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College of Engineering

RESEARCH ACTIVITIES  
ANNUAL REPORT

1982-1983

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College of Engineering  
research activities annual

**CONTENTS**

This pamphlet summarizes new research projects in the Oregon State University College of Engineering for the 1982-1983 fiscal year and certain other related data. Areas of current research emphasis are noted, and a directory of the School's research faculty is provided.

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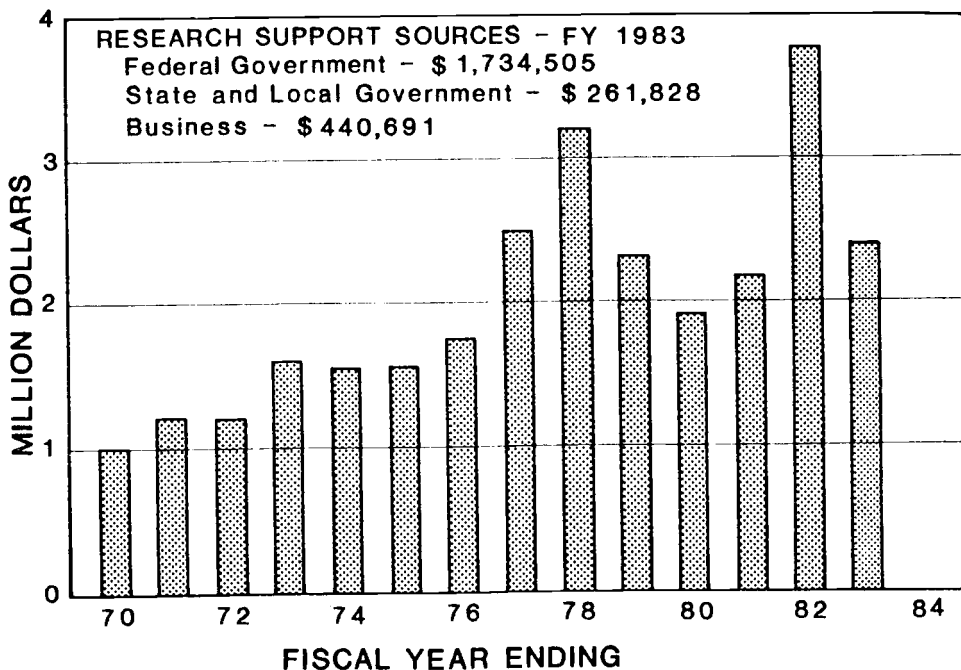
## ROLE OF RESEARCH PROGRAMS

Research involvement contributes to the strength of Oregon State University's engineering programs by providing the means to involve faculty in the advancement of knowledge, and supplementing salary resources for the employment of faculty and support personnel. Because of research, more than a third of the College's faculty is involved at any one time in investigations which take them beyond their normal classroom teaching responsibilities. Appropriated teaching salaries which would have been paid to those involved in this sponsored research are used to hire additional faculty. The result is a more diverse and highly qualified group of teaching and research engineers in the various engineering disciplines, and higher quality educational programs at both the undergraduate and graduate levels. Instructional laboratories for students benefit from the research program as equipment initially acquired for research is subsequently used for teaching. Oregon State University has long been known as a quality teaching institution. Continuing research involvement by a strong nucleus of active research engineers is vital to maintenance and enhancement of this reputation.

## RESEARCH FUNDING TRENDS

Engineering research at Oregon State University is supported entirely by grants and contracts. No State of Oregon funds are budgeted for research operations. The graph shown below summarizes research funding trends over the years since 1970 and shows that new grants and contracts this past year are down from last year when they reached an all time high, but stable when compared to funding levels over the last several years. The Federal Government is the leading source of research support.

In addition to funds for specific research grants, the graduate programs of the College of Engineering received supplemental funding of \$385,830 this past year in the form of fellowships and equipment grants.



## RESEARCH INVOLVEMENT AND PRODUCTIVITY

Table 1 shows the numbers of professorial faculty in the College's departments, degrees granted and new research grant funding for 1982-1983. Table 2 provides the distribution of actual research expenditures for the same period. Of the College's professorial faculty 47 were at least partially supported by research projects in 1982-83. Sixteen other faculty and research personnel worked on the projects, along with 79 graduate research assistants. Twenty-seven undergraduate students held part-time research-related jobs.

