

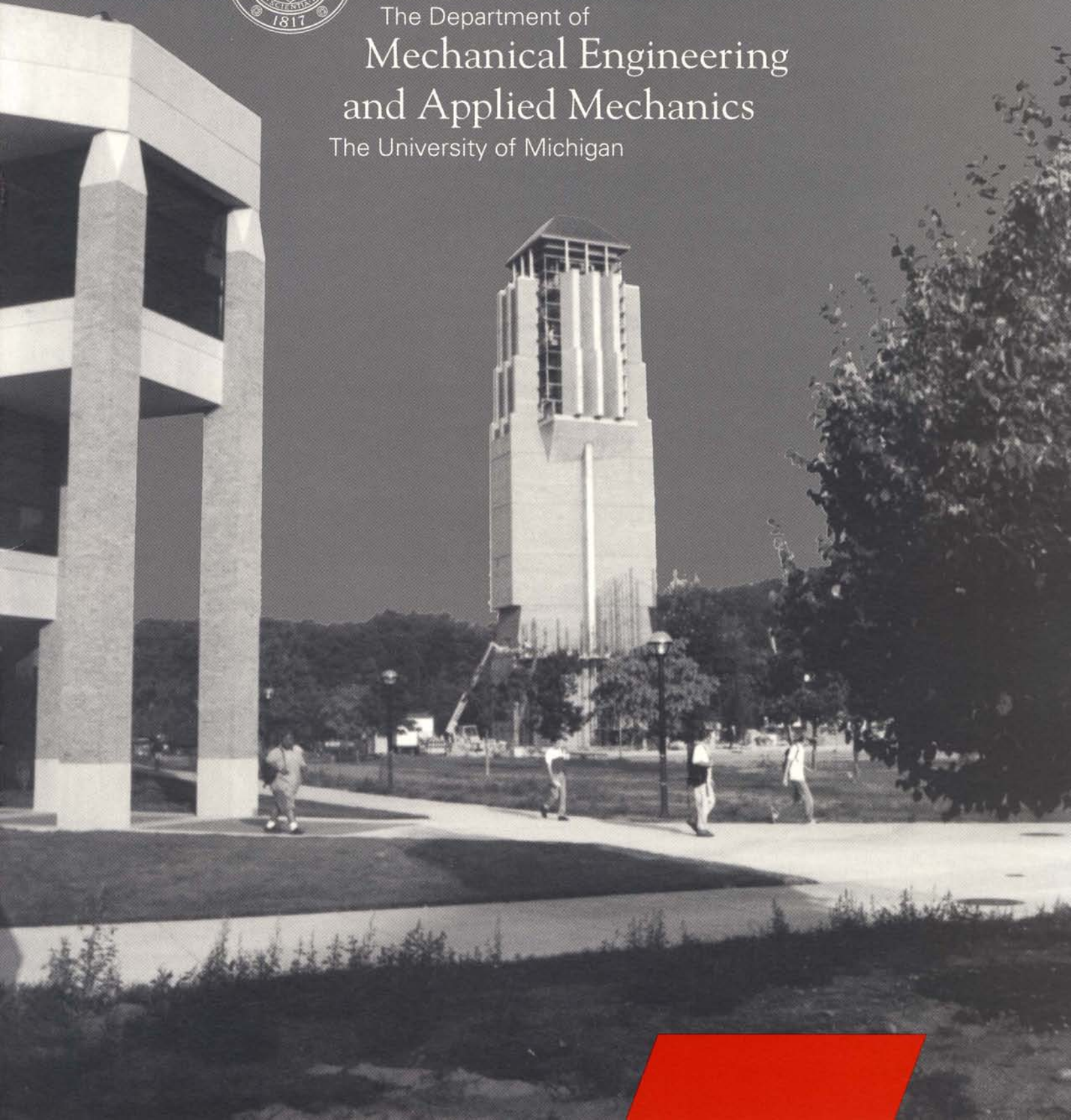
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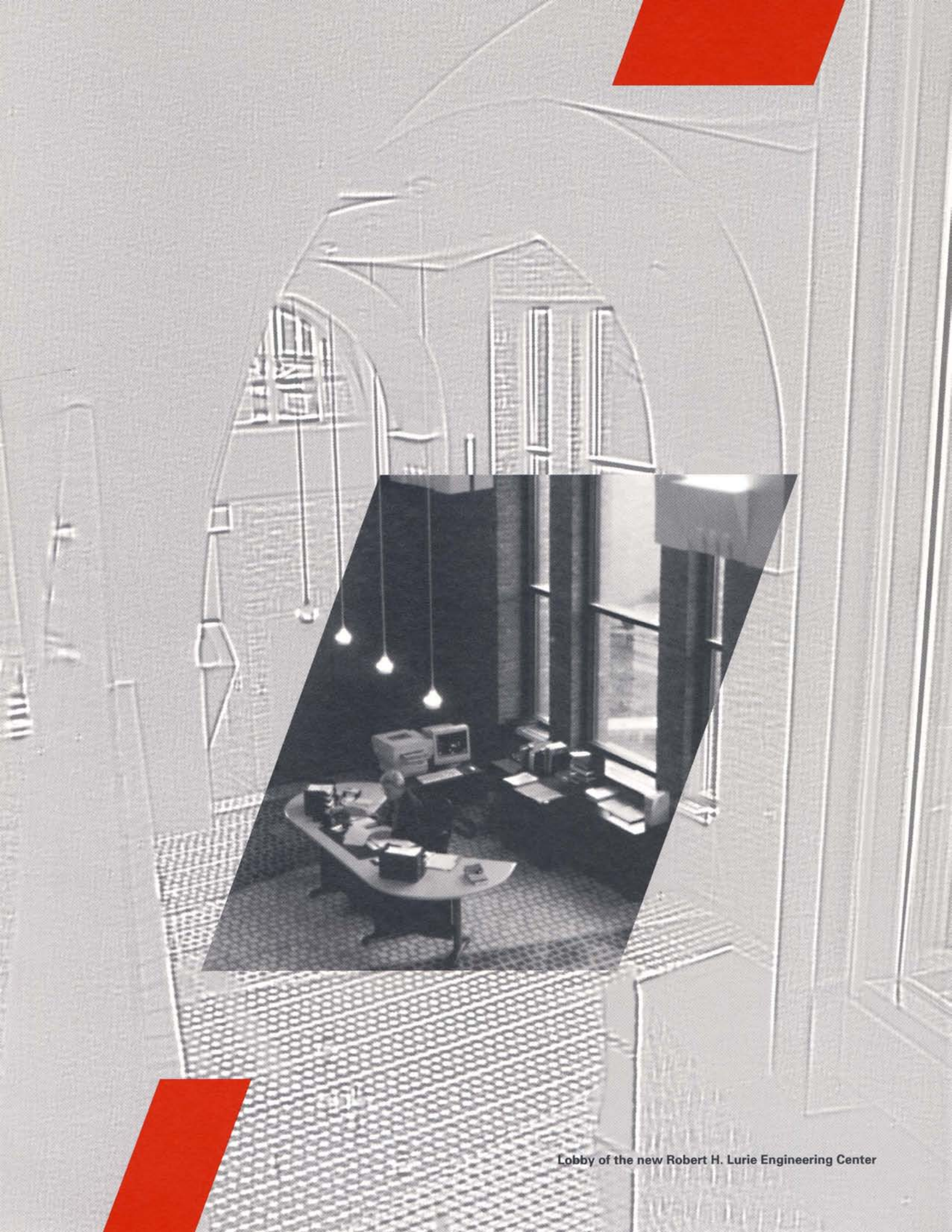


Annual Report

COMPENDIUM

The Department of
Mechanical Engineering
and Applied Mechanics
The University of Michigan





Lobby of the new Robert H. Lurie Engineering Center

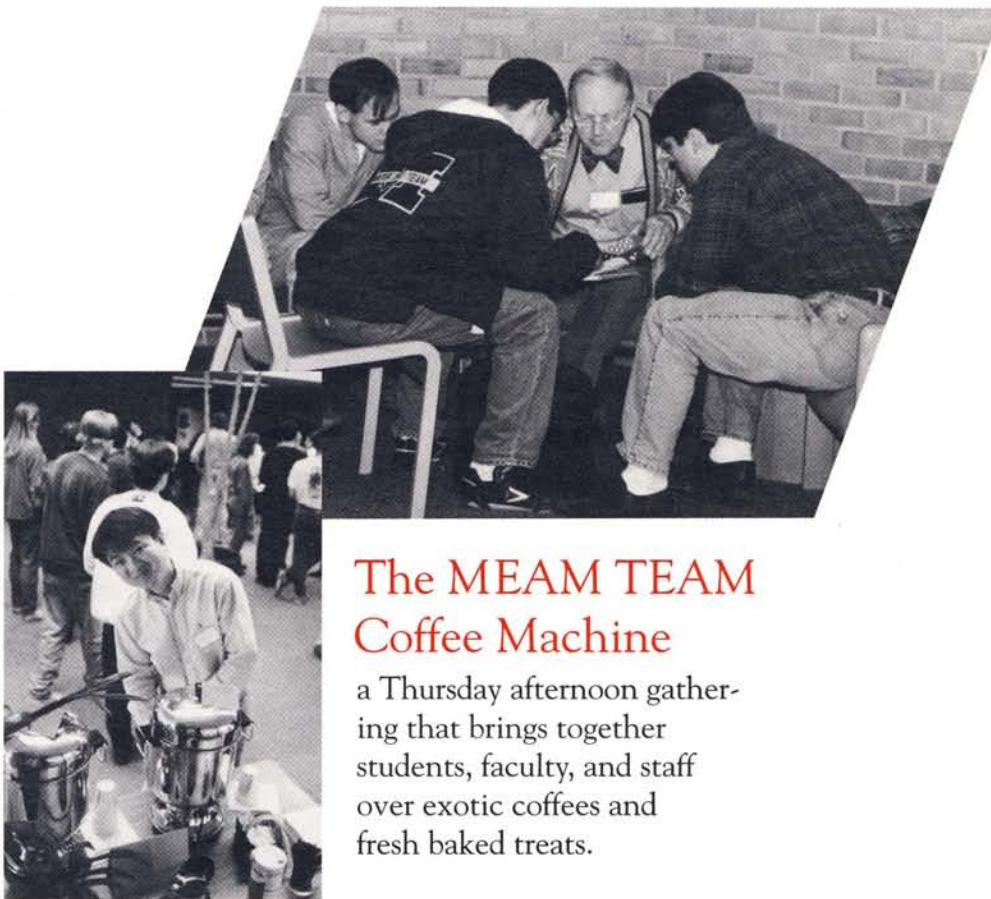
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The MEAM TEAM Coffee Machine

a Thursday afternoon gathering that brings together students, faculty, and staff over exotic coffees and fresh baked treats.



1995-96

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PHOTO: MICHAEL WOODRUFF

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A Note from the Chair

The following pages give you a “facts and figures” update on our activities this past academic year. Most of the goals we adopted in our 1993 three-year strategic plan have been accomplished:

- We have completed an unprecedented faculty recruitment effort that brought twenty outstanding new faculty to join our ranks and to help shape the Department’s future in the coming decades—and the new century.
- We have positioned the Department as the national leader in automotive and manufacturing engineering. For example, the Automotive Research Center (ARC), a U.S. Army Center of Excellence in Modeling and Simulation of Ground Vehicles, was established in 1994, while the Center for Dimensional Control had already been in existence since 1990, funded by the National Science Foundation (NSF) and ten industry partners. These have been complemented in 1996 by the Engineering Research Center in Reconfigurable Machining Systems, supported by the National Science Foundation and over twenty corporate sponsors, and by the Center for Laser Materials Processing, supported by Defense Advanced Research Projects Agency (DARPA) in collaboration with several industry partners. Our new Masters in Automotive Engineering degree program is growing rapidly, as is the College’s Program in Manufacturing (PIM), offering both masters and doctoral degrees in Manufacturing Engineering.
- We have overhauled our entire undergraduate program, introducing a new series of core hands-on, team-oriented design and manufacturing, as well as experimentation and metrology courses. Our core engineering science courses and technical electives continue to evolve into a more streamlined, unified curriculum with increased flexibility.
- We have brought a better balance to our undergraduate and graduate student populations; and we have given increased emphasis on professional graduate degrees, making it easier for non-traditional students to pursue advanced degrees through distance learning and partnership agreements with other institutions in the U.S. and abroad.
- We have established strong partnerships with our constituents, working with our highly active student societies, alumni, and our External Advisory Board to enhance our students’ experience on campus and to serve the future needs of both our graduates and their employers.
- We have continued to improve our business operations and physical plant to meet the needs of curriculum reforms, new faculty activities, and a research budget that has tripled to \$14 million of annual expenditures.

