OREGON STATE UNIVERSITY

MECHANICAL ENGINEERING

OUR FACULTY AND STAFF HERITAGE

Rogers Hall, current home of Mechanical Engineering

This booklet has been prepared to provide, in one place, a description of faculty and staff, both present and those who have served Mechanical Engineering at Oregon State University over an extended time period. Students are chronicled regularly in the pictures that line the hallways in Rogers Hall, but faculty and staff pictures have not been as complete. This booklet will serve as a pictorial record of faculty and staff.

In compiling the material for the faculty and staff, the changes and similarities of the curriculum over the years became of interest. A brief section on the evolution of the curriculum is also included.

CAVEATS

In compiling the material, a decision concerning the length of service for the past individuals to be included had to be made. The decision was to make this period ten years. Although we have had significant service by others, to make the project manageable in a reasonable time, the ten-year period was selected. Our apologies to those we were not able to include.

Individuals change in many ways over time. The personnel pictures included in this booklet are snapshots in time. We hope you recognize the persons with whom you have had contact.

ACKNOWLEDGEMENTS

Several emeritus faculty had a major role in compiling material for this booklet. We gratefully acknowledge their efforts and remembrances. They are:

John Mingle
Olaf Paasche
Milosh Popovich
George Thornburgh

We also acknowledge the assistance of Professors Timothy Kennedy, Charles Smith, James Welty, and Robert Wilson of the Mechanical Engineering Department, and Ms. Elizabeth Nielsen of the Archives Office, Oregon State University.

Gordon M. Reistad
Debra A. Jimmerson

October, 1995

Dedicated to our faculty and staff, both past and present. They distinguish the University through their service to students and society.

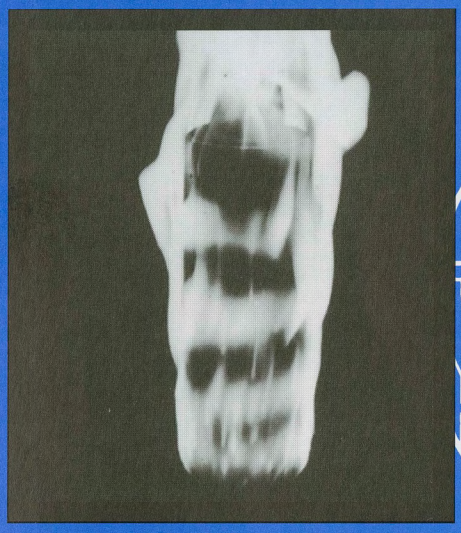
Contents

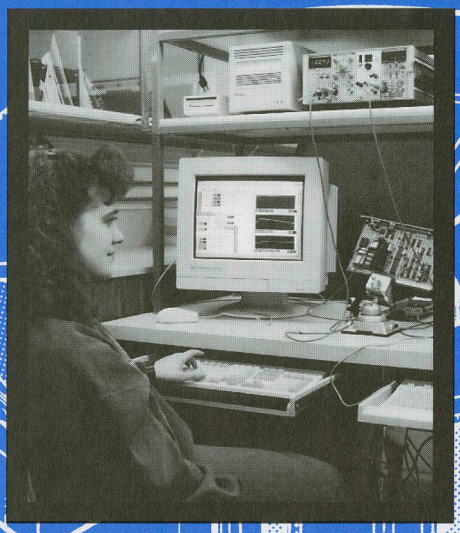
PRESENT FACULTY

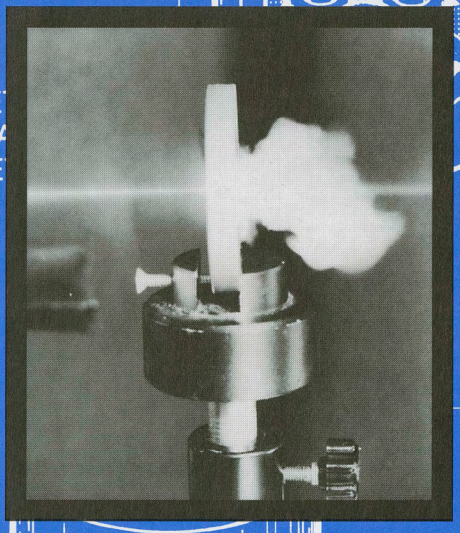
Present faculty are documented in the current Mechanical Engineering Graduate Brochure.

Research & Graduate Study

MECHANICAL ENGINEERING



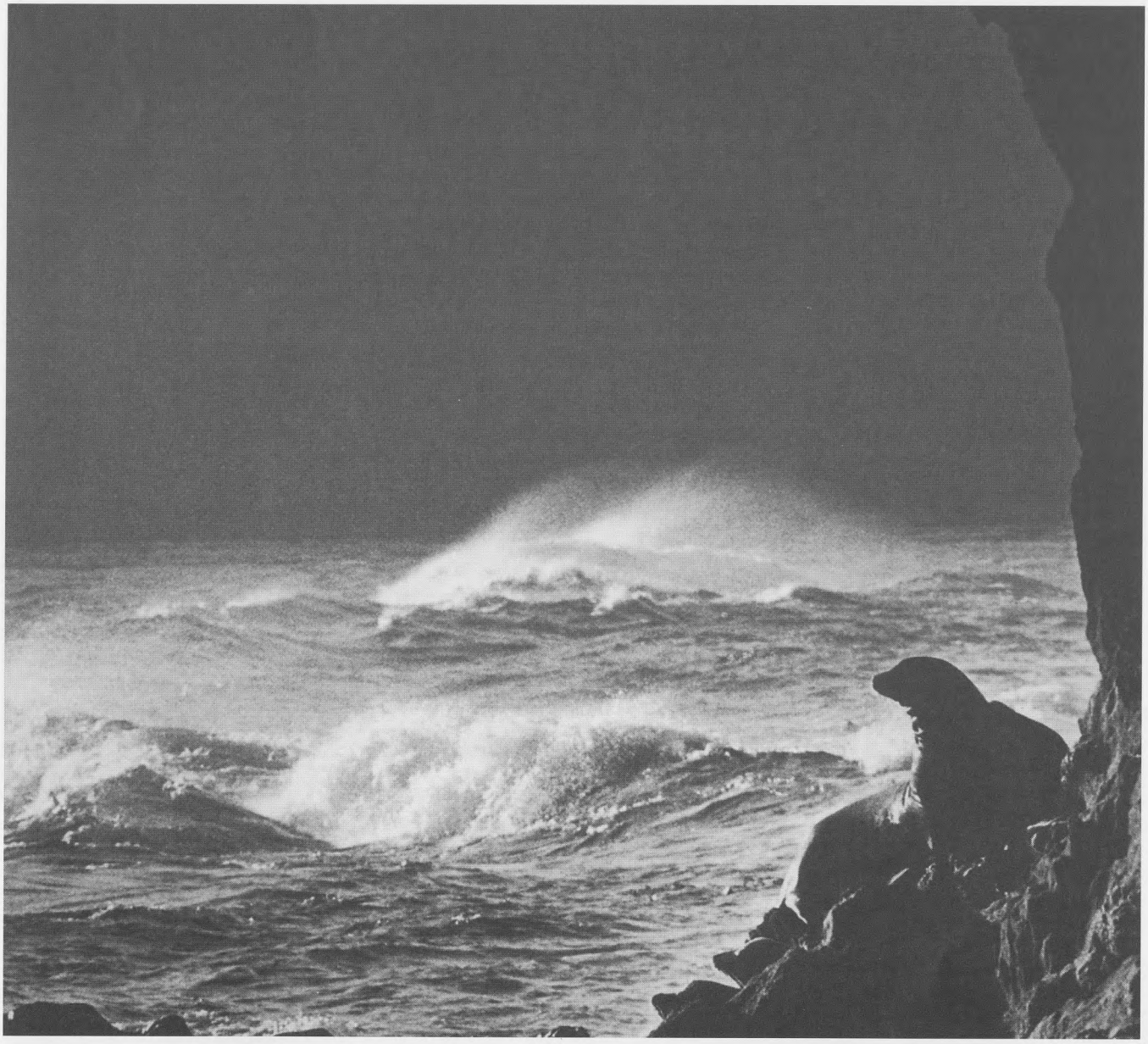




Oregon State University

Cascade Range – 80 Miles East of Corvallis

Contents



Pacific Ocean – 50 Miles West of Corvallis

Foreword

Oregon State University is located in Corvallis, a vibrant college town of about 42,000 people, located 80 miles south of Portland in the verdant Willamette Valley. With easy access to the coastal range and the Pacific Ocean to the west and the Cascade Mountains to the east, Corvallis is noted for its natural beauty and civic pride. Although somewhat removed from large populations, a variety of cultural activities may be found locally, in nearby Eugene, and in Portland. Thus, the area offers a unique mix of recreational and cultural opportunities to an international community of students, scholars, and professionals.

To portray the special character of graduate education in Mechanical Engineering at Oregon State University, this brochure summarizes the qualifications, professional accomplishments, and the current research activities of our faculty. In addition, the laboratory and computer facilities available for research are described, the graduate courses offered are enumerated, and the graduate degree requirements are specified. A number of recent dissertations, theses, and publications are also listed to indicate the thrust of the program.

If the possibility of joining this program interests you, please contact the Graduate Admissions Chairman, Department of Mechanical Engineering, Oregon State University, Corvallis, OR 97331 for more information and application procedures.

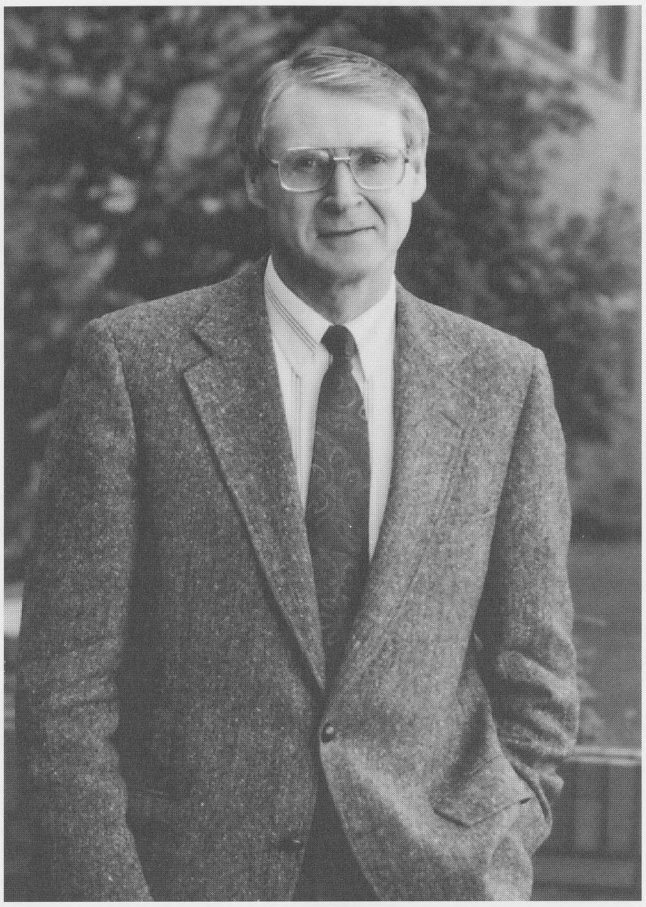
The Department

The Department of Mechanical Engineering is one of eight departments in the College of Engineering at Oregon State University. OSU is a comprehensive research-based university that has been designated as the Land/Sea/Space-grant institution in the Pacific Northwest. With about 20 faculty members and 70 graduate students, the department offers graduate programs leading to M.S. and Ph.D. degrees in the traditional areas of mechanical engineering: design, materials, mechanics, and energy and transport phenomena. Research directions and facilities, faculty profiles, sample projects, theses and some recent publications representing each of these areas are presented in the following pages.

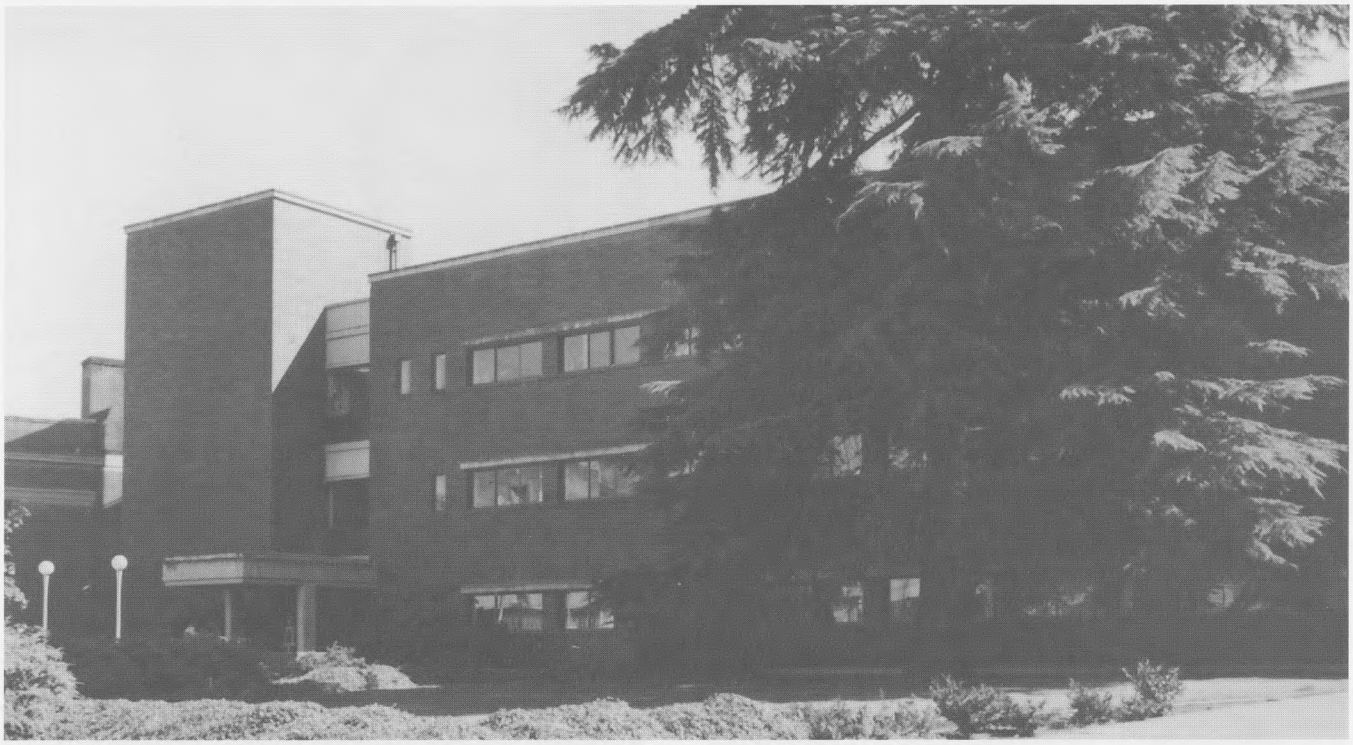
The faculty offices and most of the laboratories of the department are housed in Rogers Hall. Complete machine shop facilities for student projects and research are supervised by a full-time machinist and instrument technician. Computer facilities are available for use in Rogers Hall and include numerous workstations, microcomputers, printers, plotters, and data loggers. These and other remote systems are connected to the campus computer center which houses a mainframe computer. Materials testing laboratories with various mechanical testing instruments are located adjacent to Rogers Hall in Graf Engineering Laboratory.

Facilities in other parts of campus include a hydrodynamic wave research facility with a 100-m long wave tank used for ocean engineering studies and a Triga research reactor housed in the University Radiation Center. The designation of OSU as a NASA Space Grant institution has brought supercomputing facilities to the OSU campus. This facility is housed in the College of Oceanography and is used to analyze data from several Earth-observing satellites. Time has also been made available to members of the OSU community for computational projects. Another important resource is the Environmental Protection Agency's National Environmental Research Center located adjacent to the western edge of the campus.

The U.S. Bureau of Mines Albany Center, a Hewlett-Packard plant, and a variety of other small and large, industrial and government, research and production plants exist within a few miles of the campus and provide excellent opportunities for interaction.



Gordon M. Reistad
Department Head



Rogers Hall – Home of Mechanical Engineering

Testing a Spindle Error Motion Sensor

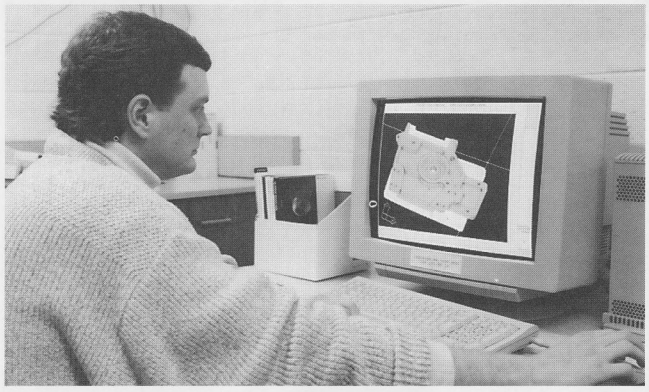
Areas of Research

RESEARCH IN DESIGN

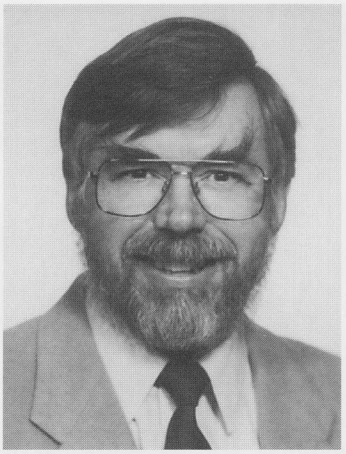
Design is the process of transforming customers' requirements into products. This process covers the whole of mechanical engineering and this is supported by the knowledge of analytical techniques from other fields. The underlying philosophy is pragmatic, and integrates the concepts of design, make, and measure.

Areas of emphasis include design methodology, design decision-making, computer-aided toleranceing and metrology, automated diagnosis and mechanical diagnosability, manufacturing process characterization, and walking machine robotics.

Laboratory facilities include a CAD laboratory with workstation-based solid modeling and manufacturing connections, a table-top CNC laboratory, a five-axis CNC production machining center, a metrology lab with high-performance machine vision and a CNC production coordinate measurement machine.

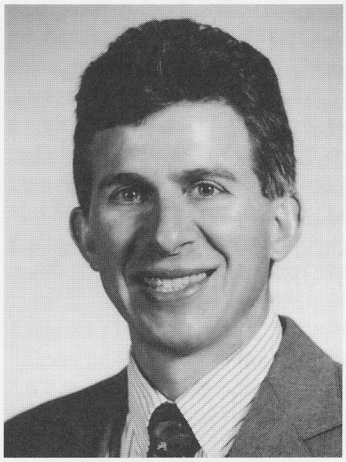


Solid Modeling of Components



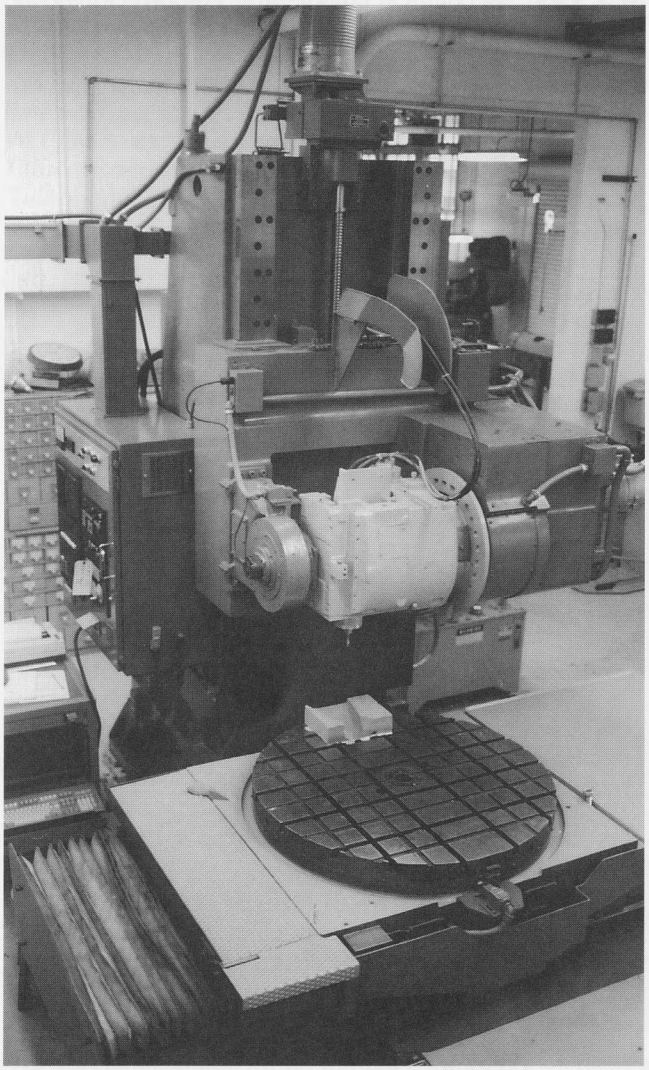
Eugene F. Fichter
Associate Professor
Kinematics, Machine Design

B.M.E. 1967, Rensselaer Polytechnic Institute; M.S. 1973, University of New Brunswick (Canada); Ph.D. 1977, Monash University (Australia).
USAF, 1967-71; Monash University, 1975-76; OSU Industrial and Manufacturing Engineering Department 1977 - present; OSU Mechanical Engineering Department 1987 - present.
At OSU since 1977.
Office: Covell 133
Telephone: 737-2873
e-mail: fichter@engr.orst.edu
Current research interest include: Kinematics and design of walking machines and robots, theoretical kinematics of mechanical mechanisms, positioning and restraint of parts during manufacturing processes.
ASME Melville Medal for best paper of 1976.
Principal Author of *Atlas of Linkage Design and Analysis*, Vol. 1; *The Four-Bar Linkage* Saltire Software (1992).
Selected recent technical publications: "Kinematic model for arthropod legs and other manipulators," *ASME Trans., J. Mechanical Design* (1994). "A Geometrical Solution for the Inverse Kinematics of Three Revolute Manipulators," *Proceedings of the 19th ASME Design Automation Conference* (1993). "Effect of Manipulator Calibration Errors on Estimated End-Point Position," *9th International Conference on CAD/CAM, Robotics & Factories of the Future* (1993). "Walking Machine Design Based on Certain Aspects of Insect Leg Design," *Proceedings of the 22nd Biennial ASME Mechanisms Conference* (1992).
Selected recent graduate student theses directed: R. Chancharoen "Computer Assisted Design of Planar Workholders," M.S. Thesis (1994); I.C. Su, "Kinematic Analysis of Walding Machine Food Trajectory," M.S. Thesis (1994); A. Batra, "Initial Spatial Motion of a Rigid Body on Removal of One Constraint," M.S. Thesis (1993).
Dr. Fichter's research has been supported by National Science Foundation and by private companies.