Table 1. Faculty, Degrees Granted, and Research Dollars

Degree Program	Faculty	Degrees Granted, 1982-83			New Research \$
		Under-graduate	Master's	Doctorate	
Agricultural Eng.*	14	15	2	0	265,236
Chemical Eng.	6	46	17	1	121,736
Civil Eng.	32	110	34	2	757,728
Construction Eng. Mgt.	-	45	-	-	-
Elec. & Comp. Eng.	24	95	28	6	324,637
Engineering Physics*	1	11	-	-	-
General Eng.	-	1	-	-	-
Industrial Eng.	13	42	1	2	164,657
Mechanical Eng.	22	100	10	2	492,789
Nuclear Eng.	10	10	5	4	310,241
<b>Total</b>	<b>122</b>	<b>478</b>	<b>97</b>	<b>17</b>	<b>2,437,024</b>

\*Agricultural Engineering is a department in the School of Agriculture, and offers ABET accredited undergraduate engineering degrees. Engineering Physics is a department in the School of Science which offers only undergraduate degrees.

Table 2. Actual Research Expenditure Distribution, Dollars, 1982-1983

Expenditure Category	Agricultural Eng.	Chemical Eng.	Civil Eng.	Electrical & Computer Eng.	Industrial Eng.	Mechanical Eng.	Nuclear Eng.	Total
Personnel	90,247	77,211	383,536	193,106	101,042	241,384	93,919	1,180,445
Payroll Assessments	20,779	12,146	88,902	41,187	26,606	45,944	9,387	244,951
Supplies & Services	19,806	17,832	69,843	49,410	21,289	18,024	15,951	212,155
Equipment	175	22,578	41,170	26,332	669	31,132	3,500	125,556
Computer	959	2,473	29,262	1,535	881	8,225	7,143	50,478
Graduate Tuition	3,444	4,572	15,800	9,994	2,376	19,512	17,632	73,330
OSU Indirect Costs	17,107	34,689	130,981	62,118	12,729	107,949	39,282	404,865
Consultants		400	34	73		3,064		3,571
Subcontractors		12,882	56,925			100,655		170,462
Travel	7,418	4,092	9,551	9,784	3,732	18,052	8,655	61,284
<b>TOTAL</b>	<b>159,935</b>	<b>188,875</b>	<b>826,004</b>	<b>393,539</b>	<b>169,324</b>	<b>593,941</b>	<b>195,469</b>	<b>2,527,087</b>

# NEW RESEARCH GRANTS AND CONTRACTS

1982 - 1983

The following listing provides names of principal investigators (faculty), research subjects, granting agency designations and project budgets for new grants and contracts.

## AGRICULTURAL ENGINEERING

Booster, D.	Effect of Reduced Tillage Practices on Crop Production in the Willamette Valley	AERF	3,700
Brooks, R.	Hydraulic Properties of Earth Materials as Affected by Clay, Water Interaction	NSF	84,299
Cuenca, R.H.	Combined Energy and Economic Analysis of Optimized Irrigation Systems	USDA-ARS	2,600
English, M.	The Effect of Irrigation Frequency on Crop Yield	USDA	21,100
English, M.	Analysis of Salmon Production Practices	NOAA	34,064
Hansen, H.	Utilizing Biomass Energy for Poultry Brooding	AERF	4,000
Hansen, H.	Agriculture Energy Use R & D	EPPI	25,500
Hellickson, M.L.	Reduced Ventilation of Livestock Structures	ARF	5,000
Hellickson, M.L.	Rigid Frame Post and Pole Structures	USDA-SCS	9,071
Kirk, D.E.	Straw Bale Burner Development	DEQ	17,848
Kolbe, E.R.	Seafood Preservation and Handling	NOAA	12,500
Miner, J.R.	Seed Harvesting and Processing (Supplement)	USDA-ARS	3,600
Moore, J.A.	Bacteria Movements from Surface Spread Animal Manure	AERF	4,500
Moore, J.A.	Tillamook Rural Clean Water Program	USDA	20,400
Moore, J.A.	Dairy Waste Management System Design	USDA-SCS	17,654



## CHEMICAL ENGINEERING

Knudsen, J.G.	Effects of Corrosion Inhibitors on Fouling Characteristics	Heat	49,287
Levenspiel, O.	Industry/University Cooperative Research: Gas-Solid Contacting in Fluidized Beds	NSF	72,449