There are still many challenges ahead that the Department will be addressing with strong support from the new College and University administration, as well as its student and alumni groups and corporate friends. As a Michigan institution we are also very fortunate to enjoy the support of the parents of our students, the citizens of our State, and their representatives. This is an opportunity for me to express the gratitude of our faculty, students, and staff to all the individuals and organizations that have contributed so much to the Department’s success.

With best regards,

Panos Y. Papalambros
Professor and Chair

MEAM Student News

The College of Engineering Alumni Society Medal—Gordon J. VanWylen, MSE '47, BSE '42

MEAM Alumni Society Award—Carroll J. Haas, Sr., BSE '47

Student Organizations

Tina Avila	President, Society of Minority Engineers
Andre D'Souza	President, Volunteer Computing Corps
Sean Ferguson	President, National Society of Black Engineers
Enrico Ferrari	President, Association for Computing Machinery
Stephanie Halloran	Vice President, Senior Class
Anne Marsan, Julie Reyer	Graduates In Mechanical Engineering (GRIME)
Kevin Mason, Sean Springfield	Underrepresented Minorities in Mechanical Engineering (UMME)
Matt Mathias	President (Winter Term), Pi Tau Sigma (ΠΤΣ)
Julie Munger	Secretary-Treasurer, Senior Class
Nathan J. Murphy	President, American Society of Mechanical Engineers (ASME)
Andrea Ryan	U-M Code of Conduct Panel
Mira Sahney	President, Society of Women Engineers (SWE)
Suzanne Sarafa	President, Senior Class
Stacey Segowski	President (Fall Term), Pi Tau Sigma (ΠΤΣ)

Mechanical Engineering Student Leadership Board (MESLB)

Arun D'Souza-(ASME)	Jennifer Liedtke-(ΠΤΣ)	Julie Reyer-(GRIME)
Darin George-At Large (GRIME)	Matt Mathias-(ΠΤΣ)	Cathy Ruf-At Large (SWE)
Stephanie Halloran-At Large (Epeians)	David Messih-(SAE)	Stacey Segowski-(ΠΤΣ)
Anthony HooSang-At Large (UMME)	Theo Moreno-(UMME)	Tariq Shammim-(GRIME)
	Nathan Murphy-(ASME)	Sean Springfield-(UMME)

Student Scholarships & Awards-Undergraduate

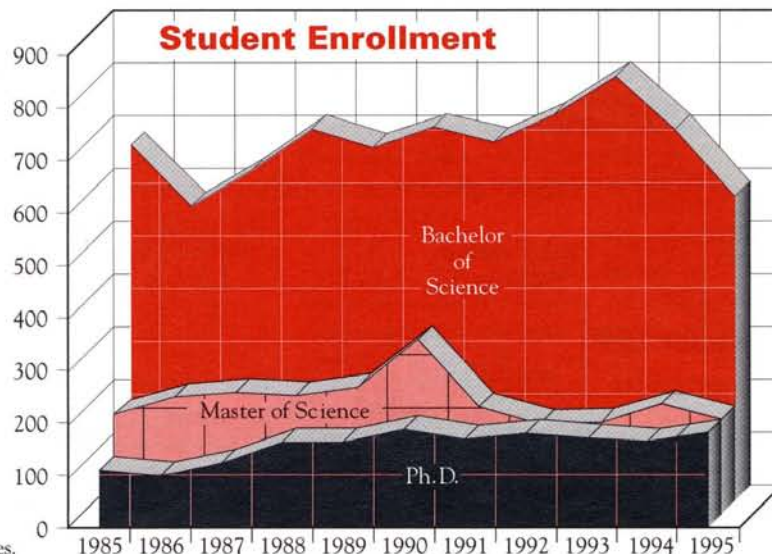
Amoco Scholarship David Reyes	Distinguished Achievement Kellie Durling	Outstanding Student Leaders Stephanie Halloran Mira Sahney Suzanne Sarafa
William E. Bandemer Scholarship Khari Burrell Kellie Durling Kevin Mason McAllister Daniel, Jr. William Pudyk	Dow Chemical Neil V. Shah Kevin Storch	Marian Sarah Parker Prize Jennifer Cook
J.A. Bursley Prize Wendy Gendler	George M. Landes Prize Alexander Kotlyar	Jay Wetzel Quality Scholarship for Excellence Natalyia Pukhlik
Robert M. Caddell Memorial Kevin Bolon	3M Scholarship Alan Yengoyan-Junior Amy K. McMahan-Senior	
John Deere Award James Driscoll IV	A.D. Moore Award Amber Thweatt	

Enrollment and Degrees Granted

Enrollment, Fall 1995	
Doctor of Philosophy	177
Master of Science in Engineering	177
Bachelor of Science	574
Total	928

Degrees Awarded 1995	
Doctor of Philosophy	30
Master of Science in Engineering	116
Bachelor of Science	257
Total	403

Numbers do not include students jointly enrolled in ME and other disciplines.



Student Fellowships & Awards-Graduate

AT&T Daniel Apley	GEM (Graduate Degrees for Minorities in Engineering and Science) Charles Hoffler II Luis Buitrago Christine Rodriguez Timothy Sanabria Morris White	MEAM John Dodson	Rackham Merit Elena Gutierrez Nigel Hyatt Daphne Joachim Ronke Olabisi Christopher Orr Bennett Ortiz
Benton James Wallace	Rollin Gerstacker Thomas Bress	National Defense Science & Engineering Graduate Michael Donovan	Rackham Pre-Doctoral Byron Newberry
Robert M. Caddell Memorial Peter Friedman	Graduate Experience Project Linda Xiaowei Huang Junjun Tang	NSF Jennifer Green Laila Guessous Paris VonLockette	U-M Regents John Batteh
CoE Fellowship Karen Lee	Ivor K. McIvor Lei Jiang	NSF Traineeship Donald Bromley Frederick Buckman Peter Ehmann George O'Neal Allen Sun	Robert Vlasic Michael Sanko
Lucile B. Conger Kellie Bailo			Whitaker Laura Wojcik
Distinguished Achievement Sang Kang Jing Wu			
DuPont James Wallace			

Doctoral Degrees Conferred

Fall 1995

Nicolas Boivin	<i>Non-Linear Modal Analysis of Nonlinear Structural Systems Using Invariant Manifolds;</i> Co-Chairs: C. Pierre & S. Shaw
Tzzy-Shuh Chang	<i>Conceptual Robustness in Distributed Concurrent Engineering and Design-In Modularity;</i> Chair: A. Ward
Randall S. Gemmen	<i>Mass Transport From a Flat Plate and Cylinder in a Strong; High Temperature, Oscillating Flow Field;</i> Co-Chairs: J. Keller & V. Arpaci
Heng-Chu Han	<i>Spectral Element Methods for the Stability of Journal Bearing;</i> Co-Chairs: W. Schultz & J. Boyd
Christopher Koh	<i>Tonnage Signature Analysis for Stamping Process Fault Detection and Isolation;</i> Co-Chairs: J. Ni & J. Shi
Chin-Yang Li	<i>Interaction of Traveling Bubbles with the Boundary Layer and Attached Cavitation;</i> Chair: S. Ceccio
Yu-Ning Lui	<i>Thermal Analysis of Multiple Beam Laser Welding;</i> Chair: E. Kannatey-Asibu, Jr.

Doctoral Degrees Conferred

Fall 1995 (cont.)

- Yutaka Nagase *Three Dimensional Microscopic Asperity Deformation Analysis for Studying Apparent Friction Behavior in Metal Forming*; Chair: N. Kikuchi
 Paul Turnbull *Analysis of a Paper Forming Process*; Co-Chairs: W. Schultz & N. Perkins
 Po-Wen Yu *Experimental and Numerical Examination of Cavitating Flows*; Chair: S. Ceccio

Winter 1996

- Wenjia Cai *Optimal Fixture Configuration Design for Deformable Sheet Metal Part Assembly*; Chair: S.J. Hu
 Roy Johanson *Topology Optimization of Multicomponent Structural Systems*; Co-Chairs: P. Papalambros & N. Kikuchi
 Young-Ho Kwon *The Removal Mechanisms of Tin Coated Steels in Scratch Test*; Chair: K. Ludema
 Amy Lerner *Influence of Mechanical Stresses on Normal Bone Growth in the Developing Femur*; Co-Chairs: S. Goldstein & L. Kuhn
 Arnold Lumsdaine *Optimal Design of Damped Laminated Structures*; Chair: R. Scott
 Jeffery Morgan *Dynamic Analysis of Coupled Substructures Using Experimentally-Based Component Mode Synthesis*; Co-Chair: C. Pierre & G. Hulbert
 Kristofor Norman *Investigation and Design of an Alternative Exhaust System for Minimum Noise, Power Loss, and Pollutant Emissions—A Theoretical, Computational, and Experimental Approach*; Chair: A. Selamet
 Jun-Shiou Ou *Integrated Optimal Structural and Vibration Control Design*; Chair: N. Kikuchi
 Wen-Hwa Shyu *Quasi-Static Mode Compensation for Component Mode Synthesis of Dynamical Systems*; Chair: G. Hulbert
 Kenjiro Terada *Global-Local Modeling for Composites by the Homogenization Method*; Chair: N. Kikuchi
 Seung-Han Yang *Real Time Compensation for Geometric, Thermal, and Cutting Force Induced Errors in Machine Tools*; Co-Chairs: J. Ni & S. Wu

Summer 1996

- Mazen Hammoud *Effects of Turbulence on Flame Initiation and Combustion Cyclic Variation in Spark Ignition Engines*; Chair: V. Arpaci
 Sungchul Jee *Fuzzy Logic Controls for CNC Machine Tools*; Chair: Y. Koren
 Tao Jiang *Topology Optimization of Structural Systems Using Convex Approximation Methods*; Chair: P. Papalambros
 Damir Juric *Computations of Phase Change*; Chair: G. Tryggvason
 Sangmo Kang *Spectral Domain Decomposition Methods for LES of Turbulence in Wall-Bounded Flows*; Chair: R. Akhavan
 Jinkoo Lee *Set-Based Design Systems for Stampings and Flexible Fixture Workspace*; Co-Chairs: A. Ward & S.J. Hu
 Dirk Wassink *Friction Dynamics in Low Speed Lubricated Sliding of Rubber: A Case Study of the Lip Seal*; Chair: K. Ludema

The MEAM External Advisory Board receives an update from Graduate Research Assistants



Faculty and Staff Honors

- Rayhaneh Akhavan** associate professor, received the ASME 1995 Robert T. Knapp Award for best paper on analytical or laboratory research. The paper was co-authored by N. Mangiavacchi and R. Gundlapalli and was entitled "Dynamics of a Turbulent Jet Interacting with a Free Surface."
- Vedat Arpacı** professor, has been awarded a CoE Teaching Excellence Award, one of three given per year. The award recognizes long term excellence in teaching and guidance at undergraduate and graduate levels. Fellow, American Society of Mechanical Engineering (ASME).
- Ellen Arruda** assistant professor, has received the U-M Career Development Fund Award which is supported by Presidential Initiatives Fund. This award was designed to recognize and address the disproportionate share of service commitments carried by women faculty.
- Claus Borgnakke** associate professor, received the Pi Tau Sigma (ΠΤΣ) Professor of the Term Award for the 1996 Winter term.
- Mehrdad Haghi** assistant professor, has been awarded the SAE Ralph R. Teetor Award in recognition for his contributions to education and research and his leadership in student activities.
- Elijah Kannatey-Asibu** professor, received the 1995 American Foundrymen Society Best Paper Award. The paper was co-authored by A.L. Purvis and R. Pehlke and was entitled "Linear Discriminant Function Analysis of Acoustic Emission Signals Generated During Solidification."
- Bruce Karnopp** associate professor, has been awarded a Thurnau Professorship in 1996, which was established to recognize outstanding contributions to undergraduate education. The program is designed to honor those tenured faculty whose commitment to, and investment in, undergraduate teaching has had a demonstrable impact on the intellectual development and lives of undergraduate students. The award will extend for three years.
- Kenneth C. Ludema** professor, received the 1995 Mayo D. Hersey Award, ASME, which is given in recognition of the distinguished and continued contribution over a substantial period of time to the advancement of lubrication science and engineering.
- Jwo Pan** associate professor, has been awarded the first Robert M. Caddell Memorial Award. This award acknowledges the outstanding research contributions in materials and/or manufacturing by a faculty member.
- Panos Y. Papalambros** professor and chair, was awarded the Black and Decker Design Automation Best Technical Paper Award at the 1995 ASME Design Automation Conference (with N. Michelena).
- Albert Schultz** Vennema Professor of Mechanical Engineering and Applied Mechanics, was named the 1995 Distinguished Lecturer in Biomechanical Engineering at Stanford University.
- Gene Smith** professor, received a CoE Service Excellence Award, one of three given per year. The award recognizes significant service and leadership contributions.
- Richard Sonntag** professor, Fellow, American Society of Mechanical Engineers (ASME).
- Dawn Tilbury** assistant professor, received one of nine Department of Energy (DoE) Undergraduate Computational Engineering and Science Education Awards for writing a series of tutorials distributed over the World Wide Web for teaching control systems design to engineering students.
- Michael Thouless** associate professor, was invited lecturer, Engineering Foundation Conference on "Mechanics and Physics of Layered & Graded Materials," Davos, Switzerland, August 1995.
- A. Galip Ulsoy** professor, was awarded the William Clay Ford Professorship of Manufacturing, effective January 1, 1996, in recognition for research and educational initiatives in expanding the presence of manufacturing-related research and course work in business and engineering.