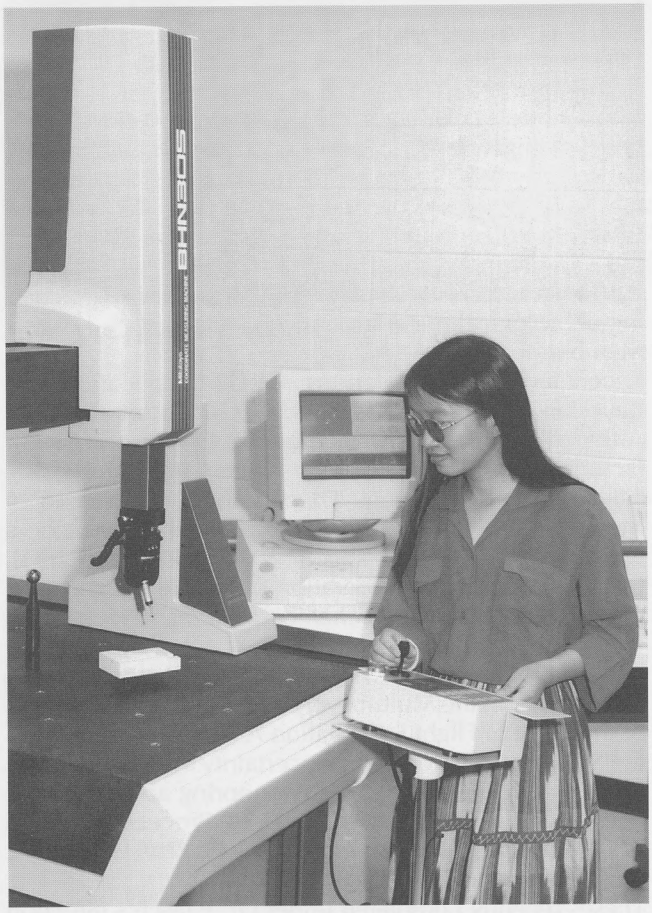
Robert K. Paasch
Assistant Professor
Mechanical Design

B.S. 1976, California Polytechnic State University, San Luis Obispo; M.S. 1981, University of California, Davis; Ph.D. 1990, University of California, Berkeley.
Marvin Landplane Company, 1978-85; Bechtel National, Inc., 1987; Lawrence Berkeley National Laboratory, 1987-89; Lawrence Livermore National Laboratory, 1989-90.
At OSU since 1990.
Office: Rogers 318
Telephone: 737-7019
Current research interests include the application of Artificial Intelligence techniques to mechanical engineering, particularly the automated monitoring and diagnosis of mechanical systems; the design of mechanical systems for reliability, diagnosability and serviceability; and computer-based mechanical systems modeling, including vibration induced fatigue crack growth and impact modeling of biological materials.
Member of ASME, AAAI.
Recent technical publications include "Applications of a Bayesian Network to Integrated Circuit Testor Analysis" Artificial Intelligence for Engineering, Design and Manufacturing (1995), (with D. Mittelstadt & B. D'Ambrosio). "Diagnostic Modeling & Diagnosability Evaluation of Mechanical Systems," Proceedings of 6th International Conference on Design Theory & Methodology (1994), (with G. Clark). "Consideration of Failure Diagnosis in Conceptual Design of Mechanical Systems," Proceedings of 5th International Conference on Design Theory & Methodology (1993), (with D. Ruff). "Management of Uncertainty in the Multi-Level Monitoring and Diagnosis of the Time of Flight Scintillation Array," Proceedings of the Seventh Conference on Uncertainty in Artificial Intelligence, (1991). "Multi-Level Monitoring and Diagnosis of Large Scale Sensor-Based Systems," Proceedings of the 7th Conference on Uncertainty in Al, (1991), with A. Agogino.
Theses recently completed under Dr. Paasch's direction are: Daniel Mittelstadt, "Application of a Bayesian Network to Integrated Circuit Testor Analysis," M.S. Thesis, 1994; Srinivas Puligilla, "Simulation of Impact Using



Five-Axis Machining Center

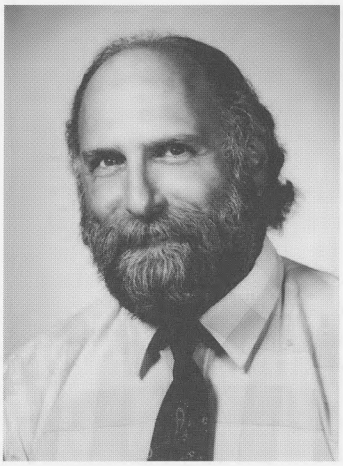
Finite Elements: A Finite Element Model of a Tomato," M.S. Thesis, 1994; Brian Wong, "Diagnosability Analysis for Mechanical Systems and Human Factor in Diagnosability," M.S.Thesis, 1994; Kevin Swier, "Reuse Workstation: Vacuum Control Chasis Design and Qualification Testing," M.S. Thesis, 1993; Garrett Clark, "Diagnostic Modeling and Diagnosability Evaluation of Mechanical Systems," M.S. Thesis, 1993.
Dr. Paasch's research is supported by NSF, Boeing and Hewlett Packard.



Component Measurement on the CNC Coordinate Measuring Machine

William F. Reiter, Jr.
Professor
Design and Manufacturing

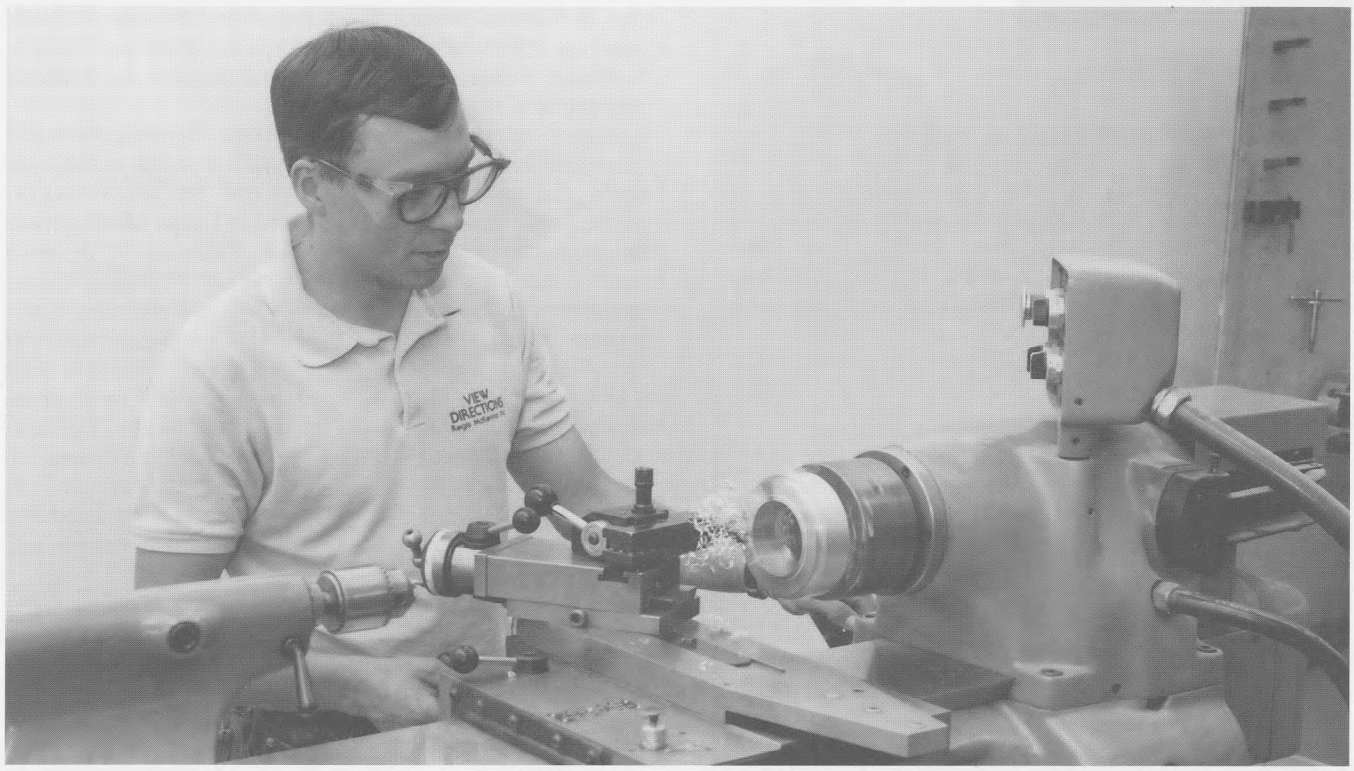
B.S. 1961, Mechanical Engineering, Rutgers University; M.S. 1966, Mechanical Engineering, Auburn University; Ph.D. 1973, Mechanical Engineering, North Carolina State University.
General Electric Company, 1961; Auburn University, 66-69; North Carolina State University 72-82; International Business Machines Corporation 1983-1992. The Boeing Company 1993.
At OSU since 1993
Office: Rogers 214
Telephone: 737-7035
Current research interests include CAD, applications of geometric dimensioning and tolerancing, computer aided tolerance analysis and synthesis, computer based metrology, numerical control machining processes, statistical process control and in-process machine inspection.
Member ASME, Sigma Xi, North Carolina State University Outstanding Teaching Award, 1981. Research activity has been supported by USDOT, textile and furniture industries of North Carolina.



David G. Ullman
Professor
Machine Design, Computer Aided Design

B.S. 1968, M.S. 1970, University of Cincinnati; Ph.D. 1978, Ohio State University.
The David Taylor Model Basin, 1965-70; Air Force Flight Dynamics Lab, 1970-72; Battelle Memorial Institute, 1972-74; Union College, 1978-82; Oxygen Enrichment Co., 1982-84.
At OSU since 1984.
Office: Rogers 212
Telephone: 737-2336

Current research interests of Dr. Ullman include the study of design methods, the use of computers to support the design process and the design of human powered vehicles.
Organizer and first chairman of the ASME Design Theory and Methodology Committee.
Received DOW Outstanding Young Faculty Award 1978, the Austin/Paul Engineering Faculty Award, 1989. ASME Fellow, 1994.
Author of *The Mechanical Design Process*, McGraw Hill (1992), *Mechanical Design Failure Analysis*, Marcel Dekker (1986). Recent technical publications include, "Computer Support for Design Team Decisions," (1995), "A Taxonomy for Engineering Decision Support Systems," (1995), "The Design Capture System: Capturing Back-of-the-Envelope Sketches," (1990), "A Taxonomy for the Mechanical Design Process," (1990), "The Information Requests of Mechanical Design Engineers," (1990), "The Evolution of Commitments in the Design of a Component," (1990), "The Importance of Drawing in the Mechanical Design Process," (1990), "Optimal Design of Traction Drive Continuously Variable Transmissions," (1989), "A Model of the Mechanical Design Process Based on Empirical Data," (1988).
Current projects include decision support tools, the capturing and browsing of design histories, sketch interpretations, the design of bicycles and other mechanical devices, and understanding the cognitive abilities of human designers.
Dr. Ullman's research is supported by NSF and major corporations.



The Design/Manufacturing Interface: Students Manufacturing Components

RESEARCH IN MECHANICS

Activities in this area can be placed into two groups: Solid Mechanics and Dynamics and Controls.

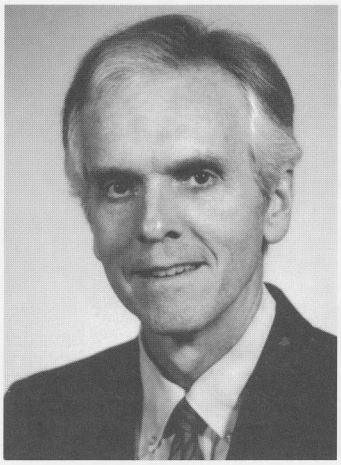
SOLID MECHANICS

Current research activities in solid mechanics include an analytical and experimental investigation of fracture characteristics of advanced composites, and creep studies of aircraft structural composites at high temperature. In addition, experimental studies are in progress dealing with laser-induced ultrasonics with applications to large metal structures and composites, noncontact optical instrumentation for ultrasonic detection, development of embedded sensors for composite "smart" structures, health monitoring of composites, cutting force measurement in finger joints, and various impact and dynamic behavior studies in sports mechanics.

The department has two principal laboratories which support experimental mechanics research. The experimental stress analysis laboratory is fully equipped to support research requiring strain gages, photoelasticity, brittle lacquer, and ultrasonics work. The laser applications laboratory contains a 2-Joule, Q-pulsed ruby laser, various CW lasers to 2 Watts, high-speed digital data acquisition instrumentation including modern digital oscilloscopes, and a large isolation table with a wide range of optical detectors and components.

Clarence A. Calder
Professor
Applied and Experimental Mechanics

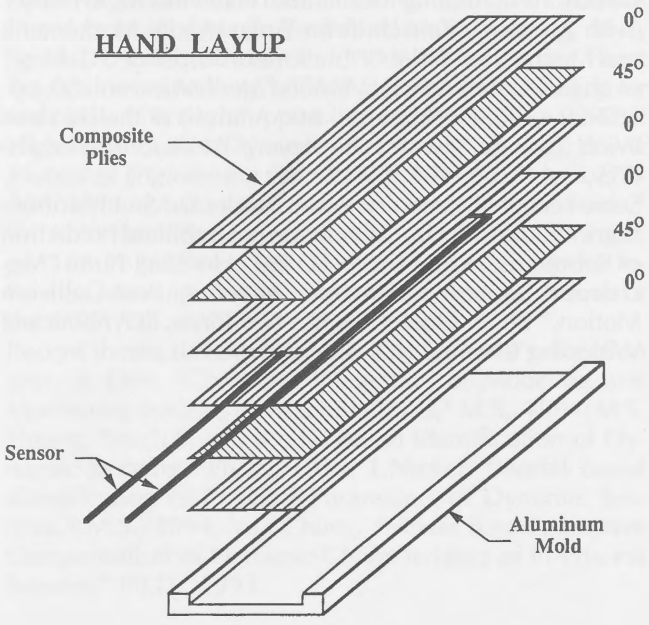
B.S.M.E. 1960, Oregon State University; M.S. 1962, Brigham Young University; Ph.D. 1969, University of California--Berkeley.
Sandia Corporation, 1962-64; Washington State University, 1969-74; Lawrence Livermore National Laboratory, 1974-78.
At OSU since 1978.
Office: Rogers 312
Telephone: 737-2427
Current research interests of Dr. Calder include laser induced ultrasonics with applications to large metal structures and graphite-epoxy composites, development of embedded sensors in composites with application to "smart" materials and health monitoring, cutting force effects on quality of finger joints in wood, and studies in sports mechanics including impact behavior, dynamic properties of fibers, and shock absorption performance of sports shoes.
President, Society for Experimental Mechanics, 1987-88. Tatnal Award, Society for Experimental Mechanics, 1982. Listed in Who's Who in the West, Who's Who in Frontier Science and Technology, Men of Achievement, and Who's Who in Engineering. Invited Lecturer, University of Mexico Annual Conference in Mechanical Engineering, 1990. Reviewer for Experimental Mechanics, National Science Foundation and Journal of Applied Mechanics.
Selected recent publications include: "Laser Generated Rayleigh Waves in Graphite/Epoxy Composites," (with H. Park), *Experimental Mechanics*, Vol. 34, pp. 148-154, 1994. "Noncontact Ultrasonics for Large Metal Structures," (with H. Park and D. Hiatt), *Titanium 92 Science and Technology*, pp. 2819-2826, 1992. "Vibration Measurement in Composite Members Using Embedded Constantan Wire," (with T. Salzano), *J. of Intelligent Material Systems and Structures*, Vol. 3, #3, pp. 536-546, July 1992. "Instrumenting an Exercise Treadmill for Evaluation of Vertical Ground Reaction Forces," (with L. Johnson and G. Smith), *Proceedings 1993 SEM Spring Conference on Experimental Mechanics*, pp. 988-998. "Wood Cutting Force Measurements in Finger Joints," *Proceedings 1992 Spring Conference on Experimental Mechanics*, pp. 1289-1294.
Recent theses under Dr. Calder's Supervision include: Bruce Sandmeyer, "Simulation of Bat/Ball Impact Using Finite Element Analysis, M.S. project, 1994; Robert Melendy, "Noncontact Measurement of Shaft Torsional Displacements by Optical Means," M.S. Thesis, 1994; Chris Jenkins, "Transient Nonlinear Deformations of Viscoelastic Membranes:, Ph.D. Thesis, 1991; Heeyong Park, "A Study of Laser Generated Rayleigh and Lamb Waves in Graphite/Epoxy Composites," Ph.D. Thesis, 1991.



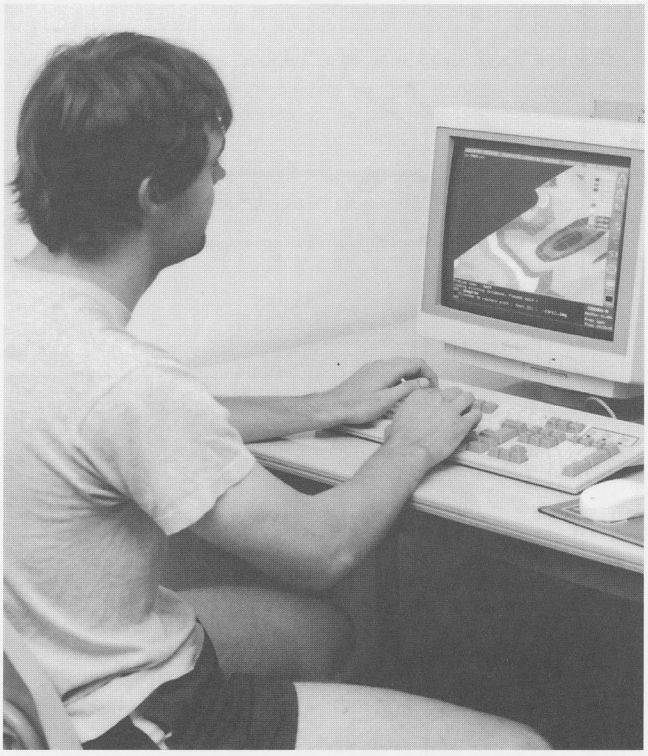
Timothy C. Kennedy
Professor
Solid Mechanics

B.S. 1968, SUNY at Buffalo; M.S. 1969, Ph.D. 1972, Stanford University.
Northwestern University 1972-73; Stanford Research Inst. 1973-76.
At OSU since 1976.
Office: Rogers 412
Telephone: 737-2579

Current research interests of Dr. Kennedy include fracture mechanics, composite materials, finite element modeling, and applications of generalized continuum theories.
Member ASME Finite Element Technology Committee.
Pi Tau Sigma Outstanding Teacher Award, 1987 and 1989.
Recent publications include "Micromechanics of Composite Materials Under Compressive Loading,: (with G. Laird), *Engineering Fracture Mechanics*, (1995). "Micromechanics of Imperfect Interfaces in Heterogeneous Materials," (with G. Laird) *Composites*, Vol. 25, pp. 593-603 (1994). "Three-Dimensional, Nonlinear Viscoelastic Analysis of Laminated Composites," (with M. Wang), *Journal of Composite Materials*, Vol. 28, pp. 902-925 (1994). "Three-Dimensional Analysis of Cracks in a Ceramic Composite," *Finite Elements in Analysis and Design*, Vol. 13, pp. 237-248 (1993). "Dynamic Analysis of Cracks in Micropolar Elastic Materials," *Engineering Fracture Mechanics*, Vol. 44, pp. 207-216 (1993).
Some recent theses developed under Dr. Kennedy's direction are: G. Laird, "Micromechanics of Heterogeneous Materials Under Compressive Loading," Ph.D. Thesis (1993); M. Wang, "Three-Dimensional, Nonlinear Viscoelastic Analysis of Laminated Composites: A Finite Element Approach," Ph.D. Thesis (1993).
Dr. Kennedy's research is supported by NASA.



Imbedded Sensor in Composite Laminate

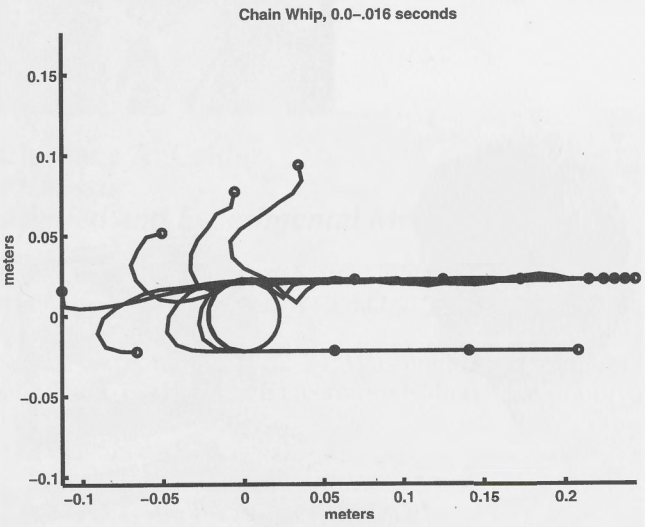


Finite Element Analysis of a Damaged Aircrfaft Fuselage

DYNAMICS & CONTROLS

Studies currently in progress include: (1) the dynamics of post-failure whipping of saw chains, and of the energy transformations induced by collisions within mechanical systems, (2) predictive, adaptive, and optimal control of mechanical systems, (3) self-tuning and fault-tolerant sensors, (4) application of multi-computer, parallel processing systems and artificial intelligence to automatic supervision of dynamic systems. Continuing development of a code for predicting dynamic response of wind turbines is currently focusing on the effects of higher modes of blade flexing.

Available equipment includes computer-aided data acquisition, signal processing and control systems, industrial controllers, sensors and actuators for mechanical quantities, and software/hardware development facilities for multi-computer and AI systems.



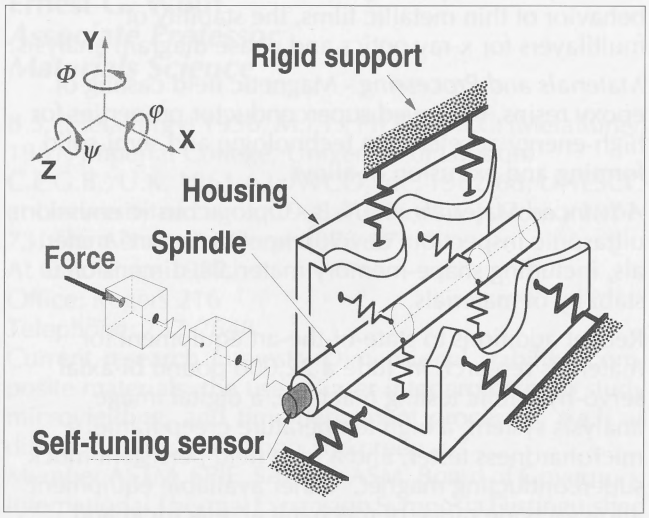
Whip of a Broken Chain on a Chainsaw

Charles E. Smith
Professor
Applied Mechanics

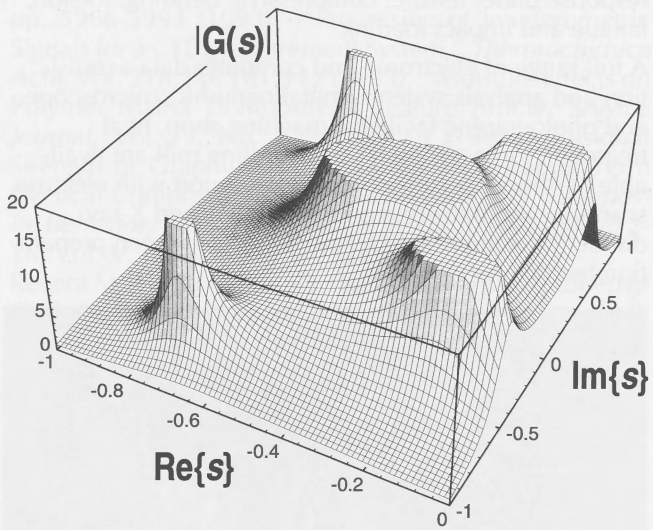
B.S. 1955, Oregon State College; M.S. 1958, Rensselaer Polytechnic Institute; Ph.D. 1961, Stanford University.
Pratt & Whitney Aircraft Co. 1955-59, Martin Co. 1963.
At OSU since 1961.
Office: Rogers 316
Telephone: 737-7018
Current research interest of Dr. Smith include dynamics of mechanical systems, kinematics, kinetics of robots and collision mechanics.
Outstanding Professor (Award by Pi Tau Sigma), 1972-73.
Author of *Applied Mechanics* (1st Ed. 1976, 2nd Ed. 1982). Recent technical publications include, " Coefficients of Restitution," *ASME J. Applied Mechanics*, (1992)."Predicting Rebounds Using Rigid Body Dynamics," ASME J. Applied Mechanics, (1991). "When is the Directions of Angular Momentum Fixed in a Rigid Body," (with J. Casey), Zeitschrift fur Angewandte Mathematik und Mechanik (1986). "Vibrations of Suspended Cables," (with J.G. Gale), *ASME J. Applied Mechanics*, vol. 50, pp. 687-89, (1983). "An Aeroelastic Analysis of the Darrieus Wind Turbine," (with E.A. Meyer), *AIAA Journal of Energy*, vol. 7, pp. 491-97 (1983).
Some recent projects completed under Dr. Smith's direction include: P.P. Liu, "Validation of Simplified Prediction of Rebounds," Ph.D. Project (1991);Ho-Sung Aum, "Mechanical System Parameters Affecting Post-Collision Motion," Ph.D. Project (1992); Ken Jones, "Dynamics of Whipping Chains," M.S. Project (1995).

