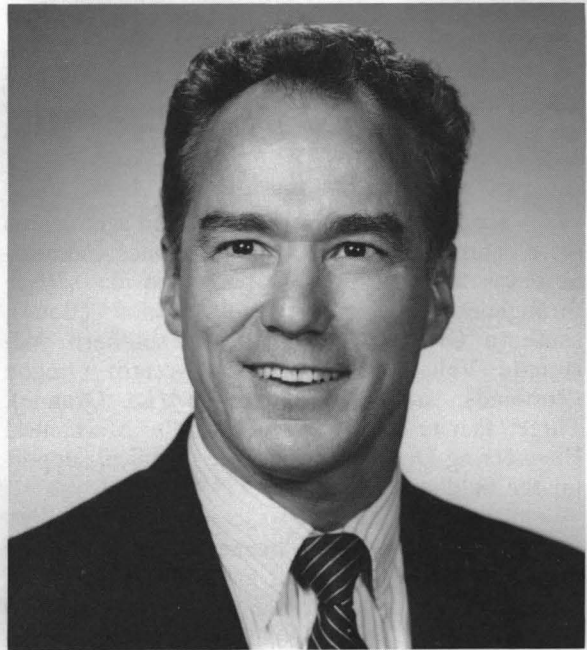
Transportation Research Institute

Transportation activities at Oregon State University are diverse, ranging from analysis of pavement materials to analysis of transportation policy. The Transportation Research Institute (TRI) is a professional and academic group that serves as a link with other universities, industry, and government on transportation issues.

TRI draws upon the expertise of members of the Colleges of Agriculture, Business, Economics, Forestry, Liberal Arts, and Science at OSU. Our 40 associates have created an interdisciplinary environment that has enhanced the quality and innovation of our faculty's research and continuing education activities.

This is TRI's fifth biennial report. It highlights a variety of research projects, seminars, conferences, and published papers relating to our faculty's recent activities. TRI faculty conducted research under 30 contract research projects in the 1987-88 period; 43 graduate students were supported by these projects; 57 reports/papers were published by TRI faculty and graduate students. TRI faculty members also made numerous technical presentations and participated in a number of national and international conferences.

TRI's plans for the future include the expansion of research activities and facilities to accommodate the goals of the Strategic Highway Research Program (SHRP) and active involvement in TransNow, a regional transportation center with universities from the states of Alaska, Idaho, Oregon, and Washington.



T.S. Vinson, Acting Director
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With the support of our current sponsors and the additional impetus of SHRP activities, TRI will continue to produce innovative research offering high quality education for transportation professionals. TRI looks forward to providing excellent training opportunities for our nation's future transportation leaders.

Extension Energy Program

The OSU Extension Energy Program is a cooperative effort of the College of Engineering, the OSU Extension Service, and the Oregon Department of Energy. It is one of seven program areas making up the Oregon State University Extension Service.

Extension Energy specialists and agents help solve energy-related problems for homes and businesses. Staff in five locations provide service throughout Oregon: central Oregon (Bend); southern Oregon (Medford); the southern Willamette Valley (Eugene); northwestern Oregon (Portland); and eastern Oregon (La Grande). Three faculty members in OSU's Mechanical Engineering Department provide technical support for the field staff.

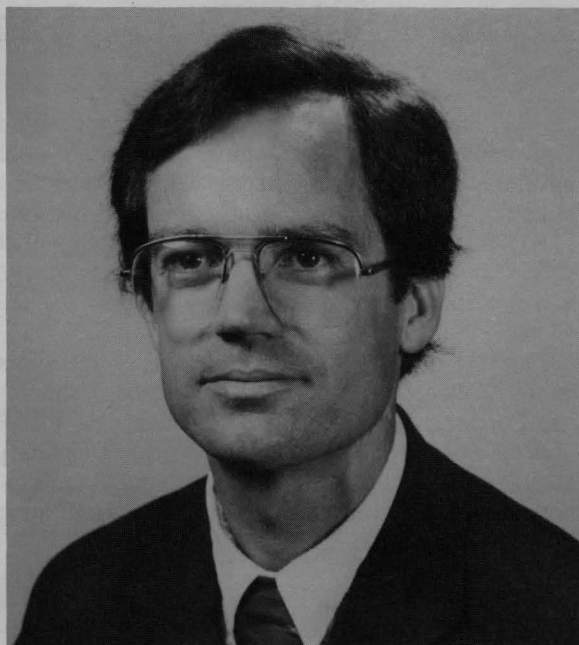
Since the program began in 1980, Oregon's Extension Energy Program has provided information and technical assistance to more than 62,500 Oregonians. It has developed a strong reputation based on responsive service and high quality education materials and programs.