Departmental Awards

Excellence in Teaching

Debashish Dutta in recognition of his exceptional efforts in advancing the undergraduate curriculum in engineering design, manufacturing, and CAD/CAM.

Bruce Karnopp in recognition of his sustained excellence as a teacher and mentor of students in the Department.

Excellence in Research Award

A. Galip Ulsoy in recognition of the quality and breadth of his contributions to basic research in the dynamics and control of mechanical systems, and in applying his findings to manufacturing and automotive systems.

Wen-Jei Yang in recognition of his many personal contributions to research and for promoting research in the area of heat transfer, as manifested by his nearly 500 publications to date.

Excellence in Service Award

Maria Comninou in recognition of long-standing and extraordinarily spirited service to the Department in the capacities of graduate admissions, human resource development, faculty recruiting, faculty governance, and faculty recognition.

Alan Wineman in recognition of sustained excellence in service to the students and faculty of the Department, and the University community as a whole.

Staff Excellence Award

Sue Gow for outstanding academic service to the Department and students of Mechanical Engineering and Applied Mechanics.

Charlie Wiykovics for outstanding computer hardware service to the Department and students of Mechanical Engineering and Applied Mechanics.

Professional Service

- James A. Ashton-Miller**, Editorial Board, *J. Orthopaedic Research*, 1992–; Editorial Board, *European J. Musculoskeletal Research*, 1991–; Editorial Board, *Clinical Biomechanics*, 1994–.
- Dennis Assanis**, Chair, Modeling and Computer Simulation of Internal Combustion Engines Workshop, Continuing Engineering Education; Associate Editor, *J. for Gas Turbines and Power*, ASME; Organizer, New Analytical Methods in Engine Design, ASME-ICE Spring Technical Conf., Fort Collins, CO, 1997; Organizer, Student Paper Competition, ASME-ICE Spring Technical Conf., Fort Collins, CO, 1997; Co-Organizer, Adiabatic Engines, SAE Intl. Conf. and Expo., Detroit, MI, 1996.
- James Barber**, Editorial Board, *J. Thermal Stresses*.
- Diann E. Brei**, Co-Chair, 1996 ASME Symp. on Adaptive Structures and Material Systems; Program Committee, SPIE 1996 North American Conf. on Smart Materials and Structures, San Diego, CA; Session Chair, SPIE 1996 North American Conf. on Smart Materials and Structures, San Diego, CA; Session Chair, Int. Mechanical Engineering Congress and Expo.: Winter Annual Meeting of the ASME, November, 1995; Session Chair, ASME Symp. on Adaptive Structures and Material Systems, San Francisco, CA, 1995; The Best of German/American Automotive Technology, Fraunhofer, USA, Southfield, MI, 1995.
- Michael M. Bridges**, Session Chair, IEEE American Controls Conf., Seattle, WA, June, 1995.
- Steven L. Ceccio**, Co-Organizer, ASME Symp. on Cavitation and Gas Liquid Flows in Fluid Machinery and Devices, San Diego, CA, 1996.
- Darek Ceglarek**, Session Chair, ASME IMECE Symp. "Dimensional Measurement and Control in Sheet Metal Forming and Assembly," San Francisco, 1995.
- David E. Cole**, Advisor, Army's National Automotive Center; Member, Board of Directors, Automotive Hall of Fame; Assistant Chair, Fundraising Committee for Ann Arbor Hands-On Museum; Organizer, U-M Automotive Management Briefing Seminars; Organizer, Symp. on "Organizational Change in the Automotive Industry" with the French Trade Commission; Member, Board of Trustees of Hope College.
- Debasish Dutta**, Associate Editor, *J. Mechanical Design, Transactions*, ASME.
- William J. Endres**, Member, Organizing Committee, 24th North American Manufacturing Research Conf. (NAMRC), May, 1996; Session Co-Chair on Sensor Issues, NAMRC; Faculty Co-Advisor, Society of Manufacturing Engineers (SME) Student Chapter.
- Rida T. Farouki**, Associate Editor, *Computer Aided Geometric Design*; Organizing Committee, Fourth SIAM Conf. on Geometric Design, Nashville, TN, November, 1995; Guest Lecturer, Global Analysis Research Center, Dept. of Mathematics, Seoul National University, Korea, May, 1996; Vice Chair, SIAM Activity Group on Geometric Design.
- S. Jack Hu**, Session Organizer/Chair, "Dimensional Measurement and Control for Sheet Metal Forming and Assembly," Symp., 1995 ASME Int. Mechanical Engineering Conf. and Expo.; Organizing Committee and member of Scientific Committee for 24th NAMRC; Contributing Editor, *IMECE Proceeding*, ASME.
- Gregory M. Hulbert**, Newsletter Editor, *Pressure Vessels and Piping Division of ASME*; Associate Editor, *J. of Pressure Vessel Technology*, ASME; Editorial Board, *Finite Elements in Analysis and Design*; Secretary, Committee on Computing in Applied Mechanics, Applied Mechanics Division, ASME; Secretary, Computer Technology Committee, Pressure Vessels and Piping Division, ASME; Co-Organizer and Chair, "Recent Trends in Computational Mechanics," 1995 ASME/JSME Pressure Vessels and Piping Conf.; Session Chair, "Meshless and Wavelet Methods," Third U.S. National Congress on Computation Mechanics; Session Chair, "Meshless and Wavelet Methods," 1995 ASME IMECE&E; Member, Junior Awards Committee of the Applied Mechanics Division (AMD) of ASME.
- Elijah Kannatey-Asibu, Jr.**, Chair, Executive Committee, Manufacturing Engineering Division, ASME; Associate Technical Editor, *J. of Manufacturing Science and Engineering*, ASME; Co-Organizer, 24th North American Manufacturing Research Conf. (NAMRC), May, 1996; External Examiner, Ph.D. Dissertation, University of Windsor, Canada; Fellow, American Society of Mechanical Engineers (ASME).
- Massoud Kaviany**, Chairman, Theory and Fundamental Research, Heat Transfer Div., ASME; Associate Editor, *J. of Heat Transfer*, ASME; Guest Editor, *Advances in Water Resources*; Co-Chair, Fifth Symp. on "Multiphase Transport in Porous Media," ASME.
- Jun Ni**, Associate Editor, *J. of Manufacturing Systems*; Newsletter Editor, *Manufacturing Engineering Division*, ASME; Int. Editorial Board, *Coordinate Measuring Machines and Systems*; Scientific Committee, 1995 NAMRI/SME 23rd North American Manufacturing Research Conf. Scientific Committee; 1996 24th North American Manufacturing Research Conf. (NAMRC); Member, Focus:HOPE, Greenfield Coalition for Manufacturing Education representing the U-M on Curriculum Committee.
- Jwo Pan**, Member, ASME AMD Fracture Mechanics Committee; Member, ASME PVP Materials and Fabrication Committee; Editorial Board, *Int. J. of Damage Mechanics*; Organizer, Symp. on Sheet Metal Forming, 1995 Int. Mechanical Engineering Congress & Expo., San Francisco.
- Panos Y. Papalambros**, Editorial Boards, *J. Integrated Computer Aided Engineering*, *J. Artificial Intelligence in Design and Manufacturing*, *Int. J. Engineering Design*, *J. Global Optimization*, *J. Engineering Optimization*, *J. Japan Soc. Mechanical Engineers*; Board of Directors, R&B Machine Tool Co.; Board of Directors, Fraunhofer Resource Center-Michigan.

Professional Service (cont.)

Huei Peng, Chairman, Organizer, Vehicle Control Sessions of 1995 American Control Conf., ASME, June, 1995; Chairman, Organizer, Transportation Sessions of ASME Int. Conf. and Expo., November, 1995; Chair, ASME Transportation Panel, November, 1995.

Noel C. Perkins, Associate Technical Editor, *J. of Applied Mechanics*, ASME; Editorial Board, *J. Vibration and Control*; Member, International Scientific Committee, Int. Conf. on Cable Dynamics, Liege, Belgium, October, 1995; Member, ASME Technical Committee on Vibration and Sound; Chair, Member, 1995 ASME Member Election Committee.

Christophe Pierre, Associate Editor, *J. Vibration and Acoustics*, ASME; Advisory Board, Nonlinear Dynamics; Member, ASME Technical Committee on Vibration and Sound; Member, Int. Gas Turbine Institute Structures and Dynamics Committee; Organizer and Chair, Sessions on Vehicle Structures, 1996 Critical Technologies for Modeling and Simulation of Ground Vehicles Conf.

Richard A. Scott, Member, Curriculum Committee, Greenfield Coalition; Member, MEPO Faculty Associates; Member, MLK College Committee; Coordinator, Special Events.

Jeffrey L. Stein, Chairman, Organizer, Editor, *Symp. on Modeling at ASME WAM*; Chairman, Organizer, Editor, *Symp. on Manufacturing at ASME WAM*; Secretary, *J. Dynamic Systems Measurement and Control*; Executive Committee, Secretary, Dynamic Systems and Control Division of ASME.

Michael Thouless, Associate Editor, *J. American Ceramic Society*;

Grétar Tryggvason, Co-Organizer, "Advances in Numerical Model of Free Surface and Interface Fluid Dynamics," *Symp.*, ASME, summer 1995; Associate Editor, *J. Computational Physics*.

A. Galip Ulsoy, Editor, *IEEE/ASME Transactions on Mechatronics*; Editorial Board, *Mechanical Systems and Signal Processing*.

Alan Wineman, Visiting Scientist, Institute for Mechanics and Materials, University of California-San Diego, January-March, 1996.

Wen-Jei Yang, Editor-in-Chief, *J. Flow Visualization and Image Processing*; Editor-in-Chief, *Int. J. of Rotating Machinery*; Monobusho (Japanese Ministry of Education) Foreign Special Visiting Professorship.

Faculty and Staff News

New Faculty

Liwei Lin, assistant professor, received his Ph.D. in Mechanical Engineering at the University of California at Berkeley in 1993. His research interests include design, silicon microprocessors, and microactuators.

Jyotirmoy (Jyoti) Mazumder, professor, received his Ph.D. in Process Metallurgy from Imperial College, London University, in 1978. His research area is transforming the field of materials processing by laser from a technological art to scientifically based engineering.

Promotions

Arvind Atreya, associate professor to professor with tenure

Steven L. Ceccio, assistant professor to associate professor with tenure

Jeffrey L. Stein, associate professor to professor with tenure

Departures

Mehrdad Haghi, assistant professor, has left the Department and joined Failure Analysis Associates of Los Angeles, CA.

David K. Felbeck, professor emeritus, retired in May of 1996, after 35 years of service.

Robert B. Keller, associate professor emeritus, retired in December of 1995, after 34 years of service.

In Memoriam

Howard Rex Colby, professor emeritus, died February 27, 1996, in Ann Arbor, MI. Professor Colby served on the faculty from 1947 to 1978, when he was placed on extended sick leave. He retired in 1983. Colby, a U.S. Navy veteran, was a dedicated educator, who assisted in the establishment of the Engineering Division of the U-M Dearborn Campus. He was 77.

Teresa Combs, administrative assistant in the Biomechanics Research Laboratory for eight years, died June 25, 1996, in Detroit, MI. She was a member of the MEAM main office staff prior to joining Biomechanics. Combs had taken an extended medical leave in 1994. She is survived by her husband, Merrill, and her children, Teela and Colton. She was 38.