Swavik A. Spiewak
Assistant Professor
Dynamics & Controls

M.S. 1970, Ph.D. 1980, Warsaw Technical University, Poland.
Warsaw Technological University 1980-82; University of Birmingham, UK, Research Fellow 1982-84; University of Wisconsin-Madison 1984-91, 1993-94; University of Calgary, Canada, 1992.
At OSU since 1994.
Office: Rogers 210
Telephone: 737-7012
Current research interests include predictive monitoring and control, system identification, optimal control, stochastic systems, nontraditional sensors, and multi-computer parallel processing system. Member of CIRP, ASME, and SME.
Recent publications include "Acceleration Based Indirect Force Measurement in Metal Cutting Processes," *International Journal of Mach. Tools and Manufacturing*, 35/1, pp. 1-17, 1995. "Analytical Modeling of Cutting Point Trajectories in Milling," *ASME Journal of Engineering for Ind.*, Vol. 116, No. 4, pp. 440-448, 1994. "A Model of High Performance Dynamometer," (with Chung), *ASME Journal of Engineering for Ind.*, Vol. 116, No. 3, pp. 279-288, 1994. "Automated Supervision of Machine Tools," in "Automated Supervision in Manufacturing," Springer, pp. 163-187, 1994. "Instrumented Milling Cutter for In-Process Measurement of Spindle Error Motion," Annals of the CIRP, Vol. 41/1, pp. 429-432, 1992.
Recent theses developed under Dr. Spiewak's direction are: S. Dye, "Computer Integration of Modeling and Monitoring Systems for Machine Tools," M.S., 1994; M.S. Huang, "High Speed Model Based Identification of Dynamic Systems," Ph.D., 1994; T.Nickel, "Model Based Identification of Physical Parameters of Dynamic Systems," M.S., 1994; Y.L. Chung, "Model Based Adaptive Compensation of Dynamic Characteristics of In-Process Sensors," Ph.D., 1993.



Lumped-Parameter Model of a Machine Tool Spindle



Visualization of the Spindle Dynamics

RESEARCH IN MATERIALS

Much of the materials research in progress is of interdisciplinary nature. Topics include:

Composite Materials - Thermal cycling effects on metal matrix composites, moisture expansion with polymer matrices, CK and creep recovery of graphite/epoxy laminates.

Superconducting Materials - Properties of metallic and ceramic superconductors, electromagnetic and microstructural characterization of Nb-Ti and Nb3Sn based composites, dimensional changes at the critical temperature, fracture and mechanical properties of metal matrix superconducting composites.

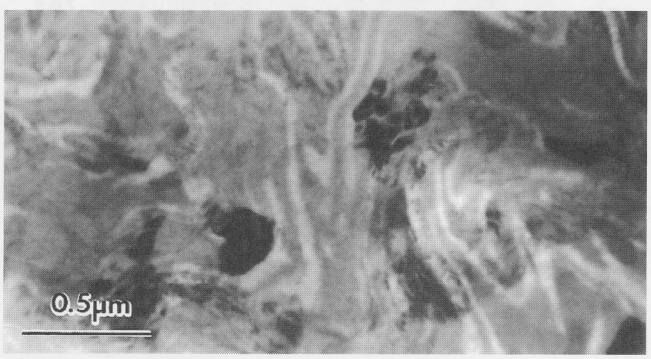
Metallurgy - Creep and thermal-mechanical processing of aerospace alloys, fatigue of metals, mechanical behavior of thin metallic films, the stability of multilayers for x-ray optics and phase diagram analysis.

Materials and Processing - Magnetic field casting of epoxy resins, improved superconductor properties for high-energy acceleration technology, and semi-solid forming and extrusion of alloys.

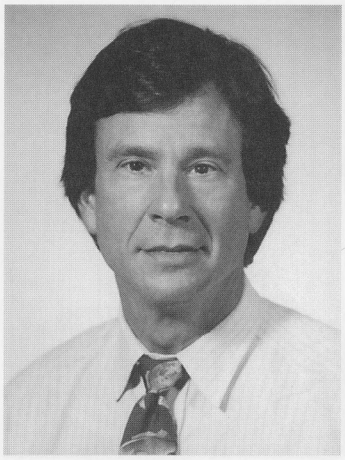
Advanced Materials Analysis - Opto,acoustic emission, ultrasonic inspection, development of "smart" materials, including shape-memory materials, dimensional stability of materials.

Recent additions to state-of-the-art equipment for materials research include a 22,000 pound bi-axial servo-hydraulic testing machine, a digital image analysis system, a high temperature creep frame, a microhardness tester, and a high field persistent mock superconducting magnet. Other available equipment allows a wide range of mechanical, electrical and thermophysical properties to be determined, including angstrom resolution thermal and moisture expansion, cryogenic electromagnet properties, and mechanical response under tensile, compressive, bending, torsion, fatigue and impact loading.

A full range of electronic and computer data acquisition and analysis systems, metallographic, microscope and photographic facilities, machine shop, heat treatment furnaces, and a small rolling mill are available. Other departments provide support with electron scanning and transmission microscopy and X-ray diffraction equipment and advanced specimen preparation techniques.

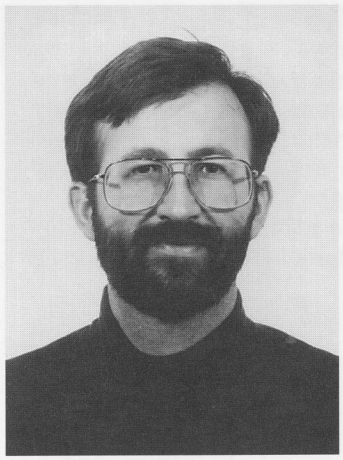


Electron Micrograph of a Nb-Ti Wire Composite



M. E. Kassner
Professor
Materials Science

B.S. (Materials Science), 1972, Northwestern
M.S. 1979, Ph.D. 1981 (Materials Science), Stanford University.
Lawrence Livermore National Laboratory 1981-1990.
At OSU since 1990.
Office: Rogers 414
Telephone: 737-7023
Current research includes metal plasticity, creep, fatigue fracture, phase diagrams, and semi-solid forming.
Member ASM, TMS, MRS, ASME.
Board of Review Metallurgical Transactions, Contributing Editor ASM/NIST Data Program for Alloy Phase Diagrams, Associate Editor Materials Letters, Fulbright Senior Scholar, Member of the TMS Mechanical Behavior Committee and ASM Thermodynamics and Phase Diagram Committee.
Recent Publications: "The Effect of Primary Alpha, Nickel and Chromium on the Creep Properties of Ti 6242, *Metall. Trans. 24A*, 1993, pp. 1819-1826. "The Role of Low Angle (Subgrain Boundary) and High Angle (Grain Boundary) Interfaces on 5- and 3-Power Law Creep," *Mater. Sci. and Eng. 166*, 1993, pp. 81-88. "The Effect of Homogenization and Precipitation Treatments on the Extrudability and Ambient-Temperature Mechanical Properties of Aluminum Alloy AA2024," *Mater. Sci. and Eng. A169*, 1993, pp. 9-17. "The Impact of Surface Processing on the Fabrication and Performance of Thin-Film, Multilayer Solar Collectors," *Critical Rev. in Surface Chemistry 3*, 1993, pp. 67-80. "Kinetics of Interlayer Growth and Changes in Residual Elastic Strain During Annealing of Mo/Si Multilayers," *Nano. Mater. 3*, 1993, pp. 195-202. "Silicide Layer Growth Rates in Mo/Si Multilayers," *Appl. Optics 32*, 1993, pp. 6975-6980. "Ductile Fracture in Pure Silver under High Triaxial Stresses," *Scripta Metall. et Mater. 31*, 1994, pp. 531-536. "Restoration Mechanisms in Large-Strain Deformation of High Purity Aluminum at Ambient-Temperature, and the Determination of the Existence of "Steady State," *Acta Metall. Mater. 42*. 1994, pp. 3223-3230. Research efforts supported by NSF, AFOSR, DOE, ASM, Northwest Aluminum, Teledyne Wah Chang.



William H. Warnes
Associate Professor
Materials Science/Applied Superconductivity

M.S. 1981, M.S. 1983, Ph.D. 1986; University of Wisconsin-Madison.
Post-doctoral Research, Physics Department, Oregon State University, 1986-87; Private Consulting, 1986-87.
At OSU since 1986.
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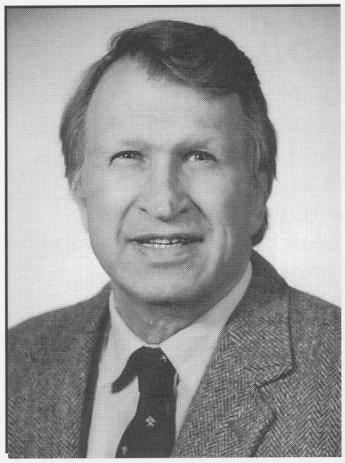
Current research interests include microstructure/properties relationship in superconductors, properties measurements of ceramic and metallic superconductors, critical field and critical current density of composite superconductors.
Member American Physical Society; Sigma X; The Scientific Research Society; ASM International; The Minerals Metals and Materials Society.
Recent technical publications include "Extended Range Low Temperature Small Sample Calorimetry," (with L. Wolochuck) *Adv. in Cryogenic Engineering*. vol. 39, 1089, Plenum Press, NY (1994). "Mechanics of Nb-Ti Superconductors," (with Z. Guo) *Adv. in Cryogenic Engineering*, vol. 40, 823, Plenum Press, NY (1994). "Filament Area Variations and Critical Current in Nb-Ti Superconducting Composites," (with G. Narang), *Adv. in Cryogenic Engineering*, vol. 40, 741, Plenum Press, NY (1994). "Evaluation of Cu: SC Ration Measurements by Chemical Etching, Electrical Resistivity, and Image Analysis," (with T. Pyon), *IEEE Trans. Applied Superconductivity*, 3(1), 1269, (1993).
Recent theses developed under Dr. Warnes' direction are: Zhiqiang Guo, "Mechanics of Nb_Ti Superconducting Composites," Ph.D. Thesis (1994); Ranjit Kurup, "Measurement of Variability of Coefficient of Friction of Veneer Dryer Roller Bearings at Varying Loads and Temperatures," M.S. Project (1994); Lee Wolochuck, "Extended Range Low Temperature Small Sample Calorimetry," M.S. Thesis (1993).



Ernest G. Wolff
Associate Professor
Materials Science

B.S. (Metallurgy) 1956, M.I.T.; Ph.D., D.I.C. (Metallurgy) 1961, Imperial College, University of London.
C.E.G.B., U.K. 1961-62; AVCO, Inc. 1962-68; UNESCO at University of Lagos, 1968-70; Northrop Corp., 1971-73; The Aerospace Corp. 1973-87.
At OSU since 1987.
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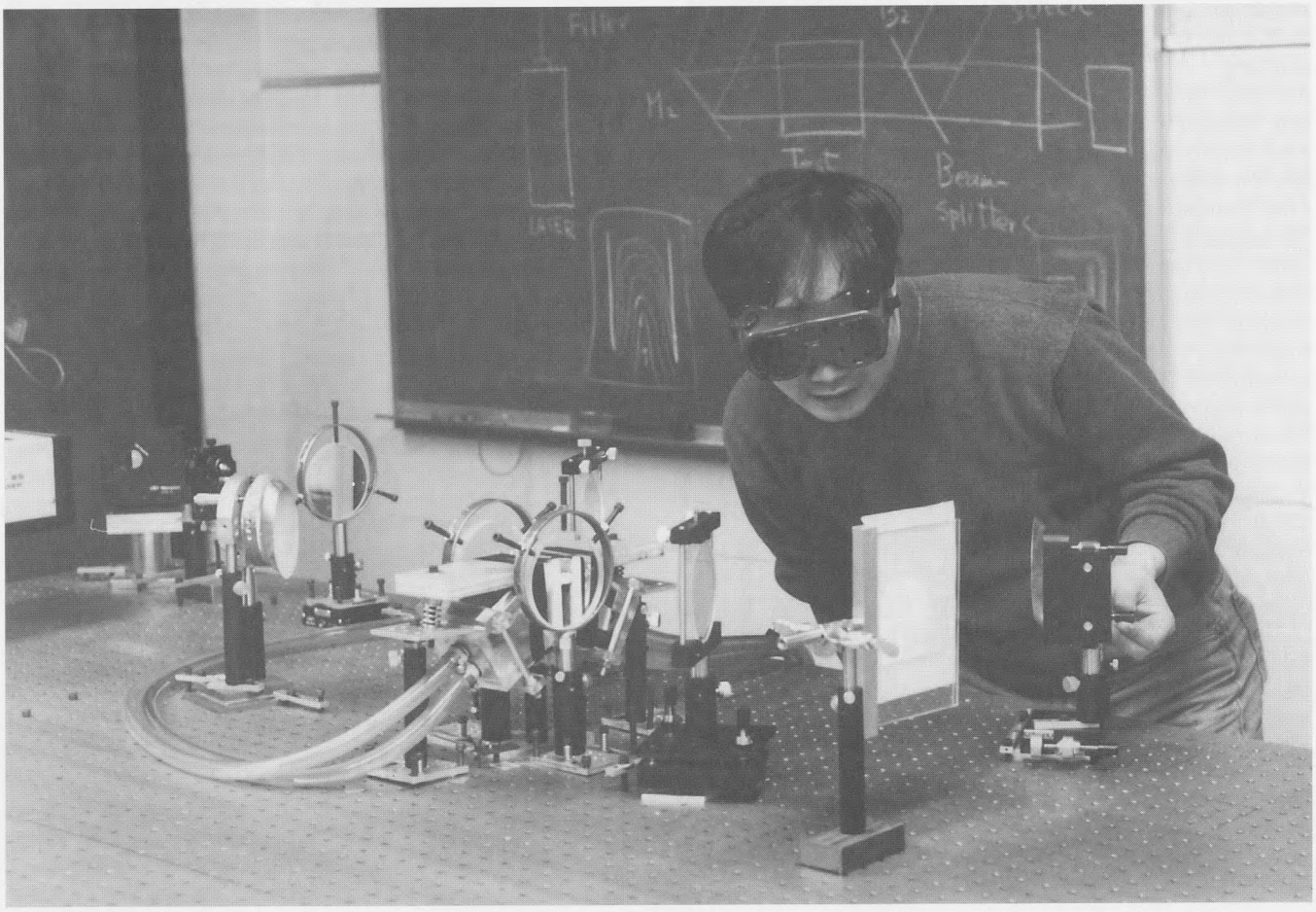
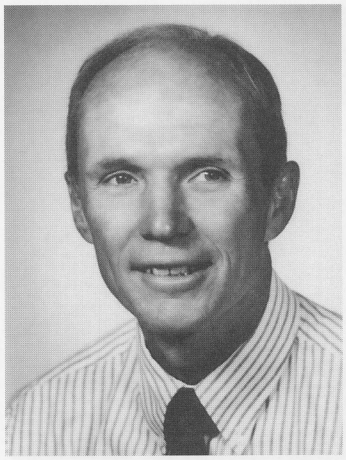
Current research interests: Dimensional stability, composite materials, the use of laser interferometry to study microyielding, and time-dependent processes, such as diffusion, stress relaxation and creep.
Member ASTM, SPIE, SAMPE, ASM, Board of Governors, International Thermal Expansion Symposia Distinguished Lecturer, NASA-VPI Series on Composites, American Men and Women in Science.
Recent Publications include "Strain-Rate Sensitivity Index of Thermoplastics," *Journal of Materials Science*, Vol. 28, pp. 5986-5994 (1993). "Processing of Interferometric Signals for a CTE Measurement System," *Thermochimica Acta*. Vol. 218, pp. 101-112 (1993). "Moisture Effects on Polymer Matrix Composites," Feature Article, *SAMPE Journal*, Vol 29, No. 3, pp. 11-19 (1993). "Residual Strength of Graphite/BMI Composites after Long Term Cyclical Compression," *Proceedings ICCM/9 "Composite Behavior,"* Editor A. Miravete, Madrid, Spain, July 12-16, Vol. V, pp. 524-531 (1993).
Recent M.S. Theses/Projects: Sanjeev R. Tyagi, "Creep of Gr/BMI Composite Laminates in Compression," M.S. Thesis, 1994. Perumal Sarangabany, "Polyurethane Impregnated Kevlar 29 Fabric for Coal Transport Railcars," M.S. Thesis, 1994. Krishnananda Shenoy, "Residual Strength Properties of Gr/BMI Composite Laminates after Constant/Cyclic Compression," M.S. Thesis, 1993. Gwo-Sheng Peng, "Processing of LaserInterferometric Signals for Small Displacement Measurements," Ph.D. Thesis, 1992.
Dr. Wolff's research is funded by companies such as Boeing, Gunderson, Blount and Kumatsu.

RESEARCH IN ENERGY AND TRANSPORT PHENOMENA

The broad research area of Energy and Transport Phenomena includes the traditional topics of thermodynamics, heat transfer, and fluid mechanics, as well as interdisciplinary topics such as combustion and biomass conversion. The faculty in this area are involved with the study of basic phenomena and the application of engineering principles to existing processes. Current research projects include heat transfer in fluidized beds; Lorentz-enhanced combustion; natural convection in vertical channels; radiative surface property measurement; wind turbine dynamics; inkjet printer dynamics; fluid dynamics of metal casting; modeling of heat transfer in electronic devices; heat and mass transfer in manufacturing processes; energy systems evaluation; and characterization of biomass fuels.

There are numerous special facilities available for use in engery and transport phenomena research, supplementing the department's well-equipped mechanical and instrumentation shops. Laboratory facilities include two internal combustion engine laboratories; combustion test facilities for alternative fuels; a heat pump refrigeration laboratory; a high-temperature two-dimensional fluidized bed; several low-speed wind tunnels, one with a 4 x 5 foot cross-section; a high-temperature materials synthesis facility; and a 2 x 3 x 40 foot variable-speed water towing channel. Special instrumentation includes a sensitive Mach-Zehnder interferometer facility for natural convection studies; an instrumented flow loop for non-Newtonian studies; a dual column gas chomatograph; a variety of lasers, including an Ar-ion laser; a scanning monochromator; and a bi-dierctional reflectometer for radiative surface property measurements.





Dwight J. Bushnell
Professor
Thermal Sciences

B.S. 1967, M.S. 1968, University of Utah; Ph.D. 1974, Brigham Young University.
Hercules, Inc. 1968-69; Biologics 1969-71; University of Missouri-Rolla 1974-76.
At OSU since 1976.
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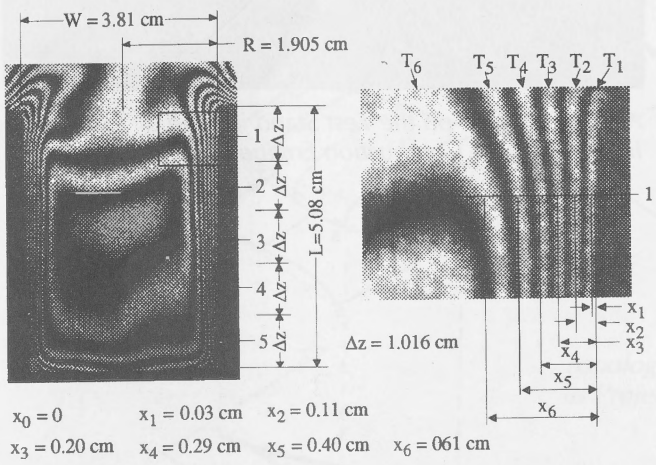
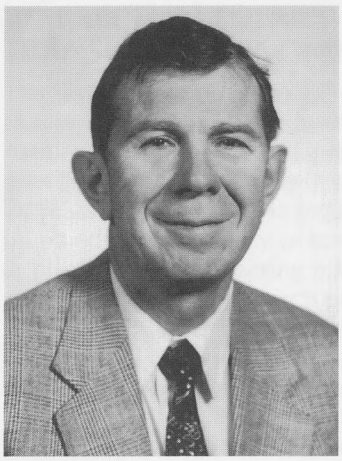
Current research interests of Dr. Bushnell include analysis and design of biomass fueled power plants, cooling of electronic components, IC engines testing and fuels evaluation, waste energy utilization.
Burlington Resources Foundation Faculty Achievement Award. Pi Tau Sigma Outstanding Teacher Award, SAE's Ralph R. Teetor Educator's Award, ASEE Western Electric Fund Excellence in Teaching Award, Carter Award for outstanding teaching, 1986, Austin Paul Award, 1987.
Recent technical publications include: "An Experimental Investigation of Wood Combustion," (with A. Dadkhah-Nikoo), *ASME Journal of Energy Research Technology*, Vol. 116, pp. 186-193, (1994). "Estimating Cogeneration Feasibility: A Computer Model," (with J.E. Simonds and G.M. Wheeler), *Forest Products Journal*, Vol. 42, No. 9, September 1992. "An Experimental Study of Free Convection Heat Transfer from an Array of Horizontal Cylinders Parallel to a Vertical Wall," (with T.R. Al-Lusi), *ASME Journal of Heat Transfer*, Vol. 114, pp. 394-400, May 1992. "Natural Convection Liquid Cooling of Heated Protrusions Simulating Plat-Mounted Electronic Packages for Parallel Vertical PCBs," (with S.K. Park), presented at the International Conference on Computer Applications in Industry and Engineering, Honolulu, HI, December 15-17, 1993. "Testing and Evaluating the Combustion Characteristics of Waste Fuels," (with J. Canova), *Proceedings of the 5th Annual National Biofuels Conference and Exhibition*, Newton, MA, October 19-22, 1992.
Some recent theses developed under Dr. Bushnell's direction are: Sung Kwan Park, "Numerical Analysis of Liquid Cooling by Natural Convection for Heated Protrusions Simulating Vertical Plate-Mounted Electronic Components Facing an Opposing Plate," Ph.D. Thesis, (1993); Abbas Dadkhah-Nikoo, "Experimental Investigation of Wood Combustion and Combustion Profiles in a Cylindrical Combustion Chamber," Ph.D. Thesis (1991); Thamir R. Al-Alusi, "An Experimental Study of Convection Heat TransferFrom a Horizontal Cylinder Array Vertically Aligned to and Confined by a Single Wall and Two Walls," Ph.D. Thesis (1990); John E. Simonds, "Computer Model for Estimating Cogeneration System Performance and Economic Feasibility," M.S. Thesis (1990).
Dr. Bushnell's research efforts have been supported by such agencies as USDA, NSF, DOE and BPA.