## CIVIL ENGINEERING

Hicks, R.G.	Optimizing Mix Ingredients for Rubber Modified Asphalt Pavement	Alaska	31,318
Hicks, R.G.	Effect of Moisture and Aging on Asphalt Pavement Life	OSDT	51,510
Hicks, R.G.	Optimizing Mix Ingredients for Rubber Modified Asphalt Pavement	Alaska	11,652
Hudspeth, R.T.	Assignment to the Naval Civil Engineering Laboratory (IPA)	Navy	7,290
Klingeman, P.C.	Hydrological Research Services	DOE	2,358
Klingeman, P.C.	State Water Research Institute Program	USDI-OWRT	115,000
Leonard, J.	Computer Modeling of Flexible Membranes	USDC-NOAA	72,938
McDougal, W.G.	Stability of Marine Foundations	USDC-NOAA	61,245
Nath, J.H.	Modify Numerical Model	USDC-NOAA	3,000
Nath, J.H.	Lagrangian Drifting Buoy Validation Program	USDC-NOAA	34,995
Nath, J.H.	High Reynolds Number Wave Force Investigation in a Wave Flume	Navy	75,000
Nath, J.H.	Hydrodynamic Coefficients for Cylinders Covered with Soft Organisms	API	86,399
Nath, J.H.	Investigation of Mass Transport in Closed Wave Flumes	USDC-NOAA	8,000
Schroeder, W.L.	Logging Road Cut and Fill Slope Stability	USDA-USFS	33,870

## CIVIL ENGINEERING (continued)

Schroeder, W.L.	Pullout Resistance of Guyline Anchor Stumps	USDA-USFS	25,955
Sellitt, C.K.	Wave Tank Test of Tri-Lock 4010 Erosion Control Blocks	Tri-Lock	25,000
Sellitt, C.K.	Adaption, Deployment, Stability - Artificial Reefs	USDC-NOAA	29,400
Vinson, T.S.	Centrifugal Modeling of Ice Floe Forces and Their Failure Mechanisms	NSF	82,798

## ELECTRICAL & COMPUTER ENGINEERING

Bhattacharya, P.K. Owen, S.J.T.	Electrical Properties of Annealed and Implanted Gallium Arsenide	NSF	50,751
Bhattacharya, P.K.	A Study of Backgating Effects and Other Materials	IT&T	24,487
Bhattacharya, P.K.	Electrical and Optical Properties of Organometallic Vapor Phase	USDE	69,098
Law, H.K.	Improvement of Universal Machine Modeling of the EMTP (Supplement)	USDE-BPA	9,933
Law, H.K.	DEMEC for Variable Speed Electric Generation	Hydro Dev.	33,068
Owen, S.J.T.	High Technology Education Development	ECC	137,300

## INDUSTRIAL & GENERAL ENGINEERING

Fichter, E.F. McDowell, E.D.	Investigation of a Novel Robot Arm	NSF	64,657
Riggs, J.L.	Oregon Productivity Center (Supplement)	USDC	25,000
Riggs, J.L.	Oregon Productivity Center (Supplement)	USDC-EDA	75,000

## MECHANICAL ENGINEERING

Adams, R.L.	The Radiative Contribution to Heat Transfer Between a High Temperature Fluidized Bed and an Immersed Tube	NSF	54,959
Boubel, R.W.	Analysis of Exhaust Stack Opacity Levels	Navy	43,787
Boubel, R.W.	Analysis of Exhaust Stack Opacity Levels (Supplement)	Navy	8,759
Thresher, R.W.	Wind Turbine Structural Design and Analysis	NASA	43,000
Welty, J.R.	Combined Cycle Biomass Energy Research Project	USDA-S&E	300,000
Wilson, R.E.	Darrieus Rotor Aerodynamics	Sandia	21,568
Wilson, R.E.	Performance Modeling for Horizontal Axis Wind Turbines (Supplement)	NASA	20,716

## NUCLEAR ENGINEERING

Binney, S.E.	Reactor Post-Accident and Routine Fission Product and Chemical Monitoring	Sargent & Lundy	125,655
Dodd, B.A.	A Comprehensive Analysis of Potential Consequences and Required Masses	DOE	26,000
Hornyik, K.	Thermal-Hydraulic Modeling of Trojan in Support of Steady State	PGE	29,310
Hornyik, K.	Verification and Qualification of LWR Models for Systems Transient Analysis	GRS	16,460
Peddicord, K.L.	Characterization and Modeling of UO <sub>2</sub> Sphere-Pac Fuel (Supplement)	Exxon	5,000
Robinson, A.H.	High Speed Neutron Radiography	Army	92,291
Robinson, A.H.	Gadolinium Burnout Rates in Light Water Reactors	Exxon	15,525