Faculty Numbers and Replacement

Research Funding and Expenditures

July 1, 1995-June 30, 1996

Agency	Researcher	PROJECT NAME	\$ Funded	\$ Expended
2mm Program, Inc.	Hu	The Development of Advanced Technologies & Systems for Controlling Dimensional Variation in Automobile Body Manufacturing		698,361
AGU	Ulsoy	Manufacturing Engineering Instruction & Research Equipment		32,593
Air Force	Dutta	Numerical Control Machining of Cyclide Surfaces		33,161
	Dutta/Farouki	Algorithms for Geometric Comparisons in Solid Modelers for Electronic Prototyping	102,378	45,206
	Holmes	High Temperature Aerospace Structural Materials: The Mechanics and Mechanical Behavior of High Temperature Intermetallic Matrix Composites		15,231
	Holmes	Influence of Loading Frequency on the Fatigue Life and Frictional Heating of Fiber-Reinforced Ceramic Composites	82,466	121,064
	Kikuchi	High-Temperature Aerospace Structural Materials: The Mechanics and Mechanical Behavior of High-Temperature Intermetallic Matrix Composites		35,727
Army	Kota/Kikuchi	Synthesis of Jointless Compliant Mechanisms for Adaptive Compliant Wing (ACW)	98,945	
	Pierre	Modal Analysis Techniques for Nonlinear Large-Scale Structural Systems		44,962
	Pierre	Normal Modes & Modal Analysis for Nonlinear Structural Systems		28,590
	Ulsoy	Crewman's Associate for Path Control: An Automated Driving Function		40,947
Army/TACOM	Kikuchi/Dutta/Papalambros	Homogenization Design and Layered Manufacture of Mechanical Components in Project MAXWELL		116,725
	Papalambros/Stein/Pierre/Atreya/Barber/Assanis/Borgnakke/Dowling/Hulbert/Kikuchi	Automotive Research Center (ARC)	600,000	3,371,440
Autobody Consortium (ATP/NIST)	Hu/Ni/Kannatey-Asibu, Jr.	Intelligent Resistance Welding (IRW)	535,000	151,262
	Shi	ABC Equipment Fund	148,603	
	Shi	Agile Precision Sheet Metal Stamping: The "Near Zero Stamping" Program	2,880,000	332,245
Automated Analysis Corp.	Pan	Springback of Sheet Metal Forming	11,579	11,579
Beloit Corporation	Schultz, W.	Two-Dimensional Unsteady Crescent Forming	10,000	
Carnegie Mellon/USAF	Pierre	The Forced Response Consortium Initiative	131,140	51,975
Caterpillar, Inc.	Brei/Grosh	Novel Piezoelectric Sound Sources	71,996	4,942
	Dutta	Process Planning Research for Mill-Turn Parts	76,969	37,397
Center for Research on Learning and Teaching	Arruda	Improved Polymer Mechanics Teaching in the Undergraduate Mechanical Engineering Curriculum	4,978	
	Sastry	A Team-Based Approach for Education of Graduate and Undergraduate Students, Integrating, Manufacturing, and Analysis	5,000	
Chevron Oronite Technology Center	Assanis	Engine Heat Transfer and Fuel/Engine Interactions		215
College of Engineering	Koren	Goebel Distinguished Professor	13,823	17,150
	Koren	Engineering Research Center Proposal Preparation	36,750	43,832
CSA Engineering/Air Force	Kota	Feasibility Study of a Variable Stiffness Spar Design	20,000	9,828
Cummins Engines	Ludema	Scuff Prevention of Fuel Injector Parts	60,785	64,971
DARPA	Holmes	Advanced Development of Fibrous Monolithic Ceramics		160
Department of Rheology	Felbeck	Department of Reology & Fracture		1,968
Detroit Deisel	Borgnakke	Performance of a Diesel with Ethanol		177
	Borgnakke	Heavy Duty Diesel Engine Research		275
DHHS-PHS	Kuo	New Diagnostic Measures of Balance Performance in Elderly	30,417	28,878
DoD	Ward	Japan Technology Management Program	14,431	12,278
DoE	Atreya	The University of Michigan Energy Analysis and Diagnostic Center	80,905	117,325
DuPont	MEAM Chair	1995-96 Educational Student Aid Grant	10,000	10,000
	Mead	1995-96 DuPont Educational Aid Program	10,000	431
	MEAM Chair	DuPont Fundamental Research		10,367

Agency	Researcher	PROJECT NAME	\$ Funded	\$ Expended
Federal Highway Administration Ford	Ulsoy/Peng	Adaptive Driver Modeling for Advanced Vehicle Control Systems	26,523	28,858
	Arpaci	Modeling of In-Cylinder Heat Transfer & Fluid Mechanics & Modeling of the Ignition Process		1,068
	Arpaci	The Effects of Turbulence on Early Flame Development		6,834
	Arpaci	Effects of Turbulent Microscales on Flame Propagation	30,000	19,673
	Arpaci	Part-Load Engine Performance Modeling		23,999
	Arruda	Testing, Modeling & Simulations of Crash-Worthiness of a Composite Elastomer/Polymer System	50,000	60,002
	Assanis	Engine Heat Rejection Studies		10,807
	Assanis	Experimental Investigation of the Heat Rejection Characteristics of I-4 and V-6 Engine Designs		166,263
	Barber	Thermoelastic Instabilities in Automotive Brakes	23,800	2,109
	Clark	Modeling of a Tire Traversing an Obstacle		45
	Dowling	Photo-Acoustic Leak Testing	150,000	8,586
	Dowling/Grosh/ Perkins	Tuning Cable Technology for Large Scale Hydraulics		31,430
	Hulbert	Ford General Research		2,207
	Hulbert/Grosh	Noise Isolation and Reduction in Alternator Assemblies	20,000	8,663
	Hulbert/Pan/ Papalambros/ Wineman/ Holmes	Center for Automotive Structural Durability Simulation		259,590
	Kannatey-Asibu, Jr.	Multi-Sensor System for Non-Destructive Evaluation and Real-Time Monitoring of Laser Weld Quality	50,000	
	Kaviani	Liquid Acquisition in Compact Condensers	99,216	96,183
	Kikuchi	Evaluating the Topological Optimization Approach		4,360
	Kikuchi	A Study for the Crash Energy Absorption Optimization of Front Frame Rail Section		18,585
	Kota	Strategic Approaches to the Management of Product Line Complexity	25,000	
	Kota	A Framework for Selection of Engine Assembly Automation Concepts		211
	Ludema	Study of Rack & Pinion Steering Gear Seal Friction Dynamics	134,880	119,429
	Merte, Jr./Lee	Thermal Behavior in Wire Harnesses	29,310	
	Pan	Strain Rate Effect on the Formability of Aluminum Sheets		15,774
	Pan	Plastic Anisotropy and Failure Criteria		15,411
	Papalambros	Design Management Strategies: An Application to Powertrain Design		9,645
	Papalambros	Large Scale Optimization for Automotive Components	29,835	35,917
	Perkins/Barber	Traction and Parasitic Loss in Automotive Accessory Drives	19,000	18,534
	Selamet	Research in Engine Performance Modeling		22,886
	Selamet	Integrated Muffler/Manifold Catalyst Exhaust System: An Innovative Approach		463
	Selamet	An Experimental & Theoretical Study of Exhaust System for Engine Performance		17,716
	Selamet	Research in Engine Performance Modeling		85,959
	Selamet	Analysis and Improvement of the Bentler and Hitachi MCM Systems		54,390
	Selamet	Modeling and Design of Exhaust System Components for Improved Engine Performance and Noise Characteristics: Theory, Computations, and Experiments, Phase II, Part 2		108,776
	Selamet	Engine Performance Modeling		41,430
	Stein	Advanced Motor Control for Automotive Steering and Active Suspension Application		2,190
	Tryggvason	A Hierarchy of Reduced Models for Underhood Flows		57,348
	Ulsoy	Mathematical Modeling of Manufacturing Processes	50,000	10,031
	Ulsoy/Peng	Advanced Suspensions and Vehicle Dynamics and Control		27,470
	Ulsoy/Perkins	Accessory Drive Belt Dynamics Design Program		38,648
Ward	Design of Air Conditioning Components with Conceptual and Physical Robustness		23,630	
Yang, W.-H.	Ford General Research		16,607	
Yang, W.-H.	Development of an Optimized CAE Tool for Safety Analysis		7,257	
Yang, W.-J.	Visualization of Flows in Torque Converters	39,999	55,945	
Yang, W.-J.	Temperature Measurements of Cutting Tools		2,213	

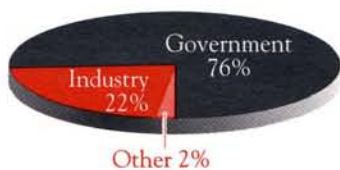
Agency	Researcher	PROJECT NAME	\$ Funded	\$ Expended
Fraunhofer Resource Center	Chen	Development of Reliable Process Parameters for the Laser Welding of Aluminum Sheet Metal With and Without Filler Wire	60,888	27,079
	Kannatey-Asibu, Jr.	Development of Reliable Process Parameters for the Laser Welding of Aluminum Sheet Metal	30,992	2,306
G & L	Ni	The Development of an Adaptive Compensation Technique for Enhancing CMM Accuracy		979
Gas Research Institute	Arpaci	An Investigation of Mass Transfer in an Oscillating Flow Field: Efficient Drying via Pulse Combustors		33
GLCTTR	Atreya	Formation and Oxidation of Soot and NOx in Diffusion of Flames		81,270
	Hulbert	Proper Three-Dimensional Tire Models		1,491
	Hulbert	A Study of Dynamic Three-Dimensional Load Transfer Characteristics of Tires During Durability Events	18,310	12,547
	Peng	Worst-Case Evaluation Method for Trucks		4,610
	Peng	Performance Evaluation of Active Suspension for Trucks	28,583	18,876
GM	Stein	A High Efficiency Powerplant for Heavy Trucks and Buses: A Feasibility Study		3,324
	Stein	Assessing the Driving Conflicts Generated by Trucks Equipped with Intelligent Cruise Control (ICC)	22,811	
	Hu	Variability Characterization and Tolerance Budget Analysis for Die Manufacturing		404,912
Goldstar Corporation	Kaviany	Computer Modeling Experimental and Analytical Study of Transient Heat Loss to Airbag Materials	141,567	82,407
	MEAM Chair	Doctor of Philosophy in Mechanical Engineering	8,000	20,576
Greenfield Coalition/NSF	Shi	Variation Reduction for Body-in-White Assembly at Lansing Car Assembly Plant		171,917
NSF	Kikuchi	Development of a Practical Design Optimization for Mechanical Structures		10,587
	Hulbert/			
	Kannatey-Asibu, Jr.	Engineering Sciences Knowledge Area Curriculum Development		
Hayes-Wheels		Mechanophysics Knowledge Stem	58,881	67,347
	Kannatey-Asibu, Jr.	Instructional Modules on Tool Wear/Tool Life and Non-Traditional Machining		6,068
	Schultz, W.	Thermal/Fluid Science Knowledge Area Development	18,000	17,387
Horiba Instruments, Inc.	Yang, W.-H.	Hayes Wheels General Research	50,000	
	Geister	Software Development for Arc-Welding Simulation and Optimization		29,093
Hyundai America Technical Center		Computerized Control and Measurement of I.C. Engine Performance		30
Inst. Manf. Tech./Chrysler	Borgnakke	Engine Performance and Emissions		6,835
	Hu	Variation Reduction Program for the Chrysler Corporation	200,000	38,313
Inst. Manf. Tech./GMC	Ni	"Book of Knowledge" Program for the Chrysler Corporation	100,000	27,936
	Ni	"Thermal Compensation" Program for General Motors of Canada, Ltd.	50,000	423
Inst. Manf. Tech./Perceptron	Shi	Technical Assistance Programs for Perceptron, Inc.	50,000	
ITS Research Center for Excellence				
	Peng	Global Active Safety Strategy Through Combined ATMS and AVCS Techniques	34,389	21,901
	Stein	Active Safety Conflict Model		22,494
IVHS	Stein	Modeling the Driver Conflict	13,095	
	Ulsoy	IVHS Lane Sensing		38,109
John Deere Foundation	Kota	Synthesis, Simulation, and Rapid Prototyping Using Motion Building Blocks		569
	Kota	Development of an Integrated Mechanisms Course: Undergraduate Curriculum Development Proposal	15,000	
Lamb Technicon/NIST-ATP	Koren/Ulsoy/Pasek	Agile Precision Line Boring	395,000	56,913
Lawrence Berkeley/DoE	Sastry	Microstructural Modeling of Highly Porous Composites	149,080	42,453
Legacy Good Samaritan Hospital & Medical Center/NIH	Kuo	Organization of Postural Control: Vestibular Processing	23,507	34,876
MI Space Grant/NASA	Bridges	Nonlinear High Precision Tracking Control of Rotating Machinery with Harmonic Drive Gearing	4,000	9,751
Mobil Technology	Assanis	Investigation of the Effects of Lubricating Oil Boundary Friction Modifiers on Overall Engine and Piston Ring Friction	150,000	58,922
	Assanis	Investigation of the Effects of Lubricating Oil Boundary Friction Modifiers on Overall Engine and Piston Ring Friction of a Ford 2.0 Liter Zetec Engine	100,000	