Above and Left: Mach-Zehnder Interferometric Study of Heat Transfer Rates for Natural Convection in an Open Channel



Lorin R. Davis
Professor
Fluid Mechanics and Heat Transfer

B.A. 1958, B.E.S.M.E. 1969, Brigham Young University; M.S. 1961, Purdue University; Ph.D. 1964, University of Illinois.
San Jose State University 1964-69.
At OSU since 1969.
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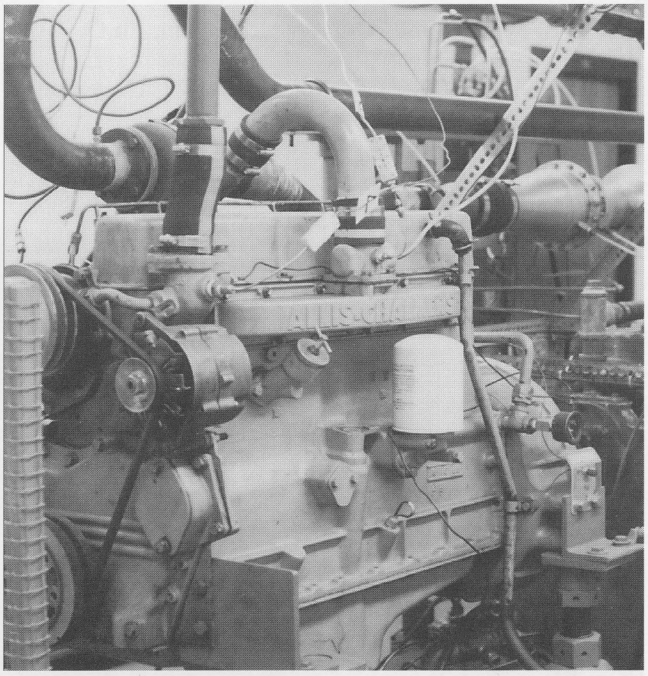
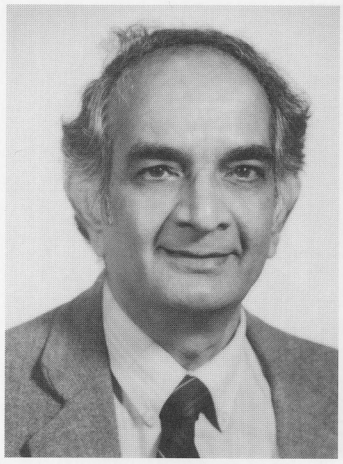
Telephone: 737-7017
Recent technical publication of Dr. Davis include: "EPA Computer Models for Mixing Zone Analysis,: *Proceedings of the 59th Annual Conference of the Pacific Northwest Pollution Control Association,* Boise, ID, October 1992. "An Experimental/Analytical Investigation of Buoyant Jets in Shallow Water," (with E. Hsiao), *First International Symposium on the Measurement and Modeling of Environmental Flows,* ASME, November 1992. "A Review of Buoyant Plume Modeling," Heat and *Mass Transfer in Frost and Ice, Packed Beds, and Environmental Discharges,* ASME HTD-Vol. 139, June 1990.
Current research interest include turbulent jet mixing, plumes and wakes, plume prediction, fluid transients, heat transfer in magnetic fluids and turbulence in metal casting.
Member of the ASME K-19 Heat Transfer Committee, member of the ASME Committee on Fluid Transients, Chairman of professional development in local chapter of ASME.
Outstanding Teacher, San Jose State University, 1968.
Some recent theses developed under Dr. Davis direction are: John Buckingham, "An Experimental Study on the Use of Inclusion Trapping Devices for Investment Casting," M.S. Thesis (1992); John H. Poland, "A Computer Imaging Method for Fluid Motion Studies in Metal Casting," M.S. Thesis (1993); Entsung Hsiao, "An Experimental/Analytical Investigation of Buoyang Jets in Shallow Water," Ph.D. Thesis (1990); DeQian Wang, "Thermophysical and Temperature Response in Surimi-Measurements and Modeling," Ph.D. Thesis (1990).



A Diesel Engine on the Test Stand in One of Two Internal Engine Combustion Engine Laboratories



A. Murty Kanury
Professor
Combustion

B.E. 1961, Andhra University; M.S. 1963, Ph.D. 1968, University of Minnesota.
F.M. Research Corp., 1969-73; SRI, 1973-75; University of Notre Dame 1975-84.
At OSU since 1985.
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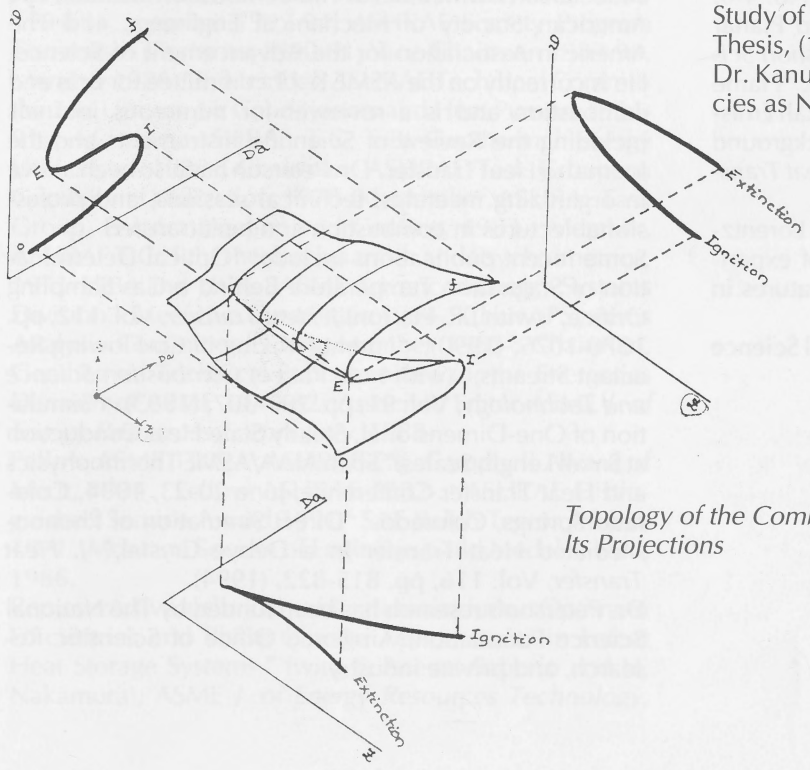
Current research interests of Dr. Kanury's include modeling of fires and furnaces, flame structure, combustion heat transfer, solid and liquid particle burning, combustion synthesis and competition of physics and chemistry in combustion systems.

Member, Editorial Board, Fire Safety Journal, 1979-.
Outstanding Teacher, Notre Dame College of Engineering, 1980; Western Electric Fund Award, ASEE, 1982; Notre Dame Aero/Mech Engineering Faculty Award, 1983. Pi Tau Sigma Outstanding Professor of the Year in Mech. Engr. at OSU, 1989.
Author of *Introduction to Combustion Phenomena*, Gordon and Breach, 1975. Recent technical publications include, "Chemical Reactions in a Transient Natural Convective Boundary Layer," (with P.D. Gandhi), pp. 208-232 in *Dynamics of Reactive Systems*, Vol. 105 of AIAA progress in Astronautics and Aeronautics, (1986). "Ignition of Liquid Fuels," Chapter 20 in *SFPE Handbook of Fire Protection Engineering*, (1988). "Flaming Ignition of Solid Fuels," Chapter 21 in *SFPE Handbook of Fire Protection Engineering*, (1988). "An Experimental Investigation of Combustive Synthesis of Titanium Carbide," (with A. Hernandez-Guerrero and Z. Huque), In Press *Combustion Science and Technology*, vol. 81, pp. 115-128, (1992). "Burning of Liquid Fuel Surfaces," pp. 175-200 in *Heat Release and Fire,* (V. Babrauskas and S.J. Grayson, Editors), Elsevier, (1992). "A Theoretical Analysis of Combustive Systhesis of Titanium Carbide," (with Z. Huque), *Comb. Sci. and Tech.*, vol. 89, pp. 27-46, (1993). "A Kinetic Model for Metal + Nonmental Reactions," *TMS Met. Trans.*, vol. 23A, pp. 2349-2356, (1992). "Combustion Characteristics of Biomass Fuels," Comb. Sci. and *Tech.*, vol. 97, pp. 469-491, (1994).
Some recent theses developed under Dr. Kanury's direction are: P.D. Gandhi, "A Theoretical Study of Radiant Ignition of Vertical Solid Fuel Elements," Ph.D. Thesis, (1984); A. Hernandez-Guerrero, "Evaporation of Water into Air-Steam Mixture Flows," M.S. Thesis, (1987); Z. Huque, "A Theoretical andExperimental Study of Self-Propagating High-Temperature Synthesis of Titanium Carbide," Ph.D. Thesis, (1991); D. Ko, "A Numerical Study of Solid Fuel Combustion in a Moving Bed," Ph.D. Thesis, (1994).
Dr. Kanury's research efforts are supported by such agencies as NBS, NSF, NAS and NASA.



Topology of the Combustion Catastrophe Surface and Its Projections

Heidi Pattee
Assistant Professor
Computational Heat Transfer, Combustion

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Exxon Company, USA 1979-1982.
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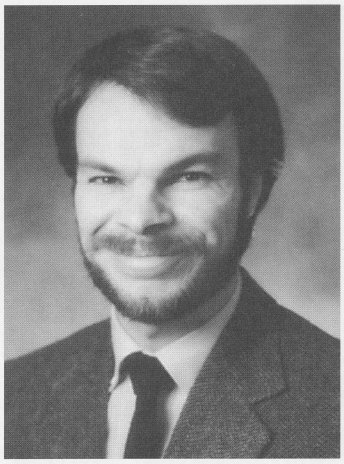
Research interests of Dr. Pattee include numerical and experimental investigation of combustion ehancement, computational fluid dynamics and heat transfer, and scientific visualization.
Recent technical publications include "Lorentz Mixing of Co-Flowing Reactant Streams," (with R.B. Peterson) *Combustion Science and Technology*, Vol. 91, No. 4-6, (1993). "Electrical Discharges Through Seeded Planar Diffusion Flames," (with R.B. Peterson) *Combustion Science and Technology,* Vol. 92, No. 4-6, (1993). "Flame Temperature Measurement by Monitoring an Alkali Emission Doublet Exposed to a Selectivity Filtered Background Source," (with R.B. Peterson) *ASME Journal of Heat Transfer,* Vol. 114, No. 3, (1992).
Current projects include numerical modeling of Lorentz-enhanced diffusion flames and development of experimental techniques for measuring flame temperatures in regions with steep gradients.
Dr. Pattee's research is supported by the National Science Foundation.



Richard B. Peterson
Associate Professor
Combustion Research

B.S. 1979, University of Nevada-Reno; M.S. 1982, Ph.D. 1984, University of California-Berkeley.
Post-doctoral position 1984-85, NRC/NSF Research Associate at BRL, Aberdeen, MD.
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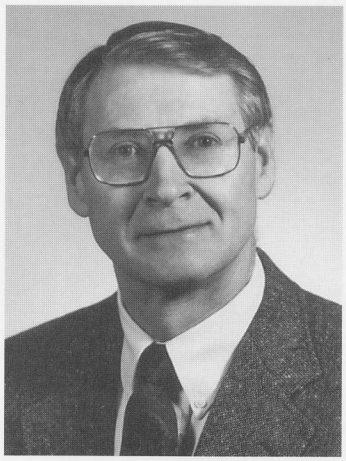
Research interest of Dr. Peterson include combustion diagnostics, modeling of chemical and physical combustion and heat transfer processes, development of techniques for modeling microscale heat transfer, energy conversion devices, and cooling of electronic components.
Dr. Peterson is a member of The Combustion Institute, The American Society of Mechanical Engineers, and The American Association for the Advancement of Science. He is currently on the ASME K-11 committee for fires and combustion and is a reviewer for numerous journals including the Review of Scientific Instruments and the Journal of Heat Transfer. Dr. Peterson has also been active in organizing meetings, technical sessions, and professional lectures in combustion and heat transfer.
Some recent publications include: "Optical Determination of Stagnation Temperature Behind a Gas Sampling Orifice," (with J.R. Herron) *J. Heat Transfer,* Vol. 112, pp. 1070-1075, (1990). "Lorentz Mixing of Co-Flowing Reactant Streams," (with H.A. Pattee) *Combustion Science and Technology*, Vol. 91, pp. 297-307, (1993). "Simulation of One-Dimensional, Steady State Heat Conduction at Small Length Scales," Sixth AIAA/ASME Thermophysics and Heat Transfer Conference, June 20-23, 1994, Colorado Springs, Colorado. "Direct Simulation of Phonon-Mediated Heat Transfer in a Debye Crystal," *J. Heat Transfer,* Vol. 116, pp. 815-822, (1994).
Dr. Peterson's research has been funded by The National Science Foundation, Air Force Office of Scientific Research, and private industry.



Gordon M. Reistad
Professor and Head
Thermodynamics/Energy

B.S. 1966, Montana State University; M.S. 1967, Ph.D. 1970, University of Wisconsin.
Bonneville Power Administration, 1975; Lawrence Livermore Laboratory, 1974; Shell Oil Company, 1966; Standard Oil Company, 1965.
At OSU since 1970.
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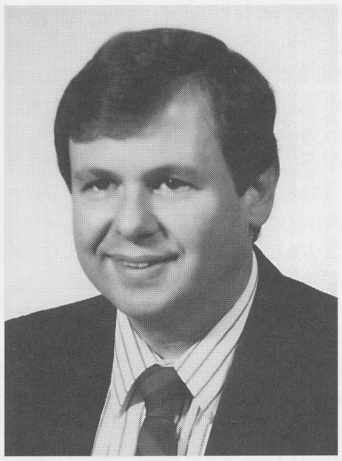
Telephone: 737-3441
Current research interests of Dr. Reistad include general and second-law thermodynamic analysis of energy systems; heat pump system improvement and optimization; heat transfer, frost, and ice formation associated with heat pump systems.
ASHRAE Research & Technical committee, Vice Chair 1994-95, member 1992-94; ASHRAE Society Program Committee Chairman 1990-91, Vice-Chairman 1989-90, Member 1986-89; Member, ASHRAE Technical Committee 7.6, Unitary Air Conditioners and Heat Pumps, 1984-91; Member, ASHRAE T.C. 6.8, Geothermal Energy Utilization, 1980-; Chairman, ASHRAE Task Group on Geothermal Utilization, 1978-80; Member, ASHRAE Task Group, District Heating and Cooling, 1983-; Member, ASHRAE T.C. 1.1, Thermodynamics and Psychrometrics, 1971-1984 and 1986-; ASME Advanced Energy Systems Division - Executive Committee 1994-, Chair of Systems Analysis Committee, 1991, Member 1985-; Chairman, Geothermal Technical Subcommittee for the Energetics Division of ASME 1980-82; Associate Editor ASME *J. of Energy Resources Technology*, 1988-.
Fellow ASME 1989-. ASHRAE E.K. Campbell Award of Merit, 1994. Fellow ASHRAE 1992-. ASHRAE Distinguished Service Award 1991. SAE Ralph Teetor Award, 1971. Montana Society of Engineers Gold Medal Award, 1966.
Representative technical publications include, "Optimum Efficiencies and Phase Change Temperatures in Latent Heat Storage Systems," (with S. Aceves-Saborio and H. Nakamura), ASME *J. of Energy Resources Technology*, Vol. 116, No. 1, pp. 79-86, March (1994). "Analytical and Numerical Results for the Deicing of Ice-Maker Evaporators," (with S. Aceves-Saborio), *ASHRAE Transactions*, Vol. 98, Pt. 1, pp. 514-524 (1992). *Thermodynamics and Energy Systems - Fundamentals, Education and Computer Aided Analysis*, AES-Vol. 24, G.M. Reistad, R.A. Gaggioli, A. Bejan, and G. Tsatsaronis, eds., ASME, New York, 1991. *Second Law Analysis - Industrial and Environmental Applications*, AES-Vol. 25/HTD-Vol. 191, G.M. Reistad, M.J. Moran, W.J. Wepfer, and N. Lior, eds., ASME, New York, 1991. "Irreversibility and Thermoeconomics Based Design Optimization of a Ceramic Heat Exchanger," (with J. Ranasinghe and S. Aceves-Saborio), ASME, *J. Engineering for Power and Gas Turbines*, Vol. 111, No. 4, pp. 719-727 (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, pp.366-374 (1989); "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, pp. 29-36 (1989).
Dr. Reistad's research efforts have been supported by private industry, DOE, BPA, USDA, and USDI.



Stel N. Walker
Assistant Professor
Fluid Mechanics

B.S. (Aerospace Engr.) 1970, Ph.D. 1976, Oregon State University.
U.S. Air Force 1970-1972; Oregon State University 1976-77; Aero Vironment, Inc. 1977-79; Pacific Wind Energy, Inc. 1980-90.
At OSU 1976-77 and since 1984.
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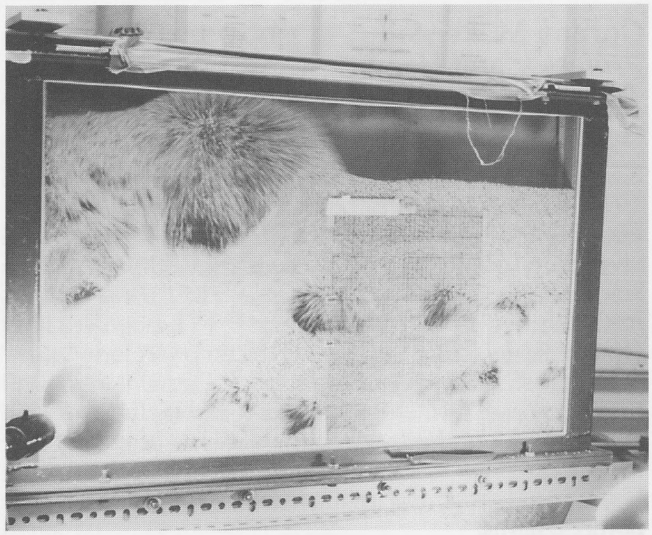
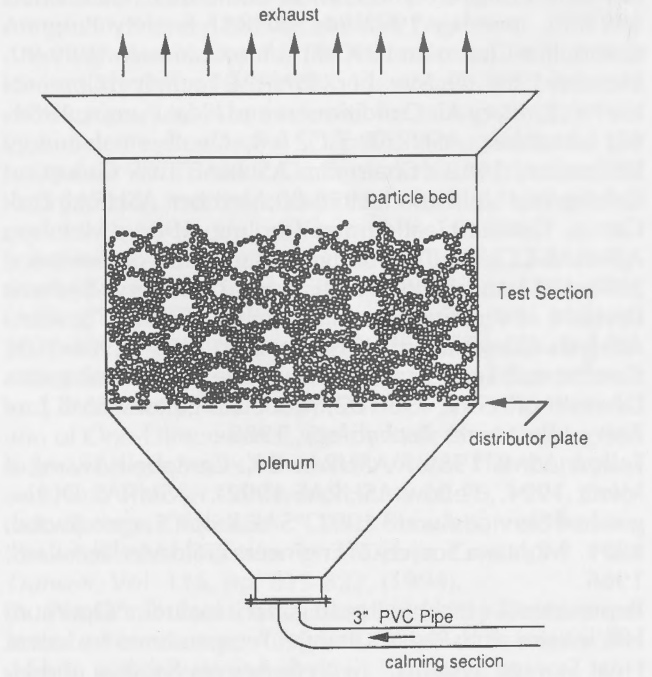
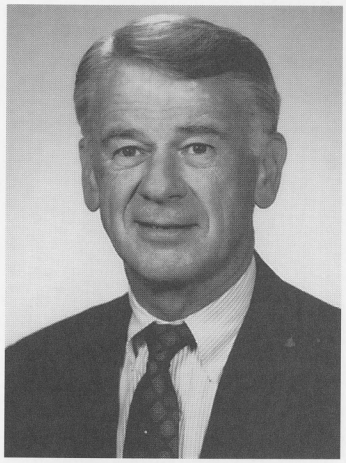
Current research interests of Dr. Walker include wind turbine aerodynamics, wind turbine siting, transmission line rating, wind energy forecasting and integration.
Recent technical publications of Dr. Walker include "User's Manual for the Advanced Dynamics Code (FAST-3)-Three-bladed Rigid Hub," (with R.E. Wilson and L.N. Freeman), *National Renewable Energy Laboratory*, Contract XF-1-11009-1 Mod 4, OSU/NREL Report 94-03, August 1994. "Identification of the Circulation Patterns Associated with Extreme Winds," (with P.L. Barbour), *OSU Wind Research Cooperative*, WRC Report 94-02, July 1994. "Risked Based Transmission Line Rating Methodology Development-Final Report," (with P.L. Barbour), 2 Vols., *Bonneville Power Administration*, BPA Report No. 93-06(a), Aug 1993. "Local Flow Measurements for Micrositry," (with J.E. Wade), Final Report, *Solar Energy Research Institute*, Contract DE-FC02-86CH10251, PWE Report 87-823, January 1988.
Dr. Walker's current research is supported by National Renewable Energy Laboratory, Bonneville Power Administration, Kenetech Windpower, FloWind, Inc., Zond Systems, Inc.; Eugene Water and Electric Board, Idaho Power, Pacific Power, Portland General Electric, Puget Sound Power & Light, and Oregon Department of Energy.





A Low-Temperature Two-Dimensional Bed for Visualization of Fluidization Processes



James R. Welty
Professor
Heat Transfer, Fluid Mechanics

B.S. 1954, M.S. 1959, (Mechanical Engineering) Oregon State University; Ph.D. 1962, (Chemical Engineering) Oregon State University.
At OSU since 1958.
Office: Rogers 322
Telephone: 737-4902

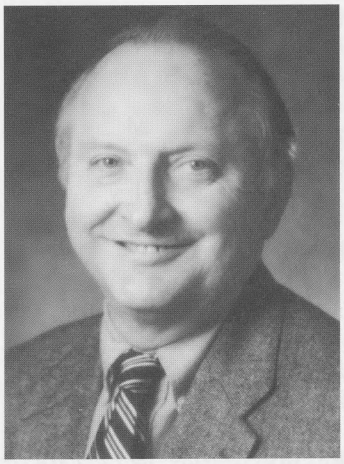
A Fellow of the American Society of Mechanical Engineers (ASME); Dr. Welty has been involved in a wide variety of professionally-related activities, principally through ASME, currently serving as ASME Vice President for Professional Development. He has also served as Chairman of the ASME Heat Transfer Division and Chair of the national committee of ASME Department Heads. Dr. Welty has received the ASME *Centennial Medallion,* the ASME *Dedicated Service Award,* and was the 1990 recipient of the ASME *Church Award* for "Noteworthy contributions to engineering Education." He has received the OSU *Carter Award* for teaching excellence, and has twice been voted the outstanding teacher in the Mechanical Engineering Department. Dr. Welty received the College of Engineering *Research Award* in 1993, the College of Engineering *Alumni Professor Award* in 1994, and the Oregon State University Alumni Association *Distinguished Professor Award* in 1994. His research areas of interest currently include fluidized bed heat transfer, radiation through arrays of discrete surfaces, microscale fluid mechanics and a variety of numerical heat transfer studies.

An area of current activity is aimed at identifying and quantifying short time-scale hydrodynamic phenomena which are thought to be the controlling heat transfer effects between fluidized beds and internal surfaces. The discrete-surface problem is one of the major unresolved concerns in describing radiant energy transport in such diverse applications as solar receivers, furnaces, clouds, fibrous insulation, and ceramic fabrics. This effort is presently supported by the U.S. Department of Energy, Office of Basic Energy Sciences. The research in Microscale fluid mechanics, sponsored by Tektronix Inc., is aimed at identifying fundamental fluid mechanical effects related to ink-jet printing technology.