# AREAS OF CURRENT RESEARCH EMPHASIS

## Agricultural Engineering

Irrigation  
Farm structures  
Waste management

Seed harvesting  
Straw burning

## Chemical Engineering

Heat exchanger fouling

Fluidized bed combustion

## Civil Engineering

Asphalt materials  
Ocean engineering  
Erosion control  
Hydrodynamics

Artificial islands  
Marine structures  
Forest slope stability  
Sediment transport

## Electrical and Computer Engineering

Solid state electronics  
Computer engineering

Systems engineering  
Materials engineering

## Industrial Engineering

Productivity

Robotics

## Mechanical Engineering

Wind power generation  
Biomass energy production  
Solar energy production

Fluidized bed combustion  
Geothermal energy  
Air pollution control

## Nuclear Engineering

Sphere-pac fuel cells  
Neutron radiography

Reactor dynamics  
Radiation safety

# FELLOWSHIPS AND EQUIPMENT GRANTS

1982 - 1983

Various outside interests annually give financial and other resources which support College of Engineering programs. Those related principally to research and graduate education are listed here.

## Electrical and Computer Engineering

Owen, S.J.T.	Tektronix Chaired Professorship	Tektronix	58,500
	Equipment Donations	Tektronix	175,000

## Chemical Engineering

Konuk, A.	Union Oil Faculty Development Fund	Union Oil	10,000
Wicks, C.E.	Predoctoral Fellowship	Weyerhaeuser Co. Foundation	9,000
Wicks, C.E.	Chevron Key Scholarship Program	Chevron	10,000
Wicks, C.E.	Equipment Grant	Chevron	7,000
Wicks, C.E.	Departmental Development Grant	Stauffer Chemical	10,000
Wicks, C.E.	Aid to Graduate Program in Chemical Engineering	Shell	7,500

## Civil Engineering

Layton, R.D.	Traffic Safety and Highway Safety Fundamentals Short Courses	OTSC	50,000
Schaumburg, F.D.	Professional Training in Pollution Control/Water Supply	EPA	7,230

## Nuclear Engineering

Ringle, J.C.	Graduate and Professional Study Fellowships	USOE	33,600
Wang, C.H.	INPO Fellowship (Hartley)	INPO	8,000

## DIRECTORY OF RESEARCH FACULTY

Dean of Engineering  
Fred J. Burgess  
Covell Hall 201  
(503) 754-4525

Assistant Dean for Research  
W.L. Schroeder  
Covell Hall 219  
(503) 754-3001

---

Agricultural Engineering  
J.A. Moore, Acting Department Head  
Gilmore Hall 100  
(503) 754-2041

Booster, Brooks, Cuenca, English, Hansen,  
Hellickson, Kirk, Kolbe, Moore

Chemical Engineering  
C.E. Wicks, Department Head  
Chemical Engineering 103  
(503) 754-4791

Crane, Knudsen, Konuk, Levenspiel,  
Meredith, Mrazek

Civil Engineering and Construction  
Engineering Management  
F.D. Schaumburg, Department Head  
Apperson Hall 206  
(503) 754-4934

Bell (C.A.), Bell (J.R.), Bella, Hicks,  
Hudspeth, Klingeman, LaBaun, Laursen,  
Layton, Leonard, McDougal, Miller, Nath,  
Nelson, Northcraft, Peterson, Phelps,  
Pritchett, Rogge, Schroeder, Schultz,  
Slotta, Staton, Tedesco, Vinson,  
Williamson

Electrical and Computer Engineering  
S.J.T. Owen, Department Head  
Dearborn Hall 303  
(503) 754-3617

Alexander, Amort, Arthur, Bhattacharya,  
Bucolo, Engelbrecht, Engle, Forbes, Herzog,  
Jensen, Kolodziej, Lauw, Lillevik, Looney,  
Magnusson, Mohler, Plant, Powers, Rathja,  
Saugen, Short, Tripathi, Weber

Industrial and General Engineering  
J.L. Riggs, Department Head  
Covell Hall 210  
(503) 754-4645

Felix, Fichter, Funk, McDowell, West

Mechanical Engineering  
J.R. Welty, Department Head  
Rogers Hall 204  
(503) 754-3441

Adams, Boubel, Burke, Bushnell, Calder,  
Davis, Holley, Kennedy, Larson, Mingle,  
Rawers, Reistad, Saletore, Smith,  
Thornburgh, Thresher, Wheeler, Wilson,  
Zaworski

Nuclear Engineering  
C.H. Wang, Department Head  
Radiation Center C 102  
(503) 754-2341

Binney, Dodd, Hornyik, Johnson, Peddicord,  
Ringle, Robinson, Spinrad, Woods