Agency	Researcher	PROJECT NAME	\$ Funded	\$ Expended
Modicon	Koren/Ulsoy	A Sequencing Central Controller for Flexible Transfer Lines		20,882
NASA	Merte, Jr.	Graduate Student Researchers Program—Bouyancy Effects on the Forced Convection Critical Heat Flux		737
	Tryggvason	Computational Studies of Boiling under Microgravity	22,000	23,618
	Tryggvason/Ceccio	Fundamentals of Mold-Free Casting: Experimental and Computational Studies	45,000	46,062
NASA—Lewis	Arpaci	Droplet Evaporation Under Microgravity	20,000	29,720
	Atreya	An Experimental & Theoretical Study of Radiative Extinction of Diffusion		5,159
	Atreya	Radiant Extinction of Gaseous Diffusion Flames	67,500	
	Merte, Jr.	A Study of Forced Convection Nucleate Boiling in Microgravity		42,758
	Merte, Jr./Keller	Study of Pool Boiling in Microgravity—Rewetting Following Dryout	166,075	156,814
	Pierre	Experimental Investigations of the Effects of Mistuning on the Forced Response of Blade Assemblies	42,621	
	Tryggvason	Computational Studies of Drop Collision and Coalescence		34,134
National Center for Manufacturing Sciences	Ni	Real Time Error Compensation (RTEC) Project		27,406
Navy	Ceccio	HPIV Measurements in Cavitating Flows		56,537
	Ceccio	Experimental Study of Cavitation Transient Boundary Layer Interactions		39
	Dowling/ Schultz, W.	Surfactant Dynamics		36,871
	Farouki/Dutta	Computational Methods for Rapid Prototyping of Analytical Solid Models	76,000	130,486
	Ni	Thermal Error Compensation System Design for Precision Machining Center	35,221	1,135
	Perkins	Nonlinear Mechanisms Controlling the Dynamics and Elastic Stability of Suspended Cables		87,449
	Schultz, W./ Dowling	Short Wave and Surfactant Interactions		19,213
	Ward	Generalized Quantitative Inferences on Sets of Possibilities in Design & Planning		4,772
NIH	Ashton-Miller	Biomechanics of Female Stress Urinary Incontinence	198,998	231,834
	Ashton-Miller/ Schultz, A.	Older American Independence Center—Intervention 3	96,875	109,096
	Schultz, A.	Fundamental Aspects of Mobility in Old Adults	693,123	907,456
	Schultz, A.	Older American Independence Center—Biomechanics Core	57,646	52,668
NIH—DHHS	Ashton-Miller	Urinary Incontinence Prevention	15,931	7,939
NIH—PHS	Kuo	Mechanisms of Sensorimotor Adaptation	117,951	
Nissan	Kikuchi	General Research Support for Computational Methods for Automotive Engineering		6,085
	Kikuchi	Development of Structural Optimization Theory Using the Homogenization Method and its Application for Dynamic Response Problems		4,056
NIST	Atreya	Basic Research on Fire Suppression		7,049
	Atreya	Characterization of Sprinkler Sprays and their Interaction with Fire Induced Flows	68,326	18,559
NSF	Akhavan	Spectral Domain-Decomposition Methods for LES of Turbulence in Complex Geometries		3,318
	Arruda	Proof-of-Principle Study of the Use of Orientation Parameters Measured		745
	Arruda	Research Initiation Award: Synthesis, Experimental Testing, and Constitutive Modeling of Elastomeric Networks Having Statistically Well-Defined Structures and Defect Structures		21,561
	Arruda/ Schultz, W./Gupta	Non-Isothermal, Analytical, and Experimental Study of Viscoelastic Fiber Drawing	89,157	85,200
	Barber	Thermoelastic Effects in the Solidification of Castings		28,258
	Barber	Frictionally-Exited Thermoelastic Instabilities in Automotive Disk		60,220
	Borenstein	Design and Control of Multi-Degree of Freedom Vehicles for Industrial Applications		18,177
	Brei	Proof-of-Concept Study of Piezoceramic C-Block Actuators	17,853	17,514
	Dutta	Computer-Aided Process Planning for Parallel N.C. Machines	46,212	41,738
	Endres/Thouless/ Pan/Ludema	Mechanics-Based Analysis of Small-Scale Surface Generation in Hard-Tool Machining	239,431	63,897
	Haghi	Knowledge-Guided 3-D Detection of Brain Tumor Volume		36,745
	Holmes	Young Investigator Award	25,000	27,208
	Kannatey-Asibu, Jr.	Laser Beam Splitting & Materials Processing		1,164
	Kannatey-Asibu, Jr.	Lasers in Manufacturing	133,200	99,915
	Kaviany	Thermomechanical Aspects of Multicomponent Binder Melting and Evaporation in Thermal Debinding		78,337

Agency	Researcher	PROJECT NAME	\$ Funded	\$ Expended	
NSF (cont.)	Kikuchi/Dutta/ Papalambros	Optimal Design of Topology and Microstructure of Discrete Parts in Project MAXWELL	87,308	27,515	
	Koren	A New Architecture of CNC Servo-Controllers		2,057	
	Kota	A New Method of Synthesis for Micro-Electro-Mechanical Systems in a Single Phase: From Function and Fabrication	10,000	11,626	
	Kota/Kikuchi	Systemic Synthesis of Jointless Compliant Mechanisms—Design for No-Assembly (DNA)	99,195	26,079	
	Kuo	Development of a Biologically-Motivated Model for Adaptive, Multi-Input Multi-Output Control of Human Balance	73,393	15,397	
	Ni	The Development of a Science Base for Drills and Drill Grinding Processes		92,328	
	Ni	Presidential Faculty Fellows Award	100,000	26,790	
	Ni	Machine-Tool Chatter Prevention Through Spindle Speed Variation		1,053	
	Ni	National Science Foundation Industry/University Cooperative Research Center for Dimensional Measurement and Control in Manufacturing	50,000	11,548	
	Stein	Well-Conditioned Observers for High-Performance, Low-Cost, Sensing Systems		26,968	
	Tilbury	Controls Education Using Matlab: Tutorials on the World Wide Web	117,205	19,377	
	Tilbury	Intelligent Control of an Autonomous Flying Vehicle	18,000		
	Tryggvason	Direct Numerical Simulations of Multi-Phase Flows	240,000	38,932	
	Ulsoy	Adaptive Repetitive Control of Nonlinear Discrete-Time Systems	55,551	46,909	
	Ulsoy/ Kannatey-Asibu, Jr./ Koren/Ni	Establishment of Graduate Research Traineeship Program	93,500	153,858	
	Ulsoy/Koren	Hierarchical Controller for Real-Time Quality Control in Machining	151,628	198,020	
	Ward	Stochastic Strategies for Distributed Decisions in Concurrent Engineering	72,357	50,691	
	ONR	Akhavan	Direct Numerical Simulations of Free-Surface Turbulent Flows		18,418
		Ceccio	Inception and Dynamics of Sheet Cavitation	125,001	73,351
		Dowling	Phase-Conjugate Array Focusing in Littoral Waters	46,625	26,929
Kikuchi/Dutta/ Papalambros		Research in Design Optimization and Computational Geometry in Project MAXWELL	264,178	278,837	
Perkins		Propagating Structural Wave Phenomena in Elastic Cables		17,717	
OVPR	Perkins	Fluid-Induced Nonlinear Dynamic Tensioning of Cables	53,000		
	Perkins	Nonlinear Resonant Tensioning of Cables in Cross-Flows	130,320		
	Schultz, W.	Wave Model by Vorticity Task B3		60,795	
	Tryggvason	Wave Model by Vorticity Task B3		78,099	
	Arruda	Career Development Award/Michigan Agenda for Women	5,000		
Rackham	Ashton-Miller	Effect of Age and Physical Activity on PFM Activity in Nulliparous Women		1,361	
	Brei	Design and Feasibility Study on Piezoceramic C-Block Actuators		9,887	
	Brei	GE Junior Faculty Fellowship	10,000	7,563	
Ricardo North America, Inc.	Bridges	Faculty Research Grant		3,935	
	Ceccio	Faculty Research Grant		3,277	
	Dowling	Faculty Research Grant		601	
	Grosh	Faculty Research Grant		17,307	
	Peng	Faculty Research Grant		2,742	
	Thouless	Faculty Research Grant	14,905	2,887	
	Tilbury	Faculty Research Grant	15,000	520	
	Sastry	Fundamental Hydrocarbon Emissions Generation Mechanisms in Automotive Engines	60,000	13,042	
	Sastry	Structural Analysis and Design of Composite Parts Produced by RTM		24,400	
	Sandia Labs/DoE School of Business Administration SMS—ARPA	Hu	Faculty Research Fellowship	20,000	
SNECMA	Ni	Advanced Compensation System for Quasi-Static and Cutting Force-Induced Errors for Turning Centers		318,435	
	Pierre	Studies of the Dynamics of Dry Friction Damped Blade Assemblies	17,000	17,791	
	Geister	Emissions from Alternate Fueled State of Michigan Vehicles		4,333	
	Perkins	The Mechanics and Modeling of Wet Paper Forming		17,271	
State of Michigan TAPPI TASC, Inc.	Michelena/ Papalambros/ Hulbert	System and Model Integration for Analysis and Design	29,258		
Toyota	Hulbert	Toyota Seminar Series		403	
	Kikuchi	Automotive Engineering	31,600	31,597	
Transitions Research Company	Borenstein	The Multi-Degree of Freedom Vehicles		1,723	

Agency	Researcher	PROJECT NAME	\$ Funded	\$ Expended
Transportation Services TRW: Vehicle Safety Systems	Haghi	Hybrid Electric Vehicle		14
	Grosh/Perkins	Evaluation and Analysis of Rattle Noise		55,187
	Perkins	Vibration Analysis		11,071
Univ. of Illinois/NASA	Assanis	Direct Injection of Natural Gas: In-Cylinder CFD Computations Using KIVA-3	84,446	102,670
Univ. of Illinois/NSF	Ni	National Coalition for Machine Tool Technology		152,598
US Car	Michelena/ Papalambros	Optimal Design of Non-Conventional Vehicles	107,688	
Various Research Sponsors	Hulbert	Computational Mechanics		4,818
	Ludema	Surface Phenomena		880
	Ni	NSF/Industry University Cooperative Research Center for Dimensional Measurement and Control in Manufacturing—Corporate Sponsorship	462,697	580,696
Various Sponsors	Yang, W.-J.	Thermal Research Activities		4,032
	Ni	S.M. Wu Discretionary		79,035
	Ni	S.M. Wu Memorial Fund		1,599
	Ni	S.M. Wu Symposium	15,000	210
Whirlpool	Dutta	Whirlpool Research		593
	Haghi	Processing and Failure of Materials with Distributed Properties		2,368
	Ward	Whirlpool Fellowship		3,815
Whitaker Foundation	Borenstein	The NavBelt: A Computerized Travel Aid for the Blind		65,049
	Grosh	Ultrasonic Phased Arrays for Non-Invasive Hyperthermia and Tissue Ablation Cancer and Cardiac Therapy	208,697	3,210
Yardney Technical Products	Kuo	An Age-Related Study of Sensorimotor Control of Human Balance		41,169
	Sastry	Testing of Novel Battery Electrode Materials		2,157
			\$12,678,503	\$13,969,174