Author of *Engineering Heat Transfer,* John Wiley, 1974 and 1978; principal author of *Fundamentals of Momentum, Heat and Mass Transfer* (with C.E. Wicks and R.E. Wilson), John Wiley, 1969, (Third Edition,1984). Recent publications include "Use of and Optical Probe to Characterize Bubble Behavior in Gas-Solid Fluidized Beds," *AIChE Journal,* 1995 (with M.E. Mainland). "Laminar Natural Convection in Vertical Tubes with One End Open to a Large Reservoir - A Numerical Solution," *Numerical Heat Transfer,* 1994 (with Y. Wu). "Splash-Zone Heat Transfer in Bubbling Fluidized Beds - An Experimental Study of Bed Temperature Effects," Proceedings of the 6th International Symposium on Transport Phenomena in Thermal Engineering, Seoul, Korea, May 1993; *Experimental Thermal and Fluid Science,* 1994 (with D.W. Pidwerbecki). "Incorporation of Polarization Effects in Monte Carlo Simulations of Radiative Heat Transfer," *Numerical Heat Transfer,* 1994, (with L. Chaomei, B.J. Palmer and M.K. Drost). "Monte Carlo Simulation of Radiation Heat Transfer in Arrays of Fixed Discrete Surfaces using Cell-to-Cell Photon Transport," *International Journal of Heat and Mass Transfer,* 1994 (with B.J. Palmer and M.K. Drost). "A Monte Carlo Simulation of Radiation Heat Transfer From an Infinite Plate to Parallel Rows of Infinitely Long Tubes - Hottel Extended," *International Journal of Heat and Mass Transfer,* 1995, (with D.L. Qualey and M.K. Drost). "Measurement and Use of Bidirectional Reflectance," *International Journal of Heat and Mass Transfer,* 1995, (with J.R. Zaworski and M.K. Drost).

Some recent theses completed under Dr. Welty's direction include: S-H Hong, "Monte Carlo Simulation of Radiation Heat Transfer in a Three-Dimensional Enclosure Containing a Circular Cylinder," M.S. Thesis (1994); D.L. Qualey, "Radiation From an Infinite Plane to Parallel Rows of Infinitely Long Tubes - Hottel Extended," M.S. Thesis (1994); J.R. Zaworski, "Experimental and Analytical Characterization of Bidirectional Reflectance Data for Engineering Materials," Ph.D. Thesis (1994); P.J. Coven, "Solid/Liquid Phase Change in Small Passageways: A Numerical Model," M.S. Thesis (1994); D. Pidwerbecki, "Heat Transfer in the Splash-Zone of a High Temperature Fluidized Bed," Ph.D. Thesis (1994).

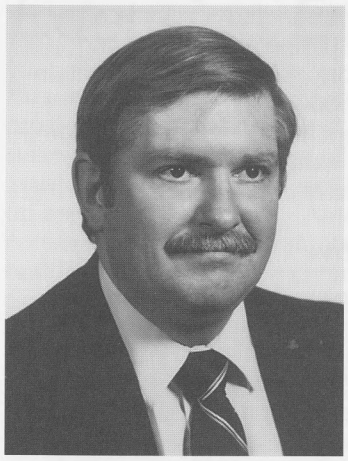
Dr. Welty's current research efforts are supported by the U.S. Department of Energy and Tektronix Inc. Previous support has included Battelle, EPA, DOA, AEC and ERDA.



Robert E. Wilson
Professor
Fluid Mechanics

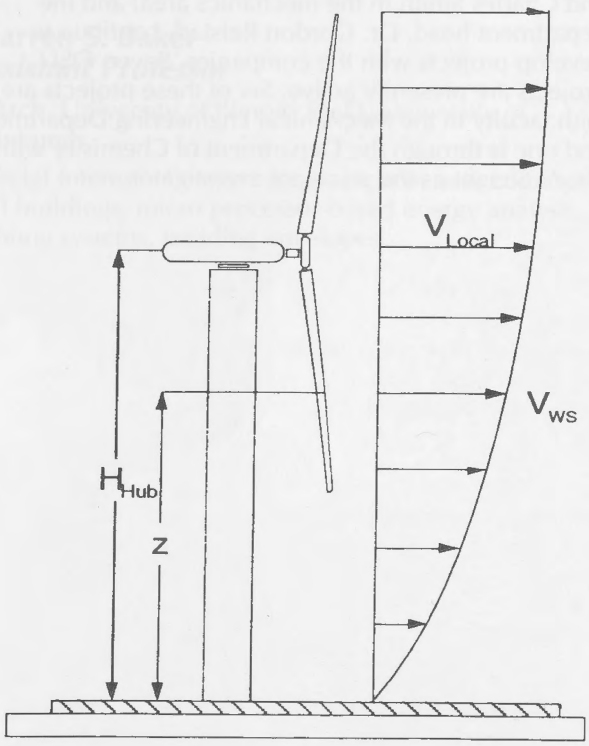
B.S. 1955, Oregon State College; M.S. 1956, University of Illinois; Ph.D. 1963, Oregon State University.
Rocketdyne 1956-57; Oregon State College, 1957-61; Aerospace Corporation 1962-63; Visiting Professor, Stanford 1969; Lecturer, USC, 1962-63; University of Colorado, 1974.
At OSU since 1957.
Office: Rogers 410
Telephone: 737-2218
Current research interests of Dr. Wilson include rotor aerodynamics and turbulence-induced rotor loads.
ASME Wind Energy Conversion Committee 1983 - to date; General Chairman Fourth ASME Wind Energy Symposium, Dallas, TX, 1985; Member ASME Power Test Code Committee PTC-42, 1980 - to date.
Outstanding Teacher Award, Pi Tau Sigma (OSU) 1974. OSU College of Engineering Annual Research Award, 1986. ASME Fellow, 1994.
Co-author of *Fundamentals of Momentum, Heat and Mass Transfer,* Wiley, 1969, 76, 84. Recent technical publications include "A Comparison of Wind Turbulence Simulation Models for Stochastic Loads Analysis for Horizontal-Axis Wind Turbines," (with S.N. Walker and T.L. Weber), Solar Energy Research Institute report SERI/STR-217-3463, DE89009442, Golden, CO, June 1989. "Mode Shapes for Wind Turbine Vibration Analysis," (with J.R. Hartin), *Journal of Solar Energy Engineering,* May 1990. "Load Response of Horizontal-Axis Wind Turbines to Turbulence," (with S.N. Walker, J.R. Hartin and T.L. Weber), Solar Energy Research Institute report SERI/TP-257-3891, DE90000375, Golden, CO, September 1990. "Turbulence Induced Loads on a Teetered Rotor," (with T.L. Weber and S.N. Walker), Report to SERI, January 1991. "User's Manual for the DRT Code," (with T.L. Weber and S.N. Walker), Report to SERI, January 1991.
Recent thesis under Dr. Wilson's direction are: T. Weber, "Turbulence Induced Load on a Teetered Rotor," (Ph.D.); J. Hartin, "Transient Response of Rotor Loads to Turbulence," (Ph.D.).

Dr. Wilson's current research is supported by the National Renewable Energy Laboratory. Previous contracts and grants have been obtained from NSF, ERDA, DOE, SANDIA and NASA.



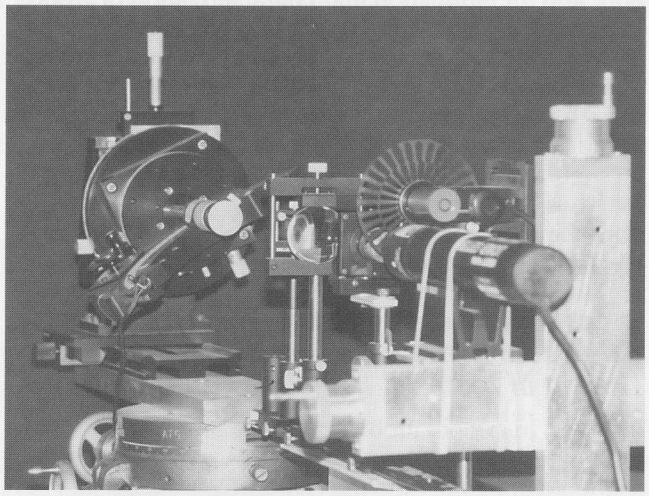
Joseph R. Zaworski
Assistant Professor
Instrumentation, Thermal Sciences

B.Sc. 1972, M.S. 1976, Ph.D. 1994, Oregon State University
Bechtel Corporation 1969-1973; Pacific Power & Light 1975-1977; Endex Data Acquisition Systems, Inc. 1978-1985; Battelle, Pacific Northwest Laboratory 1986-1987.
At OSU since 1987.
Office: Rogers 418
Telephone: 737-7024



Above and Left: Modeling the Effect on Wind Turbines of the Planetary Boundary Layer and Wind Shear

Research interests of Dr. Zaworski focus on basic instrumentation, measurement systems, and experimental techniques. Specific interests include the measurement of properties in thermal and fluid processes, and the development of both micro-sensors and techniques for micro-scale experiments.
Recent technical publications include "Experimental Validation of a Monte Carlo Model for Radiative Heat Transfer," (with J.R. Welty, M.K. Drost, B.J. Palmer), *Radiative Heat Transfer-Theory and Applications*, ASME-HTD-Vol. 244, A.M. Smith and S.H. Chan, eds., (1993). "Measurement Techniques for Bi-directional Reflectance of Engineering Materials," (with J.R. Welty, M.K. Drost), *Proceedings of the Eleventh Symposium on Energy Engineering Sciences*, U.S. DOE Report CONF-9305134, (1993). "Research Needs for Heating/Cooling Cost Allocation Systems," (with D.R. Goettling), *Proceedings, ASHRAE Annual Meeting (*1989).



A Four-Axis Goniometer Used for Measurement of Bidirectional Reflectance of Engineering Materials

SOME MULTIDISCIPLINARY AREAS OF RESEARCH

Many of the research projects engage investigators not only within mechanical engineering but also from other departments and disciplines. Such interdisciplinary work is prominent in the following studies.

Center for Advanced Materials Research

The Center for Advanced Materials Research was established in 1986 to strengthen research and education in the properties, synthesis, and understanding of new materials. At OSU materials science is an interdisciplinary program spanning nine departments in the Colleges of Engineering, Forestry, and Science. More than fifty faculty members and about 100 graduate students who comprise the Center receive $6.3 million in external support for their research activities. Major facilities include laboratories for molecularbeam epitaxy, x-ray diffraction, electrical device characterization, and for fabrication and characterization of wood composites. Areas of research are often interdisciplinary and may include collaboration with several investigators. For example, Conversion of Waste Silicon into Thin Film Composite Solar Cell is the subject of an interdisciplinary research program that is studying the incorporation of silicon sawdust waste into a macrodefect-free cement (MDFC) and, with suitable fiber reinforcement for strength and surface coatings for electrical leads, converting this into solar cell panels.

Industry/University Center of Competency for the Engineering and Design of Material Handling Equipment

Industry, in cooperation with the Mechanical Engineering Department (ME) and the Industrial and Manufacturing Engineering Department (IME), has established an interdisciplinary collaborative research effort on material handling equipment products and processes. Faculty in both departments bring their research expertise to areas such as material flow, ergonomics, design processes, manufacturing processes, plant layout simulation, intelligent sensors, machine vision, structural mechanics, systems integration, and systems dynamics and controls to address relevant industry research problems in the broad area of material handling equipment and process design. The Pacific Northwest is headquarters for some of the world's leading materials handling companies. Eaton Kenway, Hyster-Yale (NACCO), Cascade Corporation, Brudi, and several smaller companies in the area manufacture industrial vehicles and their components. Freightliner, Paccar, Columbia Machine, Lambs Grey Harbor, Gunderson, Boeing, Wagner Mining, Hewlett Packard, and Aero-Go are examples of Northwest Manufacturers who are major users, designers, or builders of material handling equipment. The opportunities and potential for industry/university cooperative applied research projects with these companies is extensive. Examples of research projects include: vehicle ergonomics for enhanced ease of operation safety and performance; design of more efficient, more maintainable, and interchangeable power trains in lines of industrial vehicles; and benchmarking and developing more efficient design and manufacturing processes through aggressive practice of concurrent engineering.

Oregon Metals Initiative

The department participates in the Oregon Metals Initiative (OMI), a cooperative research program with the mission of improving the long-term competitive position of the Oregon Metals Industry. The OMI exists to develop new technologies and new applications of existing technologies while increasing the metals research capacity, accessibility, and infrastructure in Oregon. The OMI, founded in 1990, is a coalition of state and federal governments, public and private research institutions, and private metals companies within Oregon. The participating research institutions include Oregon State University, the Oregon Graduate Institute, Linfield Research Institute, and the U.S. Bureau of Mines in Albany:

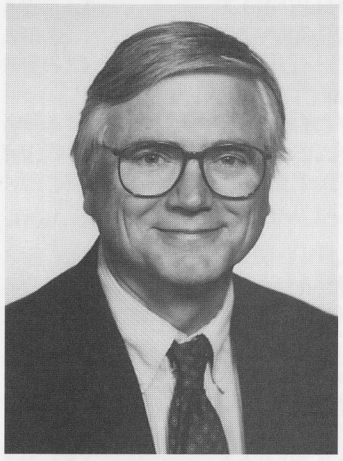
The OMI is an example of how OSU, other research institutions, private industry, and state and federal governments can effectively cooperate together to accomplish research of value for all of society.

The OSU effort in the OMI has been centered in the Mechanical Engineering Department where faculty (Drs. Michael Kassner, William Warnes, and Ernest Wolff in the materials area, and Drs. Clarence Calder and Charles Smith in the mechanics area) and the department head, Dr. Gordon Reistad, continue to develop projects with the companies. Seven OSU projects are presently active. Six of these projects are with faculty in the Mechanical Engineering Department and one is through the Department of Chemistry with Dr. A. Sleight as the principal investigator.

Extension Energy Program

Faculty of the Mechanical Engineering Department provide the management and technical support for a statewide program offering education and technical assistance to individuals, small businesses and industry, on energy-related issues. Areas of focus include energy conservation in new commercial and residential buildings, in industry, in commercial lighting and in processor-based energy analysis.

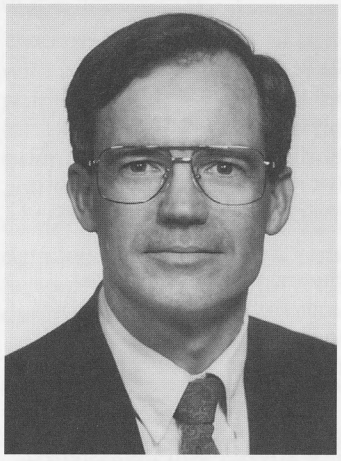
Activities include applied research on energy-related equipment, production of training tools on energy-related topics, and the delivery of training programs for professionals.



Warren S. Baker
Assistant Professor

B.Arch. University of Illinois; Ph.D. University of Edinburgh.

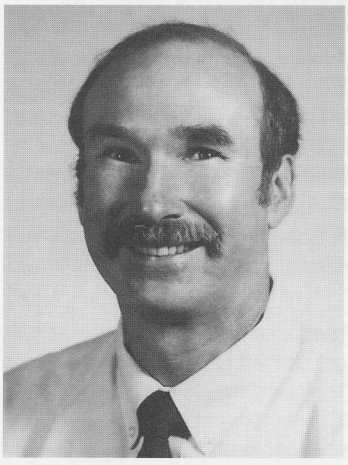
Special Interests: Energy conservation in new commercial buildings, micro processor-based energy analysis, lighting systems, building envelopes.



David Philbrick
Associate Professor

A.B. Brown University, Ph.D. University of California at Berkeley.

Special Interests: Program management, energy policy.



George M. Wheeler
Associate Professor

B.S. Massachusetts Institute of Technology, M.S. University of California at Berkeley; Ph.D University of California at Berkeley.

Special Interests: Commercial industrial energy use analysis, energy analysis software, heat recovery, HVAC systems, refrigeration, heat pumps, wood water heating, hydropower, windpower, photvoltaics.

Degree Requirements

M.S. DEGREE

A wide range of areas of study is available for the master's degree. Programs can be tailored to meet specialized or broad, industrial needs or to provide foundation for research and higher levels of study. In addition to study through formal courses, individual project and/or research constitutes a significant part of each program.

General requirements for the master's degree are detailed in the OSU Graduate Bulletin and in the handbook published by the Graduate School. Procedures carried out by the department are described below.

1. *Program of Study.* A major adviser will be assigned to each student to help in all matters of program planning. The faculty member directing the thesis or project work normally assumes this responsibility. An official program of study must be filed with the Graduate School before the end of the second term. This document is subject to the approval of the student's major and minor professors, the department head, and the dean of the Graduate School. In addition to meeting the requirements listed below, the various components of the proposed plan of study must form a coherent program.

2. *Undergraduate Background.* In addition to the capabilities developed through the graduate study program itself, a master's degree recipient is expected to have formal course work at the undergraduate level in each of the following areas:

- technical communications
- engineering mechanics
- electrical fundamentals
- thermodynamics
- metallurgy and materials
- fluid mechanics
- heat transfer
- mechanical laboratory
- design engineering

In cases where a student's undergraduate preparation was not taken through an accredited mechanical engineering program in the United States, he or she may be required to take some undergraduate courses in addition to those for the master's degree program.

3. *Minimum Number of Credits.* A minimum of 45 hours of graduate credit must be completed for the master's degree. Approximately 30 of these are designated in a major area and 15 in a supporting minor area.

4. *Core Course Requirements.* All M.S. degree programs must contain at least two of the following core courses:

ME 525	Continuum Mechanics
ME 552	Instrumentation
ME 575	Numerical Methods

5. *Major Course Requirements.* Graduate students planning to work toward the M.S. degree must select a major area. The four potential areas are identified as "Mechanics", "Thermal/Fluids", "Materials", and "Design". Within the chosen major area a minimum of 18 credit hours is required from one of the following four lists.

MECHANICS

Deformable Solids

ME 525	CONTINUUM MECHANICS
ME 526	ELASTICITY
ME 527	FRACTURE MECHANICS
ME 528	MECHANICS OF COMPOSITE STRUCTURES
ME 529	SELECTED TOPICS IN MECHANICS
ME 553	EXPERIMENTAL MECHANICS

Dynamics & Control

ME 514	SMART PRODUCTS DESIGN
ME 531	CONTROL SYSTEMS
ME 535,536	ADVANCED DYNAMICS
ME 537	VIBRATION ANALYSIS
ME 538	RANDOM VIBRATIONS
ME 539	SELECTED TOPICS IN DYNAMICS

THERMAL/FLUIDS

Fluid Mechanics

ME 560	INTERMEDIATE FLUID MECHANICS
ME 561	GAS DYNAMICS
ME 562,563	AERODYNAMICS
ME 565	INCOMPRESSIBLE FLUID MECHANICS
ME 566	VISCOUS FLOW
ME 567	COMPUTATIONAL FLUID DYNAMICS
ME 569	SELECTED TOPICS/FLUID MECHANICS

Heat Transfer

ME 546	CONVECTION HEAT TRANSFER
ME 547	CONDUCTION HEAT TRANSFER
ME 548	RADIATION HEAT TRANSFER
ME 549	SELECTED TOPICS/HEAT TRANSFER

Thermodynamics/Combustion

ME 545	COMBUSTION
ME 590	ADVANCED THERMODYNAMICS
ME 596	SELECTED TOPICS/THERMODYNAMICS
ME 597, 598,599	ADVANCED COMBUSTION

MATERIALS

Sciences (All Required)

ME 507M	MATERIALS SCIENCE SEMINAR

ME 581	PHYSICAL METALLURGY
ME 583	COMPOSITE MATERIALS
ME 588	STRUCTURE OF MATERIALS

Behavior & Utilization (6 Hours)

ME 580	MATERIALS SELECTION
ME 582	ADVANCED PHYSICAL METALLURGY
ME 584	FRACTURE/FATIGUE
ME 586	DIFFUSION, CREEP, AND OXIDATION
ME 587	CORROSION
ME 589	SELECTED TOPICS IN MATERIALS

DESIGN

Synthesis (9 Hours)

ME 512	KINEMATIC DESIGN OF LINKAGES
ME 513	COMPUTER AIDED DESIGN
ME 514	SMART PRODUCT DESIGN
ME 515	DESIGN OF ROBOTIC MANIPULATORS
ME 516	EXPERT SYSTEMS IN DESIGN
ME 517	OPTIMIZATION IN DESIGN
ME 519	SELECTED TOPICS IN DESIGN

Analysis (9 Hours)

ME 525	CONTINUUM MECHANICS
ME 535,536	ADVANCED DYNAMICS
ME 537	VIBRATION ANALYSIS
ME 575	NUMERICAL METHODS FOR ENGINEERING ANALYSIS
ME 531	CONTROL SYSTEMS
ME 553	EXPERIMENTAL MECHANICS
ME 583	COMPOSITE MATERIALS

6. *Thesis or Project Requirements.* Students may elect up to 8 hours of thesis as part of the 30 major credits. Plans for this option are to be made after mutual agreement with a faculty member upon a suitable thesis topic. In non-thesis programs, 3 to 5 credits of ME 501 (research) or ME 506 (projects) must be included. As with thesis, mutual agreement must be reached with a faculty member who will direct the work. A written report, signed by the directing faculty member, must be filed in the department office. All M.S. programs must include 1 credit of ME 507 (seminar). To receive this credit, the student must present an oral, departmental seminar on the results of the thesis or project work.

7. *Final Oral Examination.* A final oral examination is required of every candidate for the master's degree. The examining committee consists of members of the faculty in the major and a representative from a field not directly connected with the candidate's studies.

Ph.D. DEGREE

The degree of Doctor of Philosophy is awarded in recognition of achievement of a high level of competence in one of the special areas in the department. Study programs are designed to meet individual objectives. Typical programs allot two years (beyond the baccalaureate degree) of course work and approximately one academic year to the research and writing of the dissertation.

Throughout the period of candidacy, the student works with the major professor. A faculty committee appointed for each individual student has responsibility for approval of the study program, administration of examinations, and direction of the dissertation research and writing.

General requirements for the doctoral degree are detailed in the handbook published by the Graduate School. Procedures carried out by the department are described below.

1. Approval of Study. An M.S. student who wishes to continue his or her studies toward the Ph.D. degree must receive approval by the Department Graduate Committee. Application for this approval requires official GRE scores (both general test and subject test) and a letter of recommendation from the applicant's M.S. adviser. Students already at OSU must also obtain written agreement from at least one member of the graduate faculty indicating a willingness to serve as major professor. Forms for this step are available from the department.

2. Program of Study. The student's doctoral committee should be formed as soon as possible and a program of study filed with the Graduate School.

3. Departmental Preliminary Examination. A written preliminary examination is administered by the graduate committee each fall and spring quarter. This examination, based on the completed course work, is evaluated by the faculty members who submit the questions, and by the Graduate Committee. The committee may recommend failure, re-examination, or permission to take the University Preliminary Examination.

4. University Preliminary Examination. The examination is administered by the student's doctoral committee, with a representative from the OSU Graduate Council. This examination is at least partly oral and must be passed at least two terms before the final examination is taken.

5. Foreign Language Requirement. Competence in one or more foreign languages may be required by the doctoral committee, but no such requirement is made by the department or the University.

6. Final Examination. A final examination, involving defense of the thesis and administered by the doctoral committee, must be passed after the dissertation has been submitted.

7. Technical Paper Submission. Before departmental approval is given to the dissertation, a technical paper or note, based upon the work presented in the dissertation, must be submitted for consideration for publication in a refereed technical journal.

Admission, Expenses, and Financial Assistance

ADMISSIONS

Application forms required for admission to the Graduate School are available from the Office of Admissions, Oregon State University, Corvallis, Oregon 97331. The applicant will send (or arrange to have sent) to the Office of Admissions two copies of the application form, a $50.00 nonrefundable application fee, official sealed transcripts from each college or university attended, and a letter indicating the student's objectives and fields of interests. A third copy of the application form, transcripts, letter of interest, and three letters of reference addressed to the department should be sent directly to the Mechanical Engineering Department.