Major program thrusts occur in five areas.

Low Income: Training is provided to help improve the housing of low-income individuals. Specific programs include training for community action weatherization crews, workshops to support self-help projects, and information and training for social agency staff who directly help low-income households.

New Home Construction: The Extension Energy Program has been particularly successful in developing programs and materials to improve the quality and comfort of new homes. One- and two-day workshops presented by Extension Energy staff reach over 500 builders annually. Over 8000 copies of manuals written by OSU to support these programs have been printed and used throughout the northwest. Extension Energy staff have received additional grants to update these materials, and to develop a video-tape-based training program on how to build energy efficient homes.

Commercial Buildings: Programs and materials are developed to update the expertise of professionals who provide energy-related services for commercial buildings. Activities focus on training on boilers, pneumatic controls, lighting,



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computer simulation programs, and on changes to the energy provisions in Oregon's building code. Increasingly, schools and local governments are taking advantage of technical assistance and training through these programs.

Wood Smoke: Information materials are being developed and programs organized to help communities in southern and eastern Oregon reduce smoke from woodstoves.

Irrigators: Farms in eastern Oregon are benefiting from improved access to weather information and technical help from agents on ways to improve water management and irrigation system efficiency.

OSU Extension Energy staff work with students and other faculty to conduct applied research on the performance of energy-related products in the northwest. Examples have included monitoring the performance of woodstoves, batch solar collectors, and different glazing materials. These studies have frequently led to recommendations to manufacturers on ways to improve their products.

Funds for the OSU Extension Energy Program are provided by the Bonneville Power Administration, the U.S. Department of Energy, and the State of Oregon. In addition, special grants have been received to support the development of training materials and the delivery of specific training programs.

The Extension Energy staff present seminars, workshops, and conferences throughout the year. For more information about these programs, available information materials, and other services, one should contact: OSU Extension Energy Program, Oregon State University, 344 Batcheller Hall, Corvallis, Oregon 97331, (503) 737-3004.

Energy Analysis and Diagnostic Center

The wood products industry, food processors, and other manufacturers in Oregon will reap bigger profits in the coming years with the help of Oregon State University's Energy Analysis and Diagnostic Center.

Under the direction of Greg Wheeler, OSU Extension energy specialist and assistant professor of mechanical engineering, and Dwight Bushnell, associate professor of mechanical engineering, the center is conducting free energy audits and recommending energy-saving actions this year for 30 manufacturers with gross annual sales under \$50 million and annual energy bills under \$1.5 million.

Audits of 61 manufacturing plants completed thus far estimate annual savings of from \$4,476 to \$534,162 and energy savings of from 0.2% to 53%. Many of the recommended actions have payback periods under two years.

The center is one of 13 across the country managed by the University City Science Center of Philadelphia with funding from the U.S. Department of Energy.

Extension Energy Projects: 1988-89

Subject Area	Granting Agency	Grant Amount
Energy Efficient New Home Video Training Tapes	USDOE/BPA	\$ 166,770
Builders Training and Technical Assistance	Oregon DOE/BPA	176,036
Super Good Cents Builder Training	Pacific Power	7,853
Super Good Cents Utility Training	Oregon DOE/BPA	14,888
Heat Pump Training Program	Oregon DOE/BPA	58,695
Building Operator Training	Oregon DOE/BPA	113,436
Ventilation Manual & Homeowners Handbook	Oregon DOE/BPA	24,085
Technical Assistance to Irrigators	Oregon DOE/BPA	25,367
Energy Related Technical Assistance	Oregon DOE/USDOE	56,499

Low-Income Energy Education Wood Heating Programs Commercial Building Operator and Boiler Training Programs	Oregon DOE/Exxon Oil Overcharge	\$ 230,410
Residential Construction Demonstration Project	Oregon DOE/BPA	27,711
Weatherization Inspections	Oregon Dept. of Human Resources	7,150
Energy Savings Evaluation	City of Portland	8,254
Energy Analysis and Diagnostic Center (Greg Wheeler - Project Leader)		98,575
Basic Energy Program	State of Oregon	45,975
TOTAL		\$1,061,704