Research Funding Sources



Total Expenditures

1992/93



1995/96



1993/94

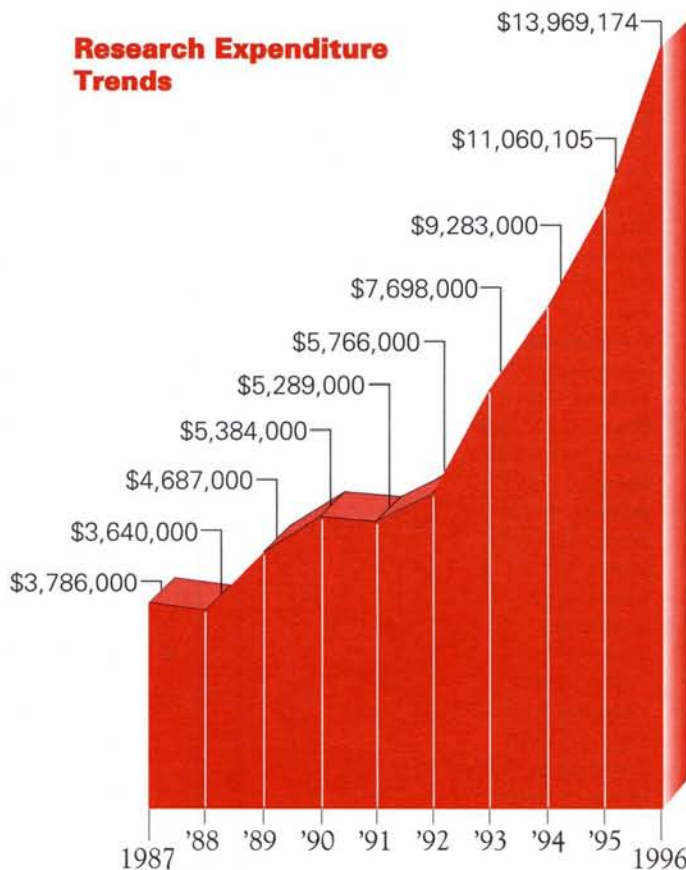


1994/95



- Instructional
- Research
- Academic Support
- Scholarship / Fellowship

Research Expenditure Trends



Research Interests
MEAM FACULTY

	Biomechanics				Control & Measurement						Dynamics				Design					
	Structural Analysis	Biomechanical Models	Movement Analysis & Control	Prosthetics	Automated Modeling / CAE	Control Systems	Microelectromechanical Sys.	Modeling & Identification	Robotics	Sensing, Signal Processing	Structural Dynamics	Multi-body Dynamics	Nonlinear Dynamics	Vehicle Dynamics	Acoustics & Vibration	Kinematics	AI & Design Methodology	CAD / CAE Geometric Mod.	Innovative Systems	Tribology
Akhavan, Rayhaneh																				
Arpaci, Vedat S.																				
Arruda, Ellen M.																				
Assanis, Dennis																				
Atreya, Arvind																				
Barber, James R.																				
Borgnakke, Claus																				
Brei, Diann E.																				
Bridges, Michael M.																				
Ceccio, Steven L.																				
Chen, Michael M.																				
Cole, David E.																				
Comninou, Maria A.																				
Dowling, David R.																				
Dutta, Debasish																				
Endres, William J.																				
Farouki, Rida T.																				
Felbeck, David K.																				
Goldstein, Steven A.																				
Grosh, Karl																				
Haghi, Mehrdad																				
Hollister, Scott J.																				
Holmes, John W.																				
Hu, S. Jack																				
Hulbert, Gregory M.																				
Jacobs, Stanley J.																				
Kannatey-Asibu, Jr., Elijah																				
Karnopp, Bruce H.																				
Kaviany, Massoud																				
Keller, Robert B.																				
Kikuchi, Noboru																				
Koren, Yoram																				
Kota, Sridhar																				
Kuo, Arthur D.																				
Ludema, Kenneth C.																				
Mead, David																				
Merte, Jr., Herman																				
Ni, Jun																				
Pan, Jwo																				
Papalambros, Panos Y.																				
Peng, Huei																				
Perkins, Noel C.																				
Pierre, Christophe																				
Sastry, Ann Marie																				
Schultz, Albert B.																				
Schultz, William W.																				
Scott, Richard A.																				
Smith, Gene E.																				
Sonntag, Richard E.																				
Soslowsky, Louis J.																				
Stein, Jeffrey L.																				
Taylor, John E.																				
Thouless, Michael																				
Tilbury, Dawn																				
Tryggvason, Grétar																				
Ulsoy, A. Galip																				
Wineman, Alan S.																				
Yang, Wei-Hsuin																				
Yang, Wen-Jei																				

● Active in the field, conducts research, teaches courses, contributes papers; ○ Interest in the field, small research grants, sometimes teaches courses

Research Interests
MEAM FACULTY
(continued)

	Manufacturing										Solid Mechanics							Combustion		
	CAM / NC Process Planning	Machining & Welding	Metal Forming	Non-trad. Manufacturing	Process Control & Monitoring	FEM & Comp. Mechanics	Fracture Mech. & Fatigue	Viscoelasticity	Composites (CMC & PMC)	Plasticity	Plates and Shells	Thermomechanics	Elasticity	Contact Mechanics	Chemistry & Kinetics	Instabilities	Multiphase Reacting Flows	Energy Conversion	Environmental	Materials Processing
Akhavan, Rayhaneh														○	○					
Arpaci, Vedat S.															●	●				○
Arruda, Ellen M.			●			●			●	●			●							
Assanis, Dennis						●								○		●	●	●		
Atreya, Arvind														●	○	●	●	●		○
Barber, James R.						○		○		●	●	●								
Borgnakke, Claus			○										○		●	●	●			
Brei, Diann E.	●		●	●	●		○		●		●									
Bridges, Michael M.				○																
Ceccio, Steven L.			●												●				○	
Chen, Michael M.	●		●	○																
Cole, David E.																	○	○		
Comninou, Maria A.						●					●	●								
Dowling, David R.														○		○	○			
Dutta, Debasish	●	○	○	○																
Endres, William J.	●	●	○	○	○	○	○	○												
Farouki, Rida T.	○																			
Felbeck, David K.						●		●												
Goldstein, Steven A.						○	○													
Grosh, Karl						●				●		○								
Haghi, Mehrdad			●			●	●	●	●											
Hollister, Scott J.						●	○	●												
Holmes, John W.						●		●		●										
Hu, S. Jack	○	●	●	○	●															
Hulbert, Gregory M.						●			●			●								
Jacobs, Stanley J.																				
Kannatey-Asibu, Jr., Elijah		●		●	●															●
Karnopp, Bruce H.																				
Kaviany, Massoud															○					
Keller, Robert B.																				
Kikuchi, Noboru		○	●			●		●	●	●	●		●							
Koren, Yoram	●	●		○	●															
Kota, Sridhar			●																	
Kuo, Arthur D.																				
Ludema, Kenneth C.		○	○										○							
Mead, David						●	○					○								●
Merte, Jr., Herman																				
Ni, Jun	●	●	●	○	●															
Pan, Jwo		●	●			●	●	●	●	●	●									
Papalambros, Panos Y.	○		○	○		○														
Peng, Huei		●		○																
Perkins, Noel C.						●					●	●								
Pierre, Christophe						●														
Sastry, Ann Marie			●	●		●	●	●	○	○	○	●								
Schultz, Albert B.																				
Schultz, William W.		○		●			●													●
Scott, Richard A.						●														
Smith, Gene E.																				
Sonntag, Richard E.																				
Soslowsky, Louis J.							●	●			○	○								
Stein, Jeffrey L.					●						○		○				○			
Taylor, John E.						●		●		●	○	○								
Thouless, Michael			●				●	●			●									
Tilbury, Dawn					●															
Tryggvason, Grétar														●	○					●
Ulsoy, A. Galip	○	○			●															
Wineman, Alan S.			●	●			●	●		●	●									
Yang, Wei-Hsuin		●	●			●			●											
Yang, Wen-Jei		●																		

● Active in the field, conducts research, teaches courses, contributes papers; ○ Interest in the field, small research grants, sometimes teaches courses

Research Interests
MEAM FACULTY
(continued)

	Combust. (cont.)					Fluid Dynamics						Heat Transfer								
	Appls.					Fundamentals			Applications			Fundamentals			Applications					
	Microgravity	Transportation	Complex Fluids	Multiphase	Numerical Techniques	Turbulence	Waves & Instabilities	Biomedical	Cavitation	Mats. Process. & Manf.	Transportation	Convection	Molecl. & Small Scales	Phase Chg. & Multiphase	Radiation	Energy Conversion	Environmental	Mats. Process. & Manf.	Microgravity	Transportation
Akhavan, Rayhaneh		●	●	●	●	●	○	●		●	●	●	●			○				
Arpaci, Vedat S.	●		●		●	●			●		●	●	●			○		●		
Arruda, Ellen M.								●								●				
Assanis, Dennis		●	●	●	○				●				●	●						●
Atreya, Arvind	●	●			○					●	○	○	●	●	●	○	○	○		
Barber, James R.																				
Borgnakke, Claus		○	○	●	●			●		●		●	●	○	●					
Brei, Diann E.																				
Bridges, Michael M.																				
Ceccio, Steven L.	●	○	●	●	●		●	●	●	●		●				●	●			
Chen, Michael M.			○	●	○			●		●	○	●	○			●				
Cole, David E.																				
Comninou, Maria A.																				
Dowling, David R.		○	●		●	●		●	●											
Dutta, Debasish																				
Endres, William J.																●				
Farouki, Rida T.																				
Felbeck, David K.																				
Goldstein, Steven A.	○					●														
Grosh, Karl																				
Haghi, Mehrdad																				
Hollister, Scott J.																				
Holmes, John W.																				
Hu, S. Jack																				
Hulbert, Gregory M.																				
Jacobs, Stanley J.		●			●	●														
Kannatey-Asibu, Jr., Elijah																				
Karnopp, Bruce H.																				
Kaviany, Massoud									●	○	●	○		●		●				
Keller, Robert B.																				
Kikuchi, Noboru				●			○	●								○				
Koren, Yoram																				
Kota, Sridhar																				
Kuo, Arthur D.																				
Ludema, Kenneth C.																				
Mead, David		●	●	●		●		●								●				
Merte, Jr., Herman											●		●	●	●	●	●	●	●	●
Ni, Jun																				
Pan, Jwo																				
Papalambros, Panos Y.	●													○	○					○
Peng, Huei																				
Perkins, Noel C.																				
Pierre, Christophe																				
Sastry, Ann Marie				○				●								●				
Schultz, Albert B.																				
Schultz, William W.		●	●	●		●	○	●		○		●				●				
Scott, Richard A.																				
Smith, Gene E.	●			○										●						●
Sonntag, Richard E.											○	○		●	●					○
Soslowsky, Louis J.																				
Stein, Jeffrey L.																				
Taylor, John E.																				
Thouless, Michael																				
Tilbury, Dawn																				
Tryggvason, Grétar		●	●	●		●		●	●	●		●		●	●	●				●
Ulsoy, A. Galip																				
Wineman, Alan S.		●	●					●												
Yang, Wei-Hsuin																				
Yang, Wen-Jei			●	●	○		●	○	●		●	○	●	●	○	●	●	●	●	●

● Active in the field, conducts research, teaches courses, contributes papers; ○ Interest in the field, small research grants, sometimes teaches courses

Research Interests

MEAM RESEARCH SCIENTISTS

	Biomechanics					Control & Measurement					Dynamics			Design					
	Structural Analysis	Biomechanical Models	Movement Analysis & Control	Prosthetics	Automated Modeling / CAE	Control Systems	Electromechanical Sys.	Modeling & Identification	Robotics	Sensing, Signal Processing	Structural Dynamics	Nonlinear Dynamics	Vehicle Dynamics	Acoustics & Vibration	Kinematics	AI & Design Methodology	CAD / CAE Geometric Mod.	Innovative Systems	Systems Integration
Ashton-Miller, James	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Borenstein, Johann						●	●	●	●			○							
Ceglarek, Dariusz							●	○						○					
Ervin, Robert D.				○	●	●	●	●				●						●	
Filipi, Zoran											○						●		
Geister, Donald E.														●	●				
Ma, Zheng-Dong				○		●	●	●	○	●	●			○		●			
Michelena, Nestor F.				○		○								●		●		●	
Wu, Xin																			
Yuan, Jingxia				○	○	○	●	●	○	○		○	●			○			

	Manufacturing							Solid Mechanics					
	Automotive Assembly	Statistical Process Control	CAM/NC Process Planning	Machining & Welding	Metal Forming/Assembly	Non-trad. Manufacturing	Process Control & Monitoring	FEM & Comp. Mechanics	Fatigue	Fracture Mechanics	Plasticity	Elasticity	Contact Mechanics
Ashton-Miller, James													
Borenstein, Johann													
Ceglarek, Dariusz	●	○	○		●	●							
Ervin, Robert D.													
Filipi, Zoran													
Geister, Donald E.				●									
Ma, Zheng-Dong							○	○		●	●		
Michelena, Nestor F.			○				○						
Wu, Xin				●	●	●			●	●			
Yuan, Jingxia		○		●	●	●	○						

	Combustion				Fluid D		Heat Transfer	
	Chemistry & Kinetics	Energy Conversion	Environmental	Materials Processing	Transportation	Convection	Energy Conversion	Environmental
Ashton-Miller, James								
Borenstein, Johann								
Ceglarek, Dariusz								
Ervin, Robert D.				●				
Filipi, Zoran	○	●	●	○	●	●	○	●
Geister, Donald E.								
Ma, Zheng-Dong								
Michelena, Nestor F.								
Wu, Xin								
Yuan, Jingxia							●	

● Active in the field, conducts research, teaches courses, contributes papers
 ○ Interest in the field, small research grants, sometimes teaches courses

Faculty Publications 1995

Biomechanics

Contributing Faculty: James Ashton-Miller, Steven Goldstein, Scott Hollister, Arthur Kuo, Albert Schultz, Louis Soslowsky.

Journal Articles

Alexander, N.B.; Mollo, J.M.; Giordani, B.; Ashton-Miller, J.A.; Schultz, A.B.; Grunawalt, J.A.; Foster, N.L.; "Maintenance of Balance, Gait Patterns, and Obstacle Clearance in Alzheimer's Disease," *Neurology*, 45, 5, 908-914, 1995.

Ateshian, G.A.; Ark, J.W.; Rosenwasser, M.P.; Pawluk, R.J.; Soslowsky, L.J.; Mow, V.C.; "In Situ Contact Areas in the Thumb Carpometacarpal Joint," *J. of Orthopaedic Research*, 13, 450-458, 1995.