Students whose undergraduate degrees are from universities outside the United States should also send GRE examination scores (general test only). All students applying for admission to the Ph.D. program should send GRE examination scores (both general test and subject test) and a letter of reference from the major professor who supervised the master's degree work.

The minimum entrance requirements are as follows:

- Baccalaureate degree from an accredited college or university.
- Combined GPA of 3.00 on the last 90 hours of graded undergraduate work plus all work completed thereafter.
- Foreign Students: minimum score of 550 on the TOEFL exam.
- Foreign Students: financial clearance from the Office of International Education.

The department does not have the capacity to accommodate all applicants who meet the minimum admission requirements.

EXPENSES

Graduate tuition and fees for the 1994-95 academic year are $1,488 per term for Oregon residents and $2,376 per term for nonresidents. Room and board costs for residence halls on campus are approximately $3,500 for the academic year. Oregon State University also maintains furnished apartments for student families, with rentals starting at $220 per month.

FINANCIAL ASSISTANCE

Financial assistance is available for well-qualified students in the form of teaching assistantships, research assistantships, and fellowships.

A relatively large number of graduate students are appointed as graduate teaching assistants each year. Each student so appointed is expected to devote from 8 to 15 hours per week assisting in the instructional activities of the department. Instructional assistance may involve the direct responsibility for an undergraduate course or may include assisting a member of the faculty in whatever duties are appropriate. Graduate teaching assistants are appointed for the nine-month academic year. Stipend levels vary; however, all graduate teaching assistants receive tuition reduction amounting to over $7,000 and $4,000 per academic year for nonresident and resident students respectively.

Several research assistantships are also awarded each year. Graduate research assistants are supported to participate and contribute in funded research activities under the direction of one or more department faculty members. Research assistants are expected to devote a prescribed amount of time to these projects normally from 12 to 20 hours per week, depending upon the nature of a given appointment. Stipend rates vary; however, all graduate research assistants pay reduced tuition. Individuals who receive these appointments are often, but not always, students who have been in the department for a period of time so that their capability to contribute to funded research projects has been demonstrated.

Fellowships are available to graduate students on a limited basis, depending upon industrial and government funding levels. Students receiving fellowship awards receive full tuition plus a stipend. No commitments are imposed upon graduate fellows with regard to the nature of project activities.

Prospective graduate students who wish to be considered for financial aid should submit the third copy of the Graduate School application and all supporting information directly to the Department of Mechanical Engineering, Rogers Hall 204, Oregon State University, Corvallis, OR 97331. Financial assistance applications should be submitted by the middle of February preceding the start of the academic year in September. Notification of financial assistance awards is normally given around the middle of March preceding the start of a given academic year. Although financial aid awards usually are made at the times indicated, applications are entertained and awards made for individuals whose graduate work begins other than at the start of the fall quarter.

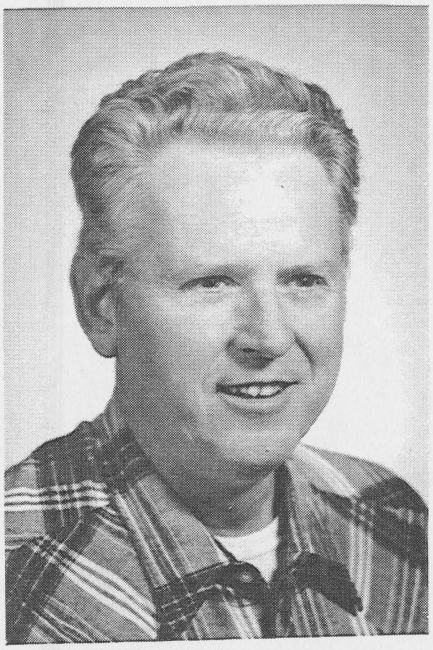
Oregon State University and the Department of Mechanical Engineering are affirmative action equal opportunity employers. Women and members of minority racial groups are particularly encouraged to apply. Some special financial aid is available for applicants in these categories .

PRESENT STAFF

DEBBIE JIMMERSON

Debbie Jimmerson is the office manager in Mechanical Engineering. She came to the department in December, 1989. Previously, she worked in the Provost's office, the Dean of Faculty's office, and the Affirmative Action Office at OSU. Before coming to OSU, Debbie worked several years for the Oregon Department of Forestry in the office and as fiscal officer on statewide fire teams. Her first job out of business school was with a consulting engineering firm in Eugene--she well remembers the blueprint machine in an ammonia-filled room! Debbie is a native Oregonian and graduated from South Eugene High School and Merritt-Davis Business School. She has served on the Professional Development Committee of the OSU Office Personnel Association, board member and newsletter editor for the OSU Management Association, and is currently chairing the OSU mentoring group for management service supervisors.

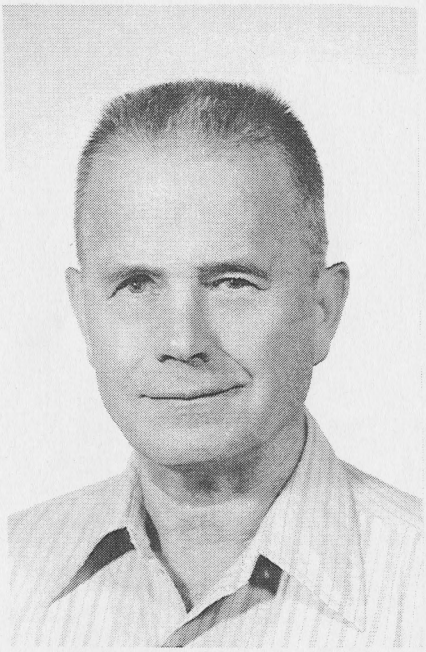
KEN McCRACKEN



Ken started in electronics at the age of 13, with the assistance of an old Army training manual. He took some electronics in high school, had an aborted attempt at college, then joined the Navy. He joined the Polaris program in 1963. As a missile technician, he attended about 3,250 hours of training courses. The Navy was not interested in conferring degrees, so an impressive amount of schooling qualified him to be a technician. He says two years under water probably also qualified him for the funny farm! During his last 18 months of service, he managed 12 men in the maintenance of the missile compartment and 16 Polaris missiles, and 3 others in the maintenance of the torpedo room and its armament. Ken was discharged in 1971 and for the next 10 years held various positions at 13 different companies involved in electronic design and manufacturing. At one point, he even repaired organs door-to-door. In 1981, he joined OSU in the Electrical and Computer Engineering Department as a Scientific Instrument Technician, eventually advancing to Development Engineer. In 1993, a "personnel adjustment" shifted his loyalties to the Mechanical Engineering Department.

DYANN McVICKER

DyAnn has been an Office Specialist in the Mechanical Engineering department since 1993. She works as the receptionist and word processor for the department. She originally came to work here through a temporary service and was eventually placed in a permanent position. She is currently a member of the OSU Office Personnel Association. Her husband's job brought them to Oregon from Southern California, where she worked as a project coordinator for a civil engineering firm for 8-1/2 years. The year before moving to Oregon, she worked in the office of the Educational Department at the San Luis Obispo County Superintendent of Schools.



ORRIE PAGE

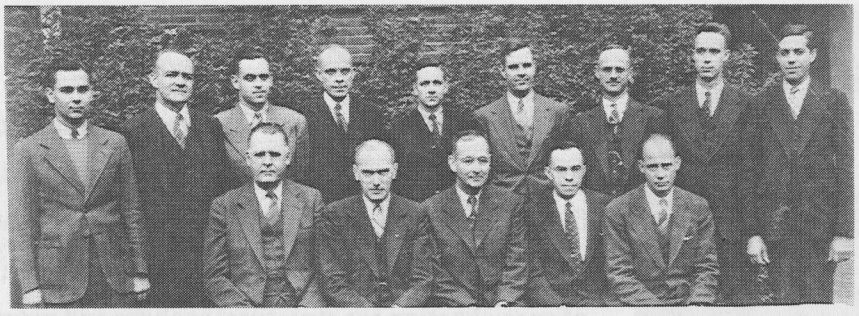
Orrie came to the Mechanical Engineering department in March of 1986. He is currently in charge of the mechanical shop facility. In addition to our department, he has worked at OSU since 1968 in the shops of the Physics department, Bioresources Engineering department, and the College of Oceanography. He had a brief break in OSU service to work at the Foamat Foods Corporation from 1970 to 1972. After high school, Orrie served in the U. S. Army for three years, specializing in "exiting perfectly good aircraft." Orrie attended the Oregon Institute of Technology for three years on the GI Bill. In 1958, he completed Auto Mechanics Technology--Associate in Applied Science, and in 1959 he completed Auto Machine Technology. Before coming to OSU in 1968, Orrie worked at the Lawrence Radiation Laboratory, Berkeley, for nine years.

SUZANNE REININGER

Suzanne is a native of Southern California. She attended the University of North Carolina at Charlotte, where she was actively involved with student organizations and worked as a resident advisor for 3 years. She graduated in 1988 with a BA in Psychology and a minor in Communications. After graduation, she worked from 1988-90 as a district manager in charge of outside sales for Randomex, a computer disk maintenance and data recovery service company, traveling throughout North Carolina, South Carolina, and eastern Tennessee. After visiting OSU and Corvallis in 1989, she decided to return to the west coast and call Corvallis her new home. Since her arrival, she has worked in Mechanical Engineering. She first served several years in the receptionist position and then transferred to her current position in charge of student records. In addition to working, she has also taken a few graduate courses in Counseling Education. She hopes to fulfill her dreams of entering school to complete a Master's degree.

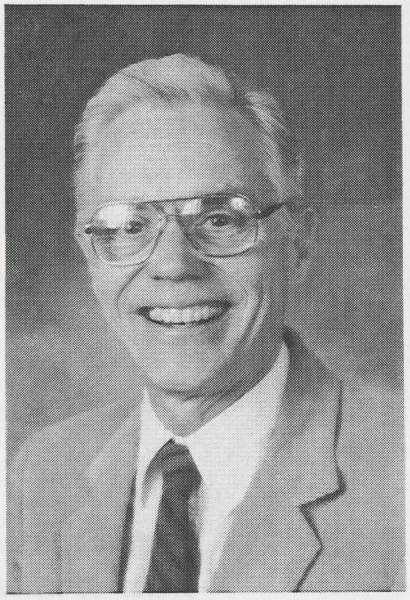
PAST FACULTY

Past faculty are listed nominally in reverse chronological order of when they retired or left Oregon State University.



O S U
MECH ENGR DEPT 1939-40

MILTON B. LARSON



Professor Larson received his BS in Mechanical Engineering from Oregon State University in 1950, ME from Yale in 1951, MS from Oregon State University in 1955, and PhD from Stanford in 1961. He joined the faculty in 1952 and was on leave for three years, returning in 1960. During the period 1964 to 1968, Professor Larson was Dean at the University of North Dakota, but returned to OSU in 1969. His field of specialization is heat transfer, solar thermal systems, and noise measurement and reduction. He is a registered engineer in Oregon, and active in ASME. Honors and awards include Phi Kappa Phi, Tau Beta Pi, Sigma Tau, Sigma Pi Sigma, Sigma Xi, and NSF Science Faculty Fellow. He received the Carter Award for excellence in teaching in 1956. Professor Larson retired in 1992, but has continued to be active in the ME department. He also spent six months in Germany teaching in the Armed Forces Higher Education program.

DAVID A. BUCY

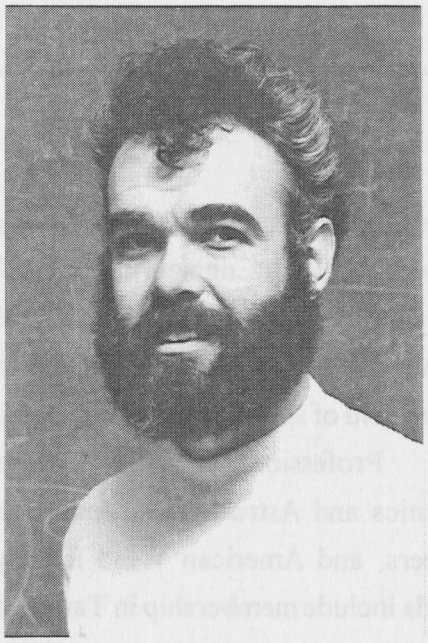
Professor Bucy served on the Oregon State faculty from 1955 to 1988. He received a BS in Civil Engineering in 1955 and joined the faculty as an Instructor in 1955. He received a MS in Metallurgical Engineering from the University of Washington in 1969. His fields of specialization are structural analysis and properties of materials. He was Director of Planning and Institutional Research from 1974 to 1988.

Honors and awards include Sigma Tau, Pi Tau Sigma, and NDEA Fellow at the University of Washington, 1967-1969. He remains active in the Corvallis community, including being a member of the Corvallis Ambassadors and serving on the City Council.

ROBERT J. ZAWORSKI

Professor Zaworski received his SB from MIT in 1947, SM from MIT in 1958 and PhD from MIT in 1966. He joined the faculty in 1958 after ten years with the Creole Petroleum Corporation in Venezuela, including time out for two years active duty with the U.S. Navy. He was a National Science Foundation Fellow from 1963-66 and then returned to the faculty in 1966. His field of specialization was thermodynamics and mechanics of marine equipment. He was a registered engineer in Oregon and New York and was active in ASME and the OSU Faculty Senate. Bob spent three years in Germany; one as a guest professor at the University of Stuttgart, and two as the Director of the OSU-German Studies Program. Honors and awards include Pi Tau Sigma, Sigma Xi and NSF Science Faculty Fellow. The students endorsed Professor Zaworski with a University Outstanding Teaching Award in 1962 and the Carter award in 1969. Bob passed away in 1986.

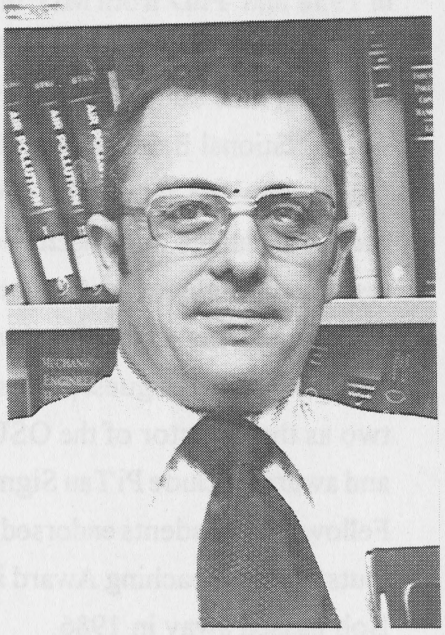
ROBERT W. THRESHER



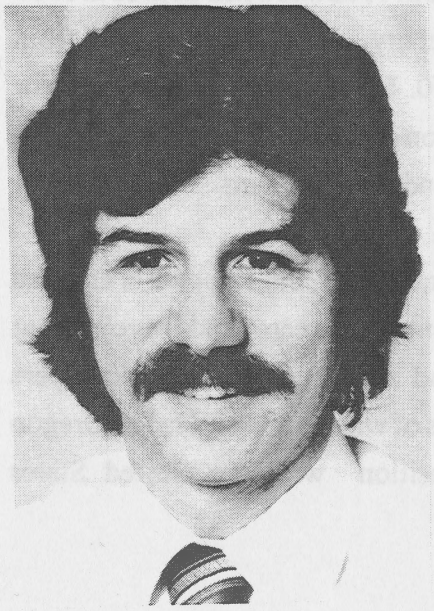
Professor Thresher served on the Oregon State faculty from 1970 to 1986. He received a BS degree in 1962 and a MS degree in 1967 from Michigan Technical University. He received a PhD from Colorado State University in 1970. He was promoted to Professor in 1980. His fields of specialization are solid mechanics, structural dynamics, fracture mechanics, and wind systems.

Honors and awards include Pi Tau Sigma, Phi Kappa Phi and Tau Beta Pi. He was Director of the Energy Research and Development Institute, 1981 to 1983. He had a number of published papers relating to the design and analysis of wind turbines. He left Oregon State University to take a position with the United States Department of Energy.

RICHARD W. BOUBEL



Professor Boubel received his BS in Mechanical Engineering from Oregon State University in 1953, MS from OSU in 1954, and his PhD from North Carolina in 1963. He joined the faculty in 1954 and was on leave for three years beginning in 1960. His fields of specialization are air pollution control and industrial hygiene, and biomass energy utilization. He is a registered engineer in Oregon and holds a certificate as an Air Pollution Control Engineer. Dick was national Vice President and President of the Air Pollution Control Association, a Fellow of ASME, and active in the Oregon section of the ASME. Honors and awards include Sigma Xi, Tau Beta Pi, and recognition as the Pi Tau Sigma Engineering Professor in 1971. His accomplishments include over 34 publications and three patents. He retired in 1986, but has been very active consulting in his field and spending several months a year with the U. S. Defense Department on their pollution control problems.

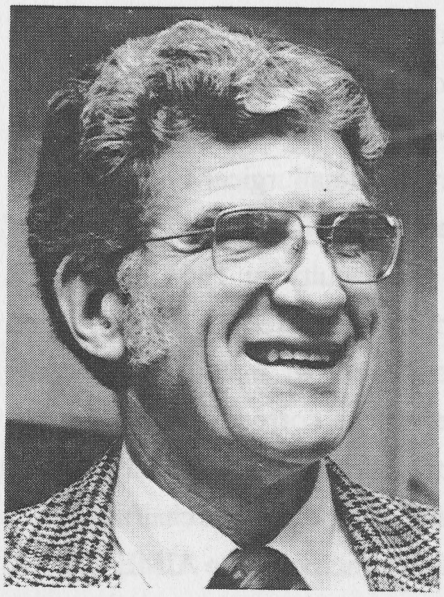


WILLIAM E. HOLLEY

Professor Holley served on the Oregon State University faculty from 1975 to 1985. He received his BS in Engineering in 1967 from California State University, Northridge; MS in Mechanical Engineering from Purdue University in 1968; and a PhD from Stanford University in 1975. His field of specialization is dynamic systems analysis and control. Professional societies include American Institute of Aeronautics and Astronautics, American Society of Mechanical Engineers, and American Wind Energy Association. Honors and awards include membership in Tau Beta Pi. He left Oregon State University to take a position in private industry.

GEORGE E. THORNBURGH

Professor Thornburgh served on the Oregon State faculty from 1952 to 1984. He received his BS degree from the University of Nebraska in 1944 and his MS degree from Iowa State College in 1950. He was promoted to Professor in 1965. His fields of specialization are heating and air conditioning, refrigeration, and power plants. From 1966 to 1974, he was Director of Planning and Institutional Research for the University. George was active in ASHRAE and ASME and is a registered engineer in Oregon. His industrial experience includes two years with Lennox Furnace Co. and one year with Bechtol Power Corp. Honors and awards include Pi Tau Sigma and Sigma Tau. He was the winner of the Carter Award for outstanding teaching in 1957.



JOHN G. MINGLE

Professor Mingle received his BS in Mechanical Engineering from Purdue University in 1942 and MS from Oregon State University in 1949. He joined the faculty in 1960 in the heat power area after eleven years with the Chevron Research Corporation engine-fuel research group. His fields of specialization are fuels and lubricants; internal combustion engines; exhaust gas analysis; vehicle performance; and combustion of solid, liquid, and gaseous fuels. He was the faculty advisor to the student Society of Automotive Engineers for twenty-three years, active in the Oregon section of SAE, and a registered engineer in Oregon. Honors and awards include Pi Tau Sigma. Professor Mingle retired in 1984.

LLOYD M. FRAZIER

Professor Frazier received his BS in IAE at Oregon State College in 1949 and his MS from Brigham Young University in 1968. He joined the faculty in 1947. His field of specialization is manufacturing engineering, including foundry and machine tool processes. He received the Tau Kappa Epsilon teaching award in 1968 and was a member of Epsilon Pi Tau. He was active in AAUP and the American Foundrymens Society and was appointed manager of the OSU Instructional Shops in 1971. Professor Frazier is a superb craftsman. He retired in 1982.

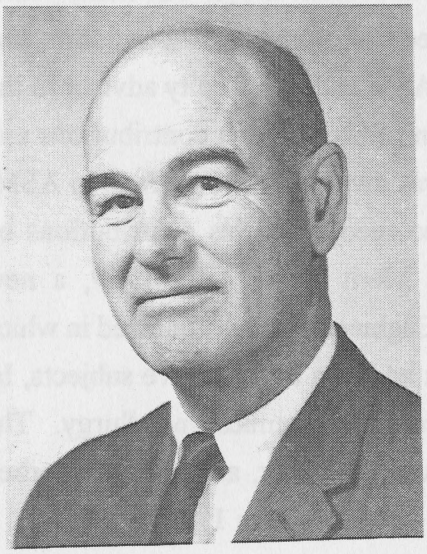
WILLIAM D. McMULLEN

Dr. McMullen received his Associate of Science at Weber College in 1953, his Bachelor of Science in Metallurgical Engineering at University of Utah in 1955, his Masters in Metallurgy at Iowa State University in 1961, his Masters in Metallurgical Engineering at Leheigh University in 1962, and his PhD at the University of Denver in 1964. He joined the faculty in 1964 and taught undergraduate and graduate courses in materials. He carried on research involving fracture toughness of materials, especially metals. He was also interested in the corrosion of metals. Dr. McMullen was an avid reader of technical and historical literature and he had an extensive library at his home. He was chairman of the Library Committee at OSU. He was active in the AIME and held offices in that organization. Bill passed away in 1980.

MILOSH POPOVICH

P57:4490, courtesy of OSU Archives

Professor Popovich received a BS in Chemical Engineering in 1939 and MS in Mechanical Engineering at Oregon State College in 1941. He returned to OSC in 1945 as Assistant Professor of Mechanical Engineering. He taught fuels and lubricants and assisted in the heat-power and materials courses. He was elected Chairman of the Mechanical Engineering Department when Professor Graf chose to devote full time to the Engineering Experiment Station in 1949. Professor Popovich served in that position until 1954, when he was appointed Assistant Dean of Engineering in charge of the Experiment Station. In 1959, he was appointed Dean of Administration of OSC, a title later changed to Vice-President. He held that position until he retired in 1979. He was active in ASME, chairing the Oregon section in 1956, and participating at the regional level by chairing the Student Sections Committee. At the national level, he served on the editorial board of the *Mechanical Engineering* magazine. He was elected to the ASME grade of Fellow in 1968. Honors and awards include Tau Beta Pi, Pi Tau Sigma, Sigma Xi, Phi Kappa Phi, Phi Lambda Upsilon, and Pi Mu Epsilon. He is a registered engineer in Oregon. He was recognized as a Distinguished Alumnus by the OSU College of Engineering in 1995.



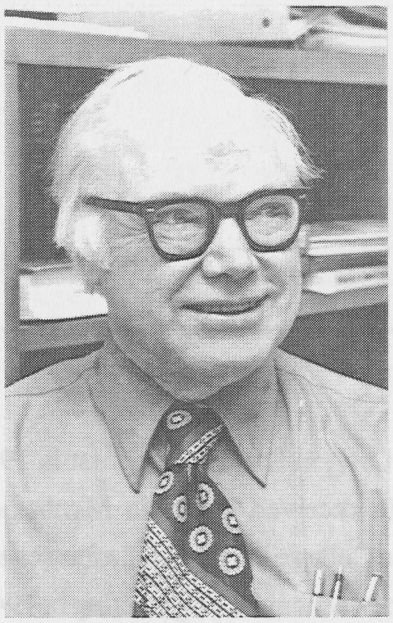
WESLEY W. SMITH

Professor Smith served on the Oregon State faculty first in 1948 as an Assistant Professor. He received a BS in Mechanical Engineering from Montana State College in 1934 and, after several years in industry, earned a ME in Mechanical Engineering in 1947. He returned as a Professor in 1956 and served until he retired in 1978. His fields of specialization are machine design, quality control, computer aided design, and cooling tower design. Honors and awards include Phi Eta Sigma, Tau Beta Pi, Phi Kappa Phi, Pi Tau Sigma, Sigma Xi, and Septemviri.

LINWOOD E. JOHNSON

Professor Johnson received his BS in Mechanical Engineering from Oregon State University in 1954 and his MS from Oregon State University in 1955. He joined the faculty in 1959 after serving four years with Admiral Rickover's U. S. Navy Nuclear Submarine Program. His field of specialization is machine design. He was active in the Oregon section of the ASME and ASEE. He also served for years as the faculty advisor to the student section of ASME. He is a registered engineer in Oregon. Honors and awards include Sigma Xi, Phi Kappa Phi, Pi Tau Sigma, Sigma Tau, and Tau Beta Pi. He resigned from the faculty in 1978 to join two other former faculty members in a private consulting firm, Accident and Failure Investigations.

OLAF G. PAASCHE



Professor Paasche received his BS in Metallurgical Engineering at the University of Illinois in 1943 and his Masters in Metallurgical Engineering at Illinois Institute of Technology in 1955. He joined the faculty in 1946. His fields of specialization are materials testing, metallography, and strength of materials. He was also associated with the Bureau of Mines in Albany, Oregon, where he conducted research on phase relations of zirconium alloys. For many years, he conducted research on creep of aluminum transmission line conductors. He was active in ASM and was faculty advisor to the student section. In recognition of his research contributions and dedication to education, he was awarded Fellow grade in ASM. The University of Illinois also recognized his contributions by conferring the Distinguished Merit Award. In 1969, a new Department of Metallurgical Engineering was organized in which Olaf played a central role. In addition to the above subjects, he undertook instruction in process and chemical metallurgy. The new department was short-lived, however, and was reabsorbed into Mechanical Engineering. Olaf retired in 1976.

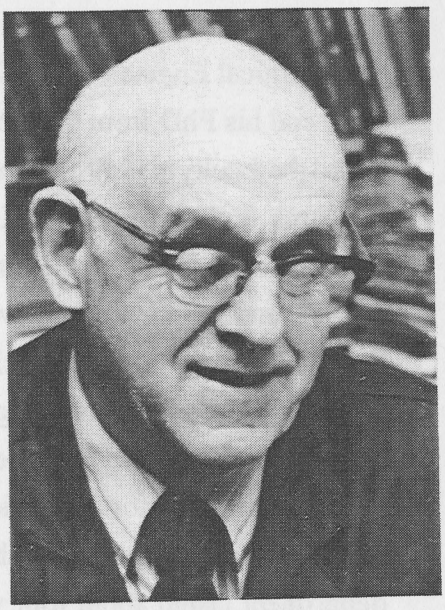
ROGER D. OLLEMAN

Dr. Olleman graduated from the University of Washington with a BS in Metallurgical Engineering. He obtained his Masters in Metallurgical Engineering at Carnegie Institute of Technology in 1950 and his PhD from the University of Pittsburgh in 1955. He joined the faculty in 1959 after industrial experience at Westinghouse Research Laboratory and Kaiser Aluminum Company. Dr. Olleman's interest in engineering materials actually began when he was an undergraduate and was employed in the shipyards. At Kaiser, he supervised research on creep of aluminum electrical transmission conductors being carried on at OSU. His frequent trips to the campus led to his desire to teach. When there appeared to be a demand for education in Metallurgical Engineering, a new department formed with Dr. Olleman as head. This new department lasted about four years, when it was reabsorbed into Mechanical Engineering. Dr. Olleman won the Carter award for superior teaching. While at OSU, he received requests to investigate failures of engineering equipment which were the subject of litigation. These requests eventually became so numerous that he formed his own consulting company and left OSU in 1976.

HANS J. DAHLKE

Professor Dahlke served on the Oregon State faculty from 1963 to 1976. He received a BS degree from San Diego State College in 1957, a MS degree in 1958, and a PhD degree in 1964 from Stanford University. His fields of specialization were engineering mechanics and experimental stress analysis. Honors and awards include Sigma Xi, Pi Tau Sigma, and Ford Foundation Fellow 1967-1968. After leaving Oregon State University, he took a position with Westinghouse Electric Company in Hanford, Washington.

ARTHUR D. HUGHES



Professor Hughes served on the Oregon State faculty from 1938 until he retired in 1974. He received his BS and MS degrees from State College of Washington in 1932. He also received a ME, Mechanical Engineering, in 1953. He was promoted to Professor in 1946. His fields of specialization were power plants, heating and air conditioning, and gas turbines. Honors and awards include Pi Tau Sigma, Sigma Tau, Tau Beta Pi, and Sigma Xi. He was given the Carter Award for outstanding teaching in 1949. He was a Fellow of both ASME and ASHRAE. He was honored as the Engineer of the Year by the Professional Engineers of Oregon. He served on the Oregon State Board of Engineering Examiners from 1950 to 1968. He spent 1944 to 1946 with Allis-Chalmers in design, research, and testing of gas turbine engines. Upon returning to Oregon State University in 1946, he modified an aircraft gas turbine engine to allow students to test it in the laboratory. He was well known in the community for his work with Boy Scouts of America, where he served in a number of community and regional capacities, including being a Scout Master for a troop with learning disabilities. Art passed away in 1992.

EDWARD E. RIESLAND

Professor Riesland received his BS in Mechanical Engineering at Oregon State University in 1957 and his MS at Oregon State University in 1960. He joined the faculty in 1957. His field of specialization was manufacturing processes, including numerical control of machine tools and mass production methods. He was active in ASME and the American Society of Tool and Manufacturing Engineers. Awards and honors include Pi Tau Sigma, Sigma Tau, and Tau Beta Pi. Professor Reisland resigned from the faculty in 1972 to enter industry.

LOUIS SLEGEL

Professor Slegel received his BS in Mechanical Engineering from Purdue in 1931, and MS from Purdue in 1932. After eight years of industrial experience, he taught at Purdue while earning his PhD during the period from 1940 to 1945. He came to Oregon as a researcher at the Bonneville Power Administration in 1945 and 1946. He joined the OSU Department of Mechanical Engineering in 1946. His field of specialization was machine design. Professor Slegel was appointed Head of the Department of Mechanical Engineering in 1954 and remained Head until he retired in 1970. As Head of the department, Slegel led the department during an exciting time for mechanical engineering. Sputnik gave considerable focus to engineering in general, and mechanical engineering associated with aerospace in particular. By the time of his retirement, the U. S. had landed a person on the moon. Louis passed away in 1992. He was a registered engineer in Oregon and active in the Oregon Section of ASME and the Northwest section of ASEE. Honors included Sigma Xi, Tau Beta Pi, Kappa Phi Sigma, Sigma Tau, and Pi Tau Sigma.

c95:018, courtesy of OSU Archives

EDWARD A. DALY

Professor Daly served on the Oregon State faculty from 1957 to 1969. He received his BS degree in 1950 from South Dakota State University and his MS degree from Michigan State University in 1951. His fields of specialization were heating and ventilating, air conditioning, nuclear engineering, and measurement and control of sound. He was elected Fellow of ASHRAE in 1993. Honors and awards included membership in Pi Tau Sigma. He was instrumental in acquiring and setting up the first operating nuclear reactor for instructional purposes at OSU. After leaving Oregon State University, he started a successful consulting business in Portland for the design of architectural sound systems. Ed passed away in 1994.

CHARLES O. HEATH

46:250, courtesy of OSU Archives

Professor Heath received his BS at California Institute of Technology and his MS at Rutgers University. He joined the faculty in 1946. His specialties were mechanics, strength of materials, and materials testing. He also taught a course in concrete for civil engineers and did much research on pozzolanic and air entraining admixtures in concrete. Charlie was an avid traveler and took a leave of absence to teach in India. He returned to OSU but ten years later, in 1968, left to teach in Ethiopia. After six years, he returned to the U. S. and settled in California. He taught at Cal Poly in San Luis Obispo from 1974 to 1980. Charlie passed away in 1993.

WILLIAM H. PAUL

Professor Paul received his BS in Mechanical Engineering from Oregon State University in 1924 and MS from Oregon State University in 1935. He joined the faculty in 1926 after two years of experience in automotive maintenance in Redlands, California. His field of specialization was automotive engineering and, throughout his long career at OSU, he was the major force in developing laboratory equipment to help teach and do research in this field. He was a registered engineer in Oregon and organized the student branch of the Society of Automotive Engineers at Oregon State University in 1935, also being very active in the Oregon sections of SAE and ASEE. Honor societies included Tau Beta Pi, Pi Tau Sigma, and Sigma Xi. He received the Carter Award in 1954. Professor Paul retired in 1965 and passed away in 1988.

HARVEY CHRISTENSEN

Professor Christensen obtained the BS degree from the University of Washington in 1943 and the MS from Oregon State College in 1950. He came to Oregon State College from the University of Washington in 1947 as an Instructor in Mechanical Engineering. He taught mechanics and aerodynamics and assumed responsibility for the aeronautical courses when Professor Ruffner departed. He had an early interest in computers and, along with a group of students, constructed a fairly sophisticated (for its time) analog computer. He was promoted to Assistant Professor in 1951 and to Associate Professor in 1957. He was a registered engineer in Oregon and was a member of Pi Tau Sigma and Sigma Xi. He departed for doctorate studies at Stanford University in 1957 and, upon completion of his degree there, accepted a position as Head of Mechanical Engineering at the University of Arizona.

CHARLES E. THOMAS

Professor Thomas obtained ME and MME degrees at Cornell in 1913 and 1931, respectively, and was an Instructor there from 1914 to 1917. He came to Oregon Agricultural College from Cornell University in 1918 as an Assistant Professor of experimental engineering. His field was mechanics and materials, and he taught courses in mechanics, dynamics, strength of materials, and the materials testing laboratory. He was promoted to Associate Professor in 1924 and to Professor in 1940. He retired in 1956. Professor Thomas was a dedicated and effective teacher who contributed a great deal to the department's reputation for excellence in teaching. He received the Carter Award in 1947. Honor societies included Tau Beta Pi, Sigma Tau, Sigma Xi, and Pi Tau Sigma.

BENJAMIN F. RUFFNER

Professor Ruffner received BS and MS degrees from New York University. He arrived at Oregon Agricultural College in 1936 from NYU, where he had been an Instructor in aeronautical engineering from 1930 to 1936, and was appointed as Assistant Professor of aeronautical engineering. He made an instant impact as a superb teacher with valuable industrial contacts. He was promoted to Associate Professor in 1938 and to Professor in 1941. With the advent of WW II, he was appointed as coordinator of the Civilian Pilot Training Program for the State of Oregon. He introduced courses in photoelasticity and stress analysis, along with improving the aerodynamics instruction by constructing wind tunnels. A full-fledged option in aerodynamics was organized and drew many students. The program was highly regarded by industry and OSC graduates were in great demand, even after the war was over. Honor societies included Tau Beta Pi, Phi Kappa Phi, Sigma Xi, Pi Tau Sigma, and Iota Alpha. Professor Ruffner was lured away by industry to fill a high-level staff position in 1952.

WALLACE H. MARTIN

Professor Martin received the BS degree in ME from Minnesota in 1910 and the MS from Iowa State in 1930. He came from University of Minnesota in 1920 to join the staff as Professor of mechanical engineering. He was the first Professor to have training and experience in the heat-power field, developing and teaching courses in heat transfer and thermodynamics as well. He was a key figure in the development of the department's reputation for excellence in teaching. After serving the College with distinction for 30 plus years, he reached the mandatory retirement age (65 at that time) in 1952 and moved to Portland to teach at the University of Portland for a number of years. He was a Fellow in the American Society of Mechanical Engineers. Honor societies included Tau Beta Pi, Sigma Xi, Pi Tau Sigma, and Phi Kappa Phi.

SAMUEL H. GRAF

Professor Graf joined Professors Covell and Phillips in the Mechanical Engineering Department in 1908 as an Instructor, after earning BS degrees in both ME and EE at Oregon Agricultural College. He received MS degrees in EE and ME in 1909. His primary interest was in engineering materials, but he had a talent for experimentation and research. In 1918, when Professor Thomas arrived, he and Thomas were listed in a separate Experimental Engineering Department. By 1924, it was changed to the Department of Mechanics and Materials, consisting of Graf, Thomas, and Othus. In the meantime, Graf had been promoted to Professor.

In 1934, Mechanics and Materials merged with Mechanical Engineering and Graf was appointed Acting Head of Mechanical Engineering. Graf became Head in 1935. He was also Director of the Engineering Experiment Station. He retired as ME Department Head in 1949 to assume full-time duties as Director of the Engineering Experiment Station, and in 1954 fully retired after 46 years of distinguished service. He was active in ASME affairs over many years, serving on several national committees and also as regional Vice-President. He was also active in the American Society for Metals. Honor society membership included Tau Beta Pi, Sigma Tau, Pi Tau Sigma, Sigma Xi, Eta Kappa Nu, and Phi Kappa Phi.

Professor Graf was a registered professional engineer in Oregon. During a significant period of his more than forty years of service, he was the main force in the building of the department. He provided continuity and drive as well as an ability to obtain equipment in the face of meager budget allocations.

JAMES C. OTHUS

Professor Othus received the ME degree from Cornell University in 1917 and the MS degree from the University of Illinois in 1932. He came to Oregon Agricultural College in 1921 as Instructor in mechanics and materials. He taught statics, dynamics, strength of materials, and machine design. He was promoted to Assistant Professor in 1926 and to Associate Professor in 1937. He was a member of Sigma Tau and Sigma Xi honor societies. During World War II, he took a leave of absence to join an industrial firm engaged in the war effort. After the war, he decided to remain there instead of returning to the academic world.

MARK C. PHILLIPS

Professor Phillips joined the faculty as an Instructor in ironwork in 1897 after receiving the BS degree in Mechanical Engineering from Oregon Agricultural College in 1896. By 1901, he was also teaching mechanical drawing. He was promoted to Assistant Professor of ME in 1908 and in 1910 appointed Superintendent of Heat, Light, and Power, a position he held until 1944. He retired in 1946. For many years, he taught the mechanisms course, a prerequisite for machine design. He was promoted to Associate Professor in 1935 and to Professor in 1945. He was a member of Sigma Tau and Tau Beta Pi honor societies.

EARL C. WILLEY

Professor Willey served on the Oregon Agricultural College faculty from 1922 to 1959. His field of specialization was heating and air conditioning. He is acknowledged as the "father" of the Oregon Chapter of ASHRAE. He spearheaded the effort to develop an industry-based group in HVAC during 1933 to 1939, and the Oregon ASHRAE chapter was organized in 1939. He began teaching in the Mechanical Engineering Department after receiving his BS degree from Oregon Agricultural College in 1921. He received the MS in Mechanical Engineering from Oregon State College in 1941. In 1945, he moved to the General Engineering Department, teaching there until he retired in 1959.

ROBERT E. SUMMERS

Courtesy of University of Minnesota Archives

Professor Summers received the BS degree in 1924 and the MS degree in 1933, both from Oregon State College. He joined the faculty as Instructor in Mechanical Engineering in 1925. He assisted Professor Martin with heat-power instruction during his early years, and later developed his own courses in thermodynamics. He also developed a laboratory and procedures for analyzing and treating boiler feedwater, material that was incorporated into the Mechanical Engineering laboratory for seniors. He was promoted to Assistant Professor in 1930. He was a member of Sigma Tau and Tau Beta Pi honoraries. His reputation attracted the attention of the University of Minnesota, and he joined their staff in 1938.

RAY BOALS

Professor Boals served on the Oregon Agricultural College faculty from 1914 to 1927. His fields of specialization were experimental engineering, steam turbines, and power plants. Professor Boals graduated from Case Institute in 1914.

P17:2073, courtesy of OSU Archives

GRANT A. COVELL

Professor Covell came to Oregon Agricultural College as Professorof Mechanics and Mechanical Engineering in 1889, the year in which the department was organized. He handled the teaching and departmental duties essentially alone, with occasional assistance from instructors for many years. He received a degree in Mechanical Engineering from Cornell in 1887 and was appointed to the faculty as an Instructor. After one year, he moved to the University of Minnesota and the following year to Oregon Agricultural College. He was a key figure in the early development of OAC as well as the Mechanical Engineering Department. He served several presidents as a member of the Administrative Council. The department and, in fact, College of Engineering were really developed in the early days (1800's) and well into the 20th century by Professor Covell. He taught the first graduates in engineering (mechanical engineers) and was instrumental in nearly the first forty years of the Department's and College's development. He was appointed Dean of Engineering in 1907 and served in that position until 1927. Civic activities included serving on the Corvallis City Council for a number of years, during which time it was said he was influential in maintaining the "dry" local option for the community. He was a member of both Tau Beta Pi and Sigma Xi.

PAST STAFF

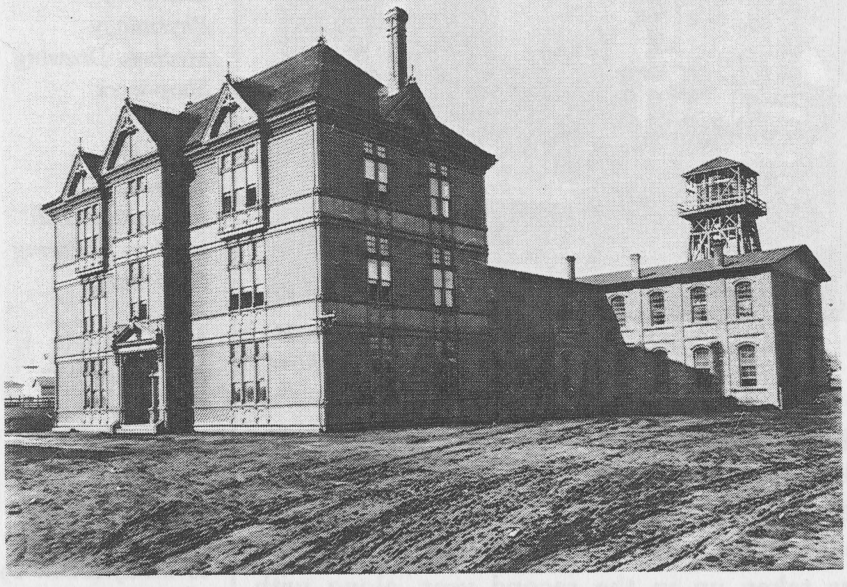
BEATRICE BJORNSTAD

Bea Bjornstad came to the OSU Mechanical Engineering Department in the spring of 1974. She had previously worked at OSU in the Colleges of Home Economics and Physical Education. Bea was hired to be the supervisor of the department office; her position would later be designated Administrative Assistant. In this role, she kept the department's books and made certain that all other tasks required of the office got done well and promptly. Her appointment extended through December, 1989, when she retired. Bea's tenure began in the days of typewriters and ditto machines and ended when 386 computers, word processing, and spread-sheets were the norm. Bea's hallmark was her obvious compassion and affection for students--particularly graduate students--who stayed in the department longer and got to know her well. Many ex-students, even now, remember her with holiday cards and their good wishes.

JOHN RICHARD "JACK" KELLOGG

Jack Kellogg joined the Mechanical Engineering Department in 1952 as a mechanician. His responsibilities were to maintain the department equipment, assist in setting up machinery used in laboratory instruction, and build equipment for experimental projects needed by faculty and students. For a number of years, he kept busy directing students in the building of their senior projects, including the instructional use of shop tools. He graduated from high school in Salem, Oregon, and served as aviation machinist in the Navy during World War II. Before coming to OSU, he worked in the construction industry on heavy machinery. In addition to his work in the department, he had a part-time business repairing photography equipment. Jack was instrumental in developing the original shop facilities for the Mines building and for the Mechanical Engineering shop in Rogers Hall. He retired in 1982 and is now deceased.

EVOLUTION OF THE MECHANICAL ENGINEERING CURRICULUM



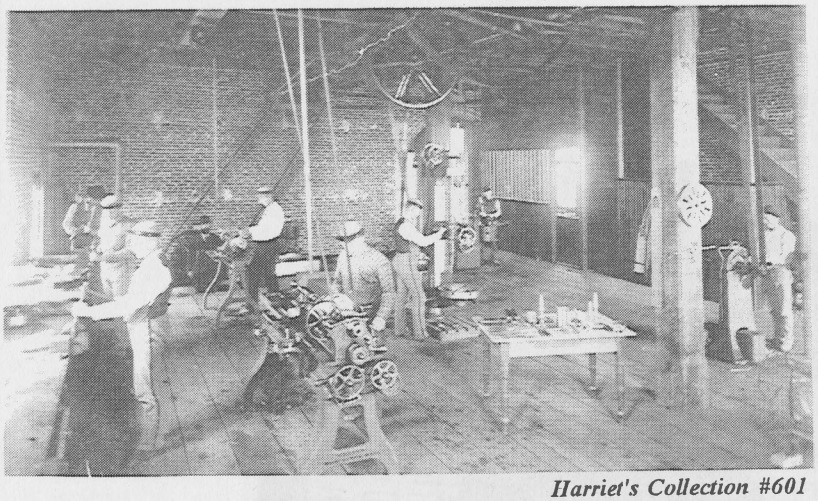
The original two-story brick section of the first Mechanical Hall and the water tower were constructed in 1889. The three-story frame annex was added in 1894. The entire structure was destroyed by fire during the night of September 27, 1898.

Harriet's Collection #63
Courtesy of OSU Archives

EVOLUTION OF THE MECHANICAL ENGINEERING CURRICULUM

In 1889, a four-year curriculum leading to the degree of Bachelor of Mechanical Engineering was established. The program, titled Mechanics and Mechanical Engineering, was administered by professor G.A. Covell beginning in 1890. Prior to 1891, the curriculum description was in the narrative form:

> "This department includes work both in class-room and shop. The class-room work takes up the studies Mechanics, Mechanism, and Mechanical Drawing. The shop-work includes wood-working, blacksmithing and machinist work. The student is first taught the use of tools in a series of exercise pieces, and afterward required to apply the principles thus learned to actual construction. In all cases the student works directly from drawings, which he must learn to make, to interpret and to follow accurately."



Harriet's Collection #601
Courtesy of OSU Archives

Specific course requirements first appeared in the 1891-92 catalog, where the descriptions included course work, recitations, hours, tools, textbooks, and expected accomplishments. The first year specified five hours of woodworking throughout the year. Blacksmithing was taken up in the second year, along with drawing, which continued into the third year. The third year was also devoted to elements of mechanisms, study of the steam engine, and work in machine shop. Study of the steam engine continued into the fourth year, which also included mechanics, machine design, and shop work.