Constantz, B.R.; Ison, I.; Fulmer, M.T.; Poser, R.D.; Smith, S.T.; VanWagoner, M.; Ross, J.; Goldstein, S.A.; Jupiter, J.B.; Rosenthal, D.I.; "Skeletal Repair by In Situ Formation of the Mineral Phase of Bone," *Science*, 267, 1796-1799, 1995.

Gilting, M.; Van den Bosch, C.; Lee, S.C.; Ashton-Miller, J.A.; Alexander, N.B.; Schultz, A.B.; Ericson, W.A.; "Association of Age with the Threshold for Detecting Ankle Inversion and Eversion in Upright Stance," *Age and Ageing*, 24, 58-66, 1995.

Hollister, S.J.; "Mechanical Factors Influencing Total Joint Outcome," *Current Orthopaedics*, 9, 2-8, 1995.

McCubbrey, D.A.; Cody, D.D.; Peterson, E.L.; Kuhn, J.L.; Flynn, M.J.; Goldstein, S.A.; "Static and Fatigue Failure Properties of Thoracic and Lumbar Vertebral Bodies and their Relation to Regional Density," *J. of Biomechanics*, 28, 8, 891-899, 1995.

Ottaviani, R.; Ashton-Miller, J.A.; Kothari, S.U.; Wojtys, E.M.; "Basketball Shoe Height and the Maximal Muscular Resistance to Applied Ankle Inversion and Eversion Movements," *American J. of Sports Med.*, 23, 4, 418-423, 1995.

Persad, C.C.; Giordani, B.; Chen, H.C.; Ashton-Miller, J.A.; Alexander, N.B.; Wilson, C.S.; Berent, B.; Guire, K.; Schultz, A.B.; "Neuropsychological Predictors of Complex Obstacle Avoidance in Healthy Older Adults," *J. of Gerontol: Psych. Sci.*, 50, 5, 272-277, 1995.

Schultz, A.B.; "Muscle Function and Mobility in the Elderly: An Overview of Some Recent Research," *J. of Gerontol: Biol Sci.*, 50A (Special Edition), 60-63, 1995.

Soslowsky, L.J.; Carpenter, J.E.; "Basic Science, Mechanics, and Anatomy of the Shoulder and Elbow," *Current Opinion in Orthopaedics*, 6, 55-62, 1995.

Soslowsky, L.J.; Goldstein, S.A.; "Testing of Ligament Reconstruction," *AAOS Bulletin*, 43, 4, 7-8, 1995.

Thelen, D.G.; Schultz, A.B.; Ashton-Miller, J.A.; "Cocontraction of Lumbar Muscles During the Development of Time-Varying Triaxial Moments," *J. of Orthopaedic Research*, 13, 3, 390-398, 1995.

Van den Bosch, C.; Gilting, M.; Lee, S.G.; Richardson, J.K.; Ashton-Miller, J.A.; "Peripheral Neuropathy Effect on Ankle Inversion and Eversion Detection Thresholds," *Arch. Phys. Med. Rehabil.*, 76, 850-856, 1995.

Waanders, N.A.; Lawton, J.N.; Steen, H.; Goulet, J.A.; Goldstein, S.A.; "Clinical Estimation of Ilizarov Fixator Axial Stiffness Based on Wire and Half Pin Contributions," *Bulletin for Hospital for Joint Diseases*, 53, 5, 9-12, 1995.

Zhang, X.; Ashton-Miller, J.A.; Stohler, C.S.; "Three-dimensional Unilateral Method for the Bilateral Measurement of Condylar Movements," *J. of Biomech.*, 28, 8, 1007-1011, 1995.

Conference Proceedings

Ashton-Miller, J.A.; Nyquist, L.; Liang, J.; Schultz, A.B.; Giordani, B.J.; Alexander, N.B.; "On Physical Risk-Taking in Healthy Community-Dwelling Elderly," *Gerontological Society of America*, Los Angeles, November, 1995.

Ashton-Miller, J.A.; Yeh, M.; Richardson, J.K.; "The Reliability of Unipedal Weight Transfer onto an Unsteady Surface in Adults With and Without Peripheral Neuropathy," *ASME Bioengineering Conf.*, Beaver Creek CO, June, 1995.

Blasier, R.B.; Soslowsky, L.J.; Malicky, D.M.; Palmer, M.L.; "Posterior Glenohumeral Stabilization Factors: Progressive Effects in a Biomechanical Model," *American Academy of Orthopaedic Surgeons*, 147, 1995.

Blasier, R.B.; Soslowsky, L.J.; Malicky, D.M.; "Posterior Glenohumeral Stabilization Factors: Progressive Effects in a Biomechanical Model," *Trans. of the 6th Int. Congress on Surgery of the Shoulder*, 6, 289, 1995.

Carpenter, J.E.; Soslowsky, L.J.; DeBano, C.M.; Banerji, I.; Moalli, M.R.; "Mechanisms of Rotator Cuff Tendinosis in an Animal Model," *Trans. of the 6th Int. Congress on Surgery of the Shoulder*, 6, 333, 1995.

Colman, W.; Kelkar, R.; Soslowsky, L.J.; Bigliani, L.U.; Flatow, E.L.; "Mathematical Acromioplasty: An Experimental and Computer Simulation of Contact," *American Shoulder and Elbow Surgeons*, 21, 1995.

Derwin, K.A.; Soslowsky, L.J.; "The Tail Tendon Fascicle of the Mov13 Mouse as a Model for Studying Structure Function," *Trans. of the Orthopaedic Research Society*, 20, 13, 1995.

Derwin, K.A.; Soslowsky, L.J.; "Studies of Tendon Composition, Structure, and Mechanics Using a Transgenic Mouse Model," *Proc. of the 1995 Bioengineering Conf.*, 29, 203-204, 1995.

Elder, S.H.; Soslowsky, L.J.; "Geometric and Tensile Property Investigation of a Tendon that Passes Around a Bony Pulley," *Trans. of the Orthopaedic Research Society*, 20, 40, 1995.

Felkey, M.L.; Sprague, J.K.; Alexander, N.B.; Ashton-Miller, J.A.; Giordani, B.J.; Schultz, A.B.; Miller, A.C.; Grunewalt, J.; Srivastava, B.; "Lorazepam Impairs Gait Accuracy and Timing in Older Adults," *Gerontological Society of America*, Los Angeles, November, 1995.

Giordani, B.J.; Miller, A.C.; Alexander, N.B.; Guire, K.E.; Ashton-Miller, J.A.; Berent, S.; Persad, C.; Schultz, A.B.; "Neuropsychological Factors Relate to Self-Report and Performance-Based Measures of Functional Mobility," *Gerontological Society of America*, Los Angeles, November, 1995.

Guldberg, R.E.; Goldstein, S.A.; Caldwell, N.J.; Kuelske, C.L.; Guo, X.E.; Moalli, M.; Hollister, S.J.; "Mechanical Influences on Trabecular Bone Repair," *Trans. 41st Meeting Orthopaedic Research Society*, 175, 1995.

Guo, X.E.; Weissman, D.E.; Goulet, R.W.; Hollister, S.J.; Derwin, K.A.; Goldstein, S.A.; "Characterization of Local Failure in Vertebral Trabecular Bone," *Trans. 41st Meeting Orthopaedic Research Society*, 532, 1995.

- Hollister, S.J.; Guldberg, R.E.; Kuelske, C.L.; Caldwell, N.J.; Richards, M.; Goldstein, S.A.; "Effects of Healing and Mechanical Stimulus on Bone Adaptation to Porous Coated Implants at Five Weeks," *Trans. 41st Meeting Orthopaedic Research Society*, 556, 1995.
- Katz, L.S.; Alexander, N.B.; Ashton-Miller, J.A.; Giordani, B.J.; Schultz, A.B.; Green, M.; Sprague, J.K.; "How a Cognitive Challenge Affects Stepping Accuracy in Young and Old Adults with Experimentally-Impaired Vision," *American Geriatrics Society Meeting*, DC, May, 1995.
- Kelkar, R.; Colman, W.W.; Soslowky, L.J.; Pollock, R.G.; Flatow, E.L.; Bigliani, L.U.; Mow, V.C.; "The Effect of Anterior Acromioplasty on Rotator Cuff Contact: An Experimental and Computer Simulations," *Trans. of the Orthopaedic Research Society*, 20, 22, 1995.
- Kelkar, R.; Colman, W.W.; Ateshian, G.A.; Soslowky, L.J.; Pollock, R.G.; Flatow, E.L.; Bigliani, L.U.; Mow, V.C.; "Three-Dimensional Topography of the Acromion: A Quantitative Study and Simulation of Surgical Alterations," *Advances in Bioengineering*, ASME, 31, 149-150, 1995.
- Kim, K.-J.; Ashton-Miller, J.A.; Schultz, A.B.; Strohbehn, K.; DeLancey, J.O.L.; "The Vescio-Urethral Pressuregram: A New Method for Analyzing the Differences in Resting and Dynamic Urethral Functions Between Young Nulliparous and Stress Incontinent Women," *Gerontological Society of America*, Los Angeles, November, 1995.
- Koenig, J.; Nyquist, L.; Ashton-Miller, J.A.; Liang, J.; Schultz, A.B.; Giordani, B.J.; Alexander, N.B.; "Engagement in Physical Activities: Physical and Psychological Factors," *Gerontological Society of America*, Los Angeles, November, 1995.
- Kohn, D.H.; Ko, C.C.; Hollister, S.J.; "Experimental Validation of Interfacial Elastic Constants Predicted by Homogenization Theory," *Trans. 41st Meeting Orthopaedic Research Society*, 753, 1995.
- Kohn, D.H.; Ko, C.C.; Hollister, S.J.; "Experimental Validation of Analytically Determined Interfacial Material," *J. of Dental Research Abstracts of the 24th Annual Meeting of the American Association for Research*, 74, 92, 1995.
- Kuo, A.D.; "An Optimal Control Model for Analyzing Human Postural Balance," *IEEE Trans. on Biomedical Engineering*, 42, 87-101, 1995.
- Kuo, A.D.; "A Simple Method of Improving Precision of Inverse Dynamics Computations," *Proc. of the 18th Annual Meeting of the American Society of Biomechanics*, Stanford, CA, 1995.
- Kuo, A.D.; "Analysis of Stability of Human Posture Strategies," *Proc. of the 18th Annual Meeting of the American Society of Biomechanics*, Stanford, CA, 1995.
- Kuo, A.D.; "Control Model of Human Postural Strategy," *IEEE Eng. in Medicine and Biology Society Proc.*, Montreal, 1995.
- Malicky, D.M.; Soslowky, L.J.; Blasier, R.B.; "Inferior Glenohumeral Subluxation: Active and Passive Stabilization in a Biomechanical Model," *Trans. of the Orthopaedic Research Society*, 20, 679, 1995.
- Malicky, D.M.; Soslowky, L.J.; Blasier, R.B.; "Long Head of Biceps: Contributions to Glenohumeral Stabilization in Three Clinically Important Directions," *Advances in Bioengineering*, ASME, 31, 5-6, 1995.
- Riemer, B.A.; Hollister, S.J.; "Analysis of Osteocyte and Lacunar Strains Using an Idealized Finite Element Model," *Trans. 41st Meeting Orthopaedic Research Society*, 540, 1995.
- Rouleau, J.P.; Palmer, M.L.; Hollister, S.J.; Moore, D.C.; Huijskes, R.; "Development of a Local Homogenization Model of the Trabecular Bone-Cement Interface," *Trans. 41st Meeting Orthopaedic Research Society*, 752, 1995.
- Schultz, A.B.; Thelen, D.G.; Ashton-Miller, J.A.; Alexander, N.B.; Giordani, B.J.; Guire, K.E.; "Physical Capacities and Mobility Performance of Old Adults," *American Geriatrics Society Meeting*, DC, May, 1995.
- Soslowky, L.J.; Carpenter, J.E.; Banerji, I.; DeBano, C.M.; "Development of an Animal Model for Investigations on Rotator Cuff Disease," *American Academy of Orthopaedic Surgeons*, 273, 1995.
- Soslowky, L.J.; Carpenter, J.E.; DeBano, C.M.; Flanagan, C.L.; Haut, K.M.; Moalli, M.R.; "Mechanisms of Rotator Cuff Tendinosis: A Biomechanical and Histologic Study Utilizing an Animal Model," *Trans. of the Orthopaedic Research Society*, 20, 23, 1995.
- Soslowky, L.J.; An, C.H.; DeBano, C.M.; Carpenter, J.E.; "The Coracoacromial Ligament: In Situ Load and Viscoelastic Properties in Rotator Cuff Disease," *Trans. of the Orthopaedic Research Society*, 20, 680, 1995.
- Soslowky, L.J.; Derwin, K.A.; "Studies of Tendon Composition, Structure, and Mechanics Using a Transgenic Mouse Model," *Proc. of the 4th China-Japan-USA-Singapore Conf.*, K, 150-153, 1995.
- Thelen, D.G.; Ashton-Miller, J.A.; Schultz, A.B.; Alexander, N.B.; "Age Effects of Muscle Activities During Rapid Torque Development," *ASME Bioengineering Conf.*, Beaver Creek, CO, June, 1995.
- Thelen, D.G.; Wojcik, L.A.; Schultz, A.B.; Ashton-Miller, J.A.; Alexander, N.B.; "Effects of Age on the Ability to Recover from a Forward Fall," *ASME Bioengineering Conf.*, Beaver Creek, CO, June, 1995.
- Wenzel, T.E.; Fyhrie, D.P.; Hollister, S.J.; "A Simple Mathematical Model for Strain Distributions in Cancellous Bone," *Trans. 41st Meeting Orthopaedic Research Society*, 537, 1995.
- Wojcik, L.A.; Thelen, D.G.; Ashton-Miller, J.A.; Alexander, N.B.; "Do Strengths or Reaction Times Predict Ability to Recover from a Forward Fall?" *Gerontological Society of America*, Los Angeles, November, 1995.
- Wojcik, L.A.; Thelen, D.G.; Schultz, A.B.; Ashton-Miller, J.A.; Alexander, N.B.; "Effects of Age on Ability to Recover from a Forward Fall," *American Geriatrics Society Meeting*, DC, May, 1995.

Book Chapters

- Hollister, S.J.; Goldstein, S.A.; "Relationships Between Trabecular Tissue Strains and Bone Adaptation under Controlled Implant Loads," in *Bone Structure and Remodeling*, World Congress of Biomechanics Symp. on Trabecular Bone, A. Odgaard, H. Weinans (eds), 51-64, 1995.

Kohn, D.H.; Ko, C.C.; Hollister, S.J.; Snoeyink, D.I.; Awerbuch, J.; Ducheyne, P.; "Methods of Detecting and Predicting Microfracture in Titanium," *Medical Applications of Titanium and Its Alloys: The Material and Biological Issues*, ASTM STP 1272, S.A. Brown, J.E. Lemons (eds), American Society for Testing and Materials, Philadelphia, 1995.

Combustion and Heat Transfer

Contributing Faculty: Vedat Arpacı, Dennis Assanis, Arvind Atreya, Claus Borgnakke, Michael Chen, Elijah Kannatey-Asibu, Jr., Massoud Kaviany, Robert Keller (emeritus), Herman Merte, Jr., Ahmet Selamet, Richard Sonntag, Wen-Jei Yang.

Journal Articles

Arpacı, V.S.; Li, C.Y.; "Turbulent Forced Diffusion Flames," *Combustion and Flame*, 102, 170–178, 1995.

Arpacı, V.S.; "Buoyant Turbulent Flow Driven by Internal Energy Generation," *Int. J. Heat Mass Transfer*, 38, 2761–2770, 1995.

Arpacı, V.S.; "Microscales of Turbulent Combustion," *Prog. Energy Combustion Sci.*, 21, 153–171, 1995.

Bergstrom, P.L.; Ji, J.; Liu, Y.-U.; Kaviany, M.; Wise, K.D.; "Thermally Driven Phase-Change Microactivation," *AIEE J. Microelectro-Mechanical Systems*, 4, 10–17, 1995.

Hanamura, K.; Kaviany, M.; "Propagation of Condensation Front in Steam Injection into Dry Porous Media," *Int. J. of Heat and Mass Transfer*, 38, 1377–1386, 1995.

Kirk, K.M.; Merte, Jr., H.; Keller, R.B.; "Low Velocity Subcooled Nucleate Flow Boiling at Various Orientations," *ASME J. of Heat Trans.*, 117, 2, 380–386, May, 1995.

Park, K.; Sonntag, R.E.; "An Equation of State for the PVT Behavior of Gaseous Refrigerants," *Korean J. of Air-Conditioning and Refrigeration Engineering*, 7, 1, 98–111, 1995.

Yang, W.-J.; Kuo, S.-L.; Zhang, N.; "Role of Main Stream Velocity in Film Cooling in a Duct with Mass Addition," *J. of Thermophysics and Heat Transfer*, 10, 2, 382–384, 1995.

Yang, W.-J.; Kawashima, G.; Ohue, H.; "Heated Flows Over a Cylinder and Tube Banks," *Symp. on Thermal Science and Engineering in Honor of Chancellor Chang-Lin Tien*, R.O. Buckius (ed), University of Illinois, Office of Printing Services, 35–42, 1995.

Yim, Y.; Sonntag, R.E.; Borgnakke, C.; "Generalized Equation of State for Refrigerants," *ASHRAE Trans.*, 101, 1, 3–16, 1995.

Conference Proceedings

Arpacı, V.S.; "Microscales of Radiation Affected Turbulence," *ASME Int. Mechanical Engineering Congress and Exposition*, 95-WA/HT-49, San Francisco, 1995.

Arpacı, V.S.; "Radiative Turbulence," *Fire and Combustion Systems*, HTD 317-2, 45–51, A. Atreya, L. Gritzo, C. Saltiel, W. Shyy (eds), ASME, IMECE, 1995.

Arpacı, V.S.; "Thermal Deformation," *Chang-Lin Tien Symp. on Thermal Science and Engineering*, 499–505, Berkeley, CA, 1995.

Brustar, M.; Merte, Jr., H.; Keller, R.B.; "The Role of Buoyancy Orientation on Bubble Residence Times and the Related Critical Heat Flux," *1995 National Heat Trans. Conf., Proc. of Symp. "Heat Transfer in Microgravity Systems"*, ASME HTD 305, 15–27, Portland, OR, August 5–9, 1995.

Chen, M.M.; "Heat Transfer in Manufacturing—Views of a New Subdiscipline," *Keynote Paper presented at ASME/JSME Joint Thermal Engineering Conf.*, 4, 1–8, Maui, March 19–24, 1995.

Merte, Jr., H.; Lee, H.S.; "Homogeneous Nucleation in Microgravity at Low Heat Flux: Experiments and Theory," *ASME, 95-WA/HT-41*, presented at *Session Heat Transfer in Microgravity Systems*, at the 1995 Int. Mechanical Engineering Congress and Exhibition, San Francisco, November, 12–17, 1995.

Mimatsu, J.; Bos, J.A.; Kannatey-Asibu, Jr., E.; Chen, M.M.; "Space-Time Resolved Calorimetry for Laser-Aided Materials Processing—A Feasibility Study," presented at *ASME/JSME Joint Thermal Engineering Conf.*, 4, 77–83, Maui, March 19–24, 1995.

Mimatsu, J.; Chen, M.M.; "Estimation of Energy Coupling Efficiency in Materials Processing with CO₂ Laser," presented at *32nd National Heat Transfer Conf. of Japan*, 417–418, Yamaguchi, Japan, May 26, 1995.

Book Chapters

Atreya, A.; Gritzo, L.; Saltiel, C.; Shyy, W.; (eds), *Proc. of the ASME Heat Transfer Division on Fire and Combustion*, HTD, 317, 2, 1995.

Sonntag, R.E.; "Thermodynamics," *Encyclopedia Britannica*, 1995 Edition. Also published in *Encyclopaedia Britannica Macropaedia*, 1995.

Sonntag, R.E.; "The First Law of Thermodynamics and Energy Conservation," *The Engineering Handbook*, 43, CRC Press, 1995.

Books

Kaviany, M.; *Principles of Heat Transfer in Porous Media*, a monograph published by Springer-Verlag in the Mechanical Engineering Series, ISBN 0-387-97593-4, 1991, Second Edition, 1995.

Yang, W.-J.; Taniguchi, H.; Kudo, K.; *Radiative Heat Transfer by the Monte Carlo Method*, Academic Press, Cambridge, MA, 1995.

Computational Mechanics

Contributing Faculty: Rida Farouki, Karl Grosh, Gregory Hulbert, Noboru Kikuchi, Zheng-Dong Ma, John Taylor.

Journal Articles

Hulbert, G.M.; Jang, I.; "Automatic Time Step Control Algorithms for Structural Dynamics," *Computer Methods in Applied Mechanics and Engineering*, 126, 155–178, 1995.

Ma, Z.-D.; Kikuchi, N.; Cheng, H.-C.; "Topological Design for Vibrating Structures," *Computer Methods in Applied Mechanics and Engineering*, 121, 259–280, 1995.

Ma, Z.-D.; Kikuchi, N.; Cheng, H.-C.; Hagiwara, I.; "Topological Optimization Technique for Free Vibration Problems," *J. of Applied Mechanics*, 62, 1, 200–207, 1995.

Ma, Z.-D.; Kikuchi, N.; "A New Method of the Sequential Approximate Optimization," *Engineering Optimization*, 25, 231–253, 1995.

Conference Proceedings

Grosh, K.; Pinsky, P.M.; "Galerkin Generalized Least Squares Finite Element Methods for Timoshenko Beams," *Proc. of the 4th Pan-American Congress of Applied Mechanics*, 317–322, Buenos Aires, January 3–6, 1995.

Hulbert, G.M.; "Reproducing Kernel Particle Methods for Electromagnetics," *3rd U.S. National Congress on Computational Mechanics*.

Hulbert, G.M.; "Reproducing Kernel Particle Methods for Electromagnetics," 1995 ASME IMEC&E.

Book

J.F. Cory, Jr., J.L. Gordon, G.M. Hulbert, et al. (eds), *Current Topics in Computational Mechanics*, PVP 305, ASME, New York, 1995.

Control and Measurement

Contributing Faculty: Johann Borenstein, Michael Bridges, Robert Ervin, Yoram Koren, Hwei Peng, Jeffrey Stein, Dawn Tilbury, A. Galip Ulsoy.

Journal Articles

Ben Amara, F.; Kabamba, P.T.; Ulsoy, A.G.; "Adaptive Band-Limited Disturbance Rejection in Linear Discrete-Time Systems," *Mathematical Problems in Engineering*, 1, 2, 139–177, 1995. Also published in the *Proc. of the American Control Conf.*, Seattle, June, 1995.

Borenstein, J.; "Internal Correction of Dead-Reckoning Errors with the Compliant Linkage Vehicle," *J. of Robotic Systems*, 12, 4, 257–273, April, 1995.

Borenstein, J.; Koren, Y.; "Error Eliminating Rapid Ultrasonic Firing for Mobile Robot Obstacle Avoidance," *IEEE Trans. on Robotics and Automation*, 11, 1, 132–138, February, 1995.

Bridges, M.M.; Cai, J.; Dawson, D.M.; Grabbe, M.T.; "Experimental Results for a Robust Position and Force Controller Implemented on a Direct Drive Robot," *Robotica*, 13, 11–18, 1995.

Bridges, M.M.; Dawson, D.M.; "Redesign of Robust Controllers for Rigid-Link Flexible-Joint Robotic Manipulators Actuated with Harmonic Drive Gearing," *IEE Proc.; Control Theory and Applications*, 142, 5, September, 1995.

Bridges, M.M.; Dawson, D.M.; Abdallah, C.A.; "Control of Rigid-Link Flexible-Joint Robots: A Survey of Backstepping Approaches," *J. of Robotic Systems*, 12, 3, 199–216, March, 1995.

Bushnell, L.; Tilbury, D.; Sastry, S.; "Steering Three-Input Nonholonomic Systems: The Firetruck Example," *Int. J. of Robotics Research*, 14, 4, 366–381, August, 1995.

Fan, Z.; Koren, Y.; Wehe, D.; "Tracked-Robot Control: The Hybrid Approach," *IFIP—Control Engineering Practice*, 3, 3, 329–336, 1995.

Huh, K.; Stein, J.L.; "Well-Conditioned Observer Design for Observer-Based Monitoring Systems," *J. of Dynamic Systems Measurement and Control*, 117, 4, 592–599, December, 1995.

Peng, H.; "Highway-Level Vehicle Control For AHS," *IVHS J.*, 2, 3, 293–310, 1995.

Stein, J.L.; Wilson, B.H.; "An Algorithm for Obtaining Minimum-Order Lumped-Parameter Models of Distributed and Discrete Systems," *J. of Dynamic Systems Measurement and Control*, 117, 4, 534–540, December, 1995.

Tilbury, D.; Murray, R.; Sastry, S.; "Trajectory Generation for the N-Trailer Problem Using Goursat Normal Form," *IEEE Trans. on Automatic Control*, 40, 5, 802–819, May, 1995.

Tilbury, D.; Sastry, S.; "The Multi-Steering Trailer System: A Case Study in Goursat Normal Forms and Prolongations," *Int. J. of Robust and Nonlinear Control*, 5, 4, 343–364, July, 1995.

Tilbury, D.; Sjørdalen, O.; Bushnell, L.; Sastry, S.; "A Multi-Steering Trailer System: Conversion into Chained Form Using Dynamic Feedback," *IEEE Trans. on Robotics and Automation*, 11, 6, 807–818, December, 1995.

Tu, J.F.; Stein, J.L.; "On-Line Preload