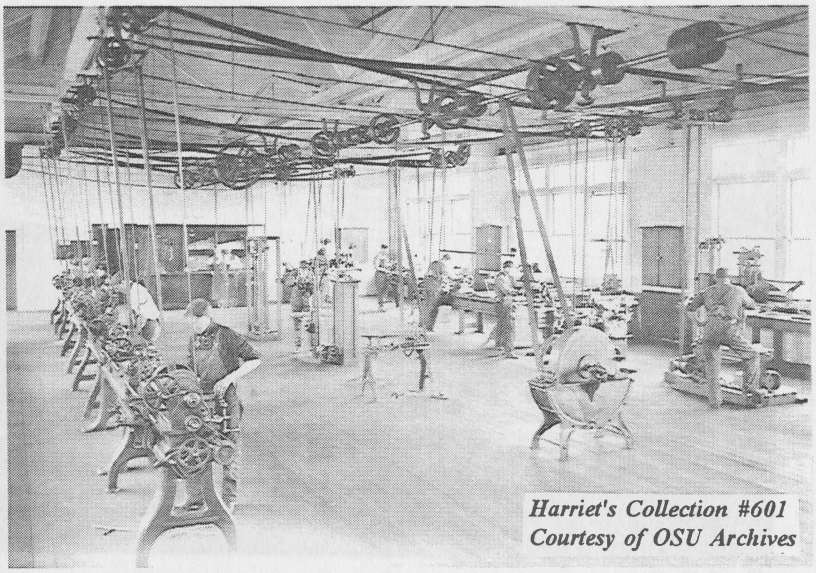
Oregon Agricultural College
1892-93
Course of Study

First Year	***Third Year***
Algebra	*Pol. Economy*
English Comp.	*Rhetoric*
U. S. History	*Anal. Geometry*
Book-keeping	*El. of Mechanism*
Shop-work	*Shop-work*
Algebra	*Physics*
English Comp.	*Anal. Geom. (1/2)*
Gen. History	*Calculus (1/2)*
Drawing	*Eng. Literature*
Shop-work	*Mechanism*
	Shop-work
Algebra	
English Comp.	*Physics*
Drawing	*Calculus*
Chemistry	*Steam Engine*
Shop-work	*and Motors*
	Drawing & Design
Second Year	
	Fourth Year
Geometry	
Chemistry	*English Lit.*
Physiology	*Mechanics*
Mechan. Drawing	*Physics*
Shop-work	*Steam Engine*
	Shop Work
Geometry	
Chemistry	*Psychology*
Physiology (1/2)	*American Lit.*
Mechan. Drawing	*Mechanics*
Shop-work	*Machine Design*
	Shop Work
Trigonometry	
Chemistry (1/2)	*Ethics*
Botany	*English Lit.*
Drawing	*Mechanics*
Shop-work	*Shop Work*

NOTE: The above course of study is subject to modification by the committee, but will not be materially changed.

Choral singing for a quarter of an hour daily is made obligatory on the whole school.

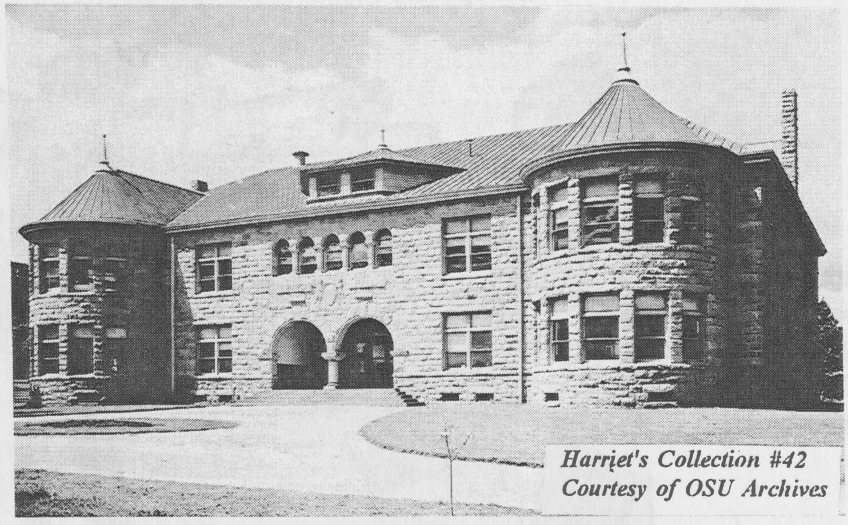
Printing optional from beginning of the first year.



Harriet's Collection #601
Courtesy of OSU Archives

The 1892-93 curriculum, shown on the previous page, includes shop work every quarter, required choral singing, more than three quarters of chemistry, and a three-year mathematics program that reached calculus during the junior year.

The 1915-16 catalog listing, shown at the right, indicates a two-semester format, apparently the only year this system was used at Oregon State. In this curriculum, calculus was moved to the sophomore year and taught both semesters. The titles still used today, "Statics," "Dynamics," and "Strength of Materials" appeared for the first time. Also, the 1915-16 senior year included many courses which are significant offerings today: Power Plants, Internal Combustion Engines, Heating and Ventilation, Advanced Mechanics, and Machine Design. The list also includes three years of required Military Drill.



Harriet's Collection #42
Courtesy of OSU Archives

After the fire of 1898, funds were appropriated for the second Mechanical Hall. It was constructed of Oregon gray granite and sandstone, and housed most engineering classrooms and labs. The third floor was added in 1920, the same year it was named Apperson Hall.

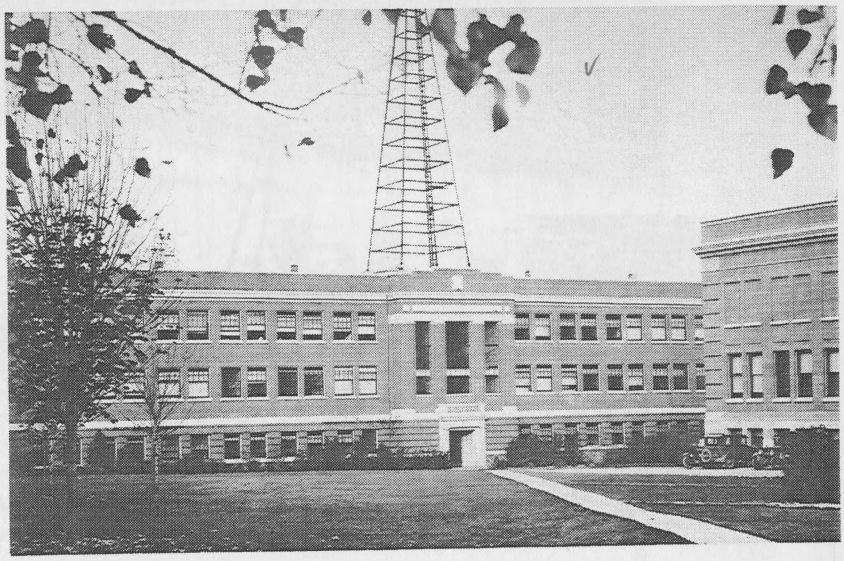
Degree Course in Mechanical Engineering 1915-16

	Semester 1st	2nd
Freshman Year		
*Modern English Prose (English 81, 82)**	3	3
Trig., College Algebra (Math, 11,21)	5	
Elementary Analysis (Math, 31)		5
General Chemistry (Chem. 100, 101)	3	3
Mechanical Drawing (M.E. 151)	2	
Descriptive Geometry (M.E. 152)		3
Foundry (Ind. Arts 171)	2	
Patternmaking (Ind. Arts 131)		2
Library Practice (Libr. 1)	1/2	
Hygiene (Phys. Ed. 10)	1/2	
Drill (Military 1,2)	1	1
Gymnasium (Phys. Ed. 15, 16)	1/2	1/2
	17½	17½
Sophomore Year		
Diff. and Integral Calculus (Math 51, 52)	4	4
Engineering Physics (Physics 101, 102)	4	4
Mechanical Drawing (M.E. 153)	3	
Mechanism (M.E. 204)		3
*Commercial Geography (Com. 202)**	3	
*Principles of Economics (Com. 212)**		3
Blacksmithing (Ind. Arts 151)	2	
Toolmaking and Tempering (Ind. Arts 152)		1
Machine Shop (Ind. Arts 202)		1
Drill (Military 3, 4)	1	1
Gymnasium (Phys. Ed. 17, 18)	1/2	1/2
	17½	17½

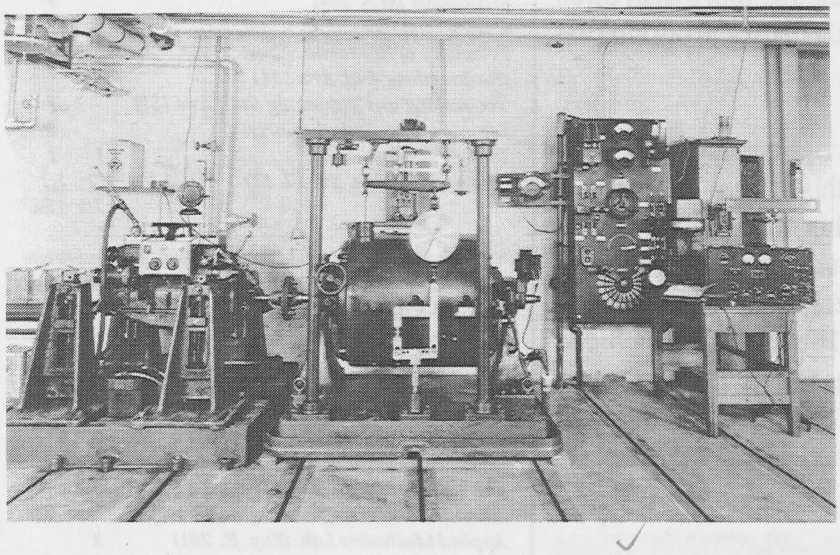
** Upon approval of the Dean, students may substitute a Modern Language for English in the freshman year and for Commercial Geography and the Principles of Economics in the sophomore year.*

Junior Year		
Statics and Dynamics (M.E. 251)	5	
Strength of Materials (M.E. 252)		3
Theory/Practice of Steam Engrg. (M.E.305)	3	
Advanced Steam Engineering (M.E. 306)		3
Applied Mechanics Lab. (Exp. E. 201)	3	
Power and Hydraulic Lab. (Exp. E. 202)		3
Graphic Statics (C.E. 511)	2	
Machine Shop (Ind. Arts 203, 205)	2	3
Military Science (Theo. Inst. 1, 2)	1	1
Drill (Military 5, 6)	1	1
Hydraulics (I.E. 102)	—	3
	17	17
Senior Year		
Machine Design (M.E. 205, 206)	4	3
Steam Boilers (M.E. 309)	2	
Electrical Machinery (E.E. 403)	3	
Steam Power Plant Design (M.E. 316)		3
Advanced Mechanics Lab. (Exp. E. 203)	3	
Advanced Power Lab. (Exp. E. 204)		3
Gas Engine Laboratory (Exp. E. 272)		2
Internal Combustion Motors (M.E. 346)		2
Heating and Ventilating (M.E. 331)	3	
Seminar (M.E. 351, 352)	1	1
Elective	—	2
	16	16

Although it has never been unusual for engineering curricula to have a highly technical emphasis, the 1920-21 curriculum included very few nontechnical courses. English Composition was delayed until the junior year, and economics and government until the senior year. Beginning in 1953-54, electives in the humanities and social sciences became required by both the national accreditation agency and Oregon State University.



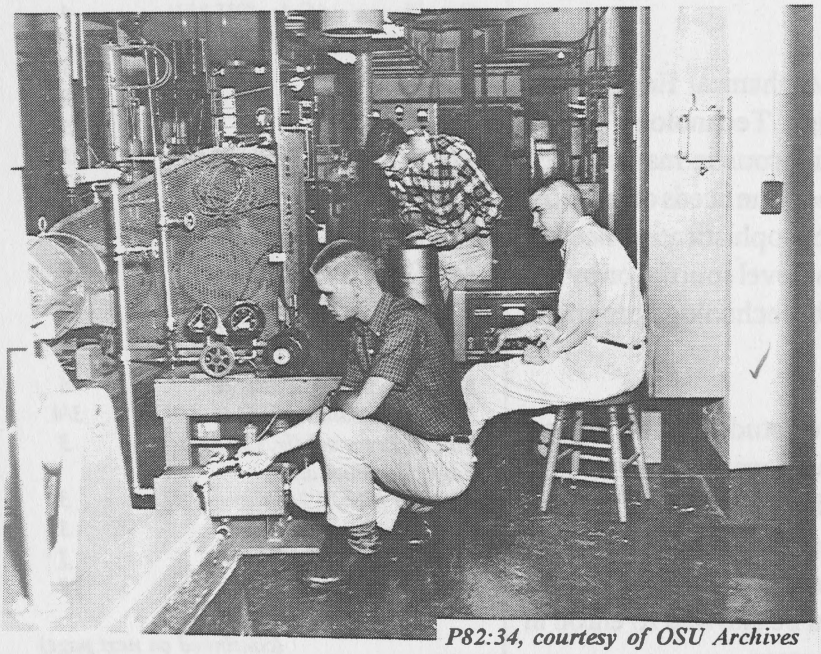
Graf Hall *P16:707, courtesy of OSU Archives*



An Aeronautical option was listed in the 1929-30 catalog, with courses in Aero Propulsion, Airplane Design, Aero Dynamics, and Navigation available to "qualified" students "on consultation with the head of the department," as substitutes for some of the regular Mechanical Engineering courses. An Automotive option was added for the 1945-46 year, and in 1953-54, options in Applied Mechanics, Heating and Air Conditioning, Power, and Metallurgy were added. For a period of time in the 1950's, options were simply listed by a footnote referring the student to an advisor for specific course requirements.

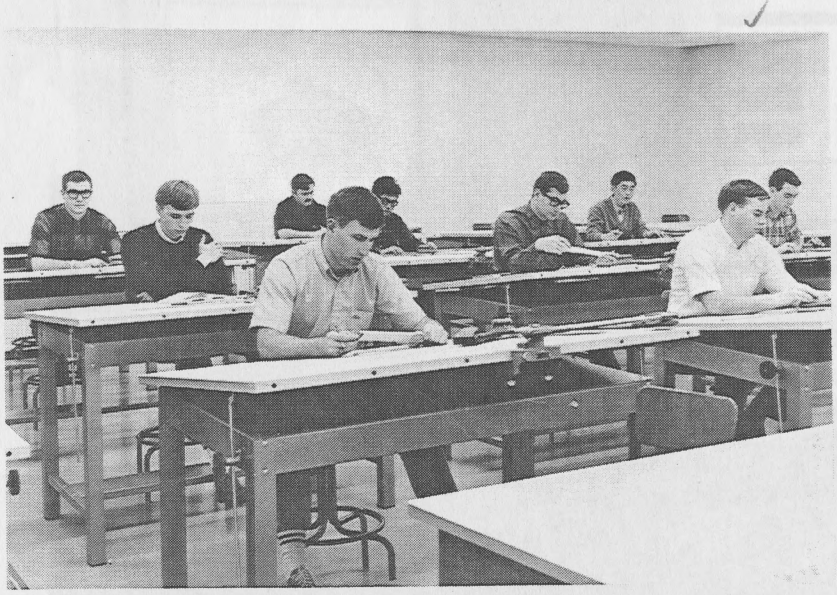
A Nuclear option was added in 1958-59, with courses and hours "to be arranged" that year but specifically spelled out in the following year's catalog. A Military Science option allowed substitution of military courses along with a minimum number of mechanical engineering courses.

The national emphasis on space exploration, which began in the late 1950's, stimulated greater emphasis on analytical approaches to engineering. This motivated mechanical engineering programs toward greater dependence on mathematics, as empirical rules were replaced with more fundamentally-based methods of prediction. The 1964-65 curriculum, shown on the right, illustrates this change in focus.



P82:34, courtesy of OSU Archives

Beginning in 1964-65, there were several administrative changes that affected the organization of the department. First, the departments of Mechanical Engineering and Industrial Engineering became the department of Mechanical & Industrial Engineering, which offered separate degrees in each discipline. In 1968-69, Metallurgical Engineering became a separate department with a degree offering. This status was terminated after the program failed to obtain accreditation from ECPD.



1964-65 Curriculum

Freshman Year	
Engr. Orient. (GE 101/2/3)	*6*
Algebra/Trig. (MTH 104)	*4*
Calculus (MTH 200/1)	*8*
General Physics (PH 207/8/9)	*12*
General Chem. (CH 201/2/3)	*9*
English Comp. (WR 111/2/3)	*9*
Defense Ed. or Elective	*3*
Phys. Ed./Gen. Hygiene	*1*
Sophomore Year	
Calculus (MTH 202/3)	*8*
App. Diff. Equations (MTH 321)	*3*
Defense Ed. or Elective	*3*
Physical Ed.	*3*
Mech. of Solids (GE 211/2/3)	*9*
Elec. Fundamentals (GE 201/2/3)	*9*
Mfg. Processes (PT 262)	*3*
Intro. to Mod. Physics (PH 213)	*3*
Sci. or Math Elective	*3*
Human./Social Science	*9*
Junior Year	
Mechancial Lab. (ME 351)	*3*
Engr. Analysis (ME 371)	*3*
Engr. Mechanics (ME 301/2)	*6*
Thermodynamics (GE 311/2/3)	*9*
Nature & Behavior of Materials (GE 321/2/3)	*9*
Trans. & Rate Proc. (GE 331/2)	*6*
Restr. Electives	*6*
Unrestr. Electives	*9*
Senior Year	
Mech. Analysis & Design (ME 411/2/3)	*9*
Mechanical Lab. (ME 437)	*3*
Mech. Engr. Economy (ME 460)	*3*
Seminar (ME 407)	*1*
Restr. Electives	*21*
Unrestr. Electives	*9*
TOTAL	*202*

In 1968-69, the department was named Mechanical, Industrial, and Nuclear Engineering, offering an additional separate degree in Nuclear Engineering. Also that year, the Aeronautical option became the Aerospace option. In 1970-71, Industrial Engineering returned to its status as a separate department. In 1973-74, the separate department of Nuclear Engineering was formed, and the pre-1964 designation, Department of Mechanical Engineering, was reinstated.

In the 1960's, curricula and degrees in Mechanical Engineering Technology and Nuclear Engineering Technology were introduced. These were somewhat less rigorous in mathematics and science content and were intended to meet the needs of industry for positions that did not require the level of sophistication needed for advanced design or research, perhaps the level spurred on by the national emphasis on space exploration. The technology programs at OSU were continued until 1978-79.

In the early 1980's, increasing numbers of students and limited budgets forced the college to devise a means of controlling enrollment. This was achieved with the initiation of a Pre-Engineering/Professional Engineering program in 1983-84, which consisted of two years of required courses for all students, with a limit on the number of students who would be allowed to enroll in the third and fourth year Professional Program.

1994-95 Curriculum

Pre-Mechanical Engineering:

Freshman Year	
Intro. to Mech. Engr. (ME 101)	*3*
Adv. Level Program. (ME 102)	*3*
General Chemistry (CH 201/2)	*6*
Calculus (MTH 251/2/3)	*12*
Gen. Physics w/ Calc. (PH 211)	*4*
English Comp. (WR 121)	*3*
Fitness (HHP 231)	*3*
Perspectives	*9*
Free Elective	*3*
Inform. and Pers. (COMM 116)	*3*
Sophomore Year	
Vector Calculus I (MTH 254)	*4*
App. Diff. Eq. (MTH 256)	*4*
Gen. Physics w/ Calc. (PH 212/3)	*8*
Statics, Dynamics, Mech. of Materials (ENGR 211/2/3)	*9*
Elec. Fund. (ENGR 201/2)	*6*
Prin. of Statistics (ST 314)	*3/4*
Mat. & Proc. in Mfg. (IE 335)	*3*
Engr. Graphics and Design (ENGR 245)	*3*
Tech. Writing (WR 327)	*3*
Perspectives	*3*
TOTAL	*99*

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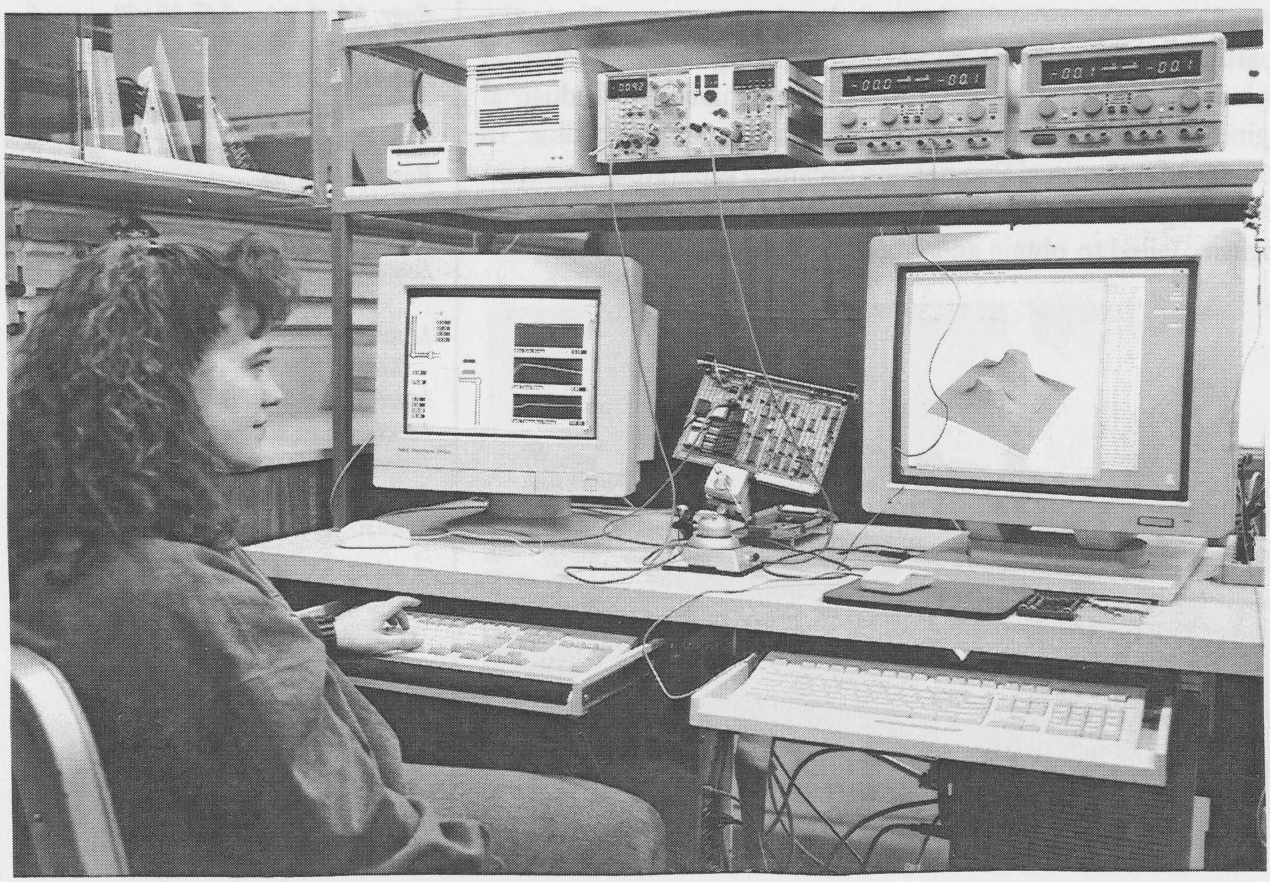

During the mid 1980's to the present, design became more of a national focus and was more intimately integrated into the mechanical engineering program, with initial design work begun prior to the senior year. The availability of computers and design software drastically changed the content of design courses, by making it feasible for students to explore many more "what-if" options than had been previously possible. During this time, the senior specialty options were replaced with the requirements of a specified number of design and analysis electives.

The Pre-Engineering/Professional Engineering program and the integrated design experience are illustrated by the 1994-95 curriculum.

At this time, there are moves both locally and nationally that promise continuing significant evolution of the curriculum to afford our students an excellent, relevant offering.

1994-95 Curriculum (continued)

Professional Mechanical Engineering:

Junior Year	
Mech. of Materials (ME 316)	3
Dynamics (ME 317)	3
Thermodynamics (ENGR 311)	3
Thermo. Application (ENGR 312)	4
Momentum, Energy, and Mass Transfer (ENGR 331/2)	8
Materials Science (ENGR 321)	3
Mech. Prop. of Matls. (ENGR 322)	4
Intro. to Design (ME 382)	4
Mech. Component Design (ME 383)	4
Instrument Lab. (ME 350)	1
Engr. Economy (ENGR 390)	3
Free Electives	5
Num. Methods in ME (ME 373)	3
Senior Year	
Perspectives	6
Synthesis	6
Mechanical Lab. (ME 351)	4
Thermal/Fluid Sys. Des. (ME 441)	3
Sys. Dynam. & Control (ME 430)	3
Senior Design Project (ME 418/9)	4
Approved Lab. Course	3
Seminar (ME 407P)	1
Project Seminar (ME 407)	1
Restricted ME Design Electives	6
Restricted ME Analysis Electives	9
Free Electives	7
TOTAL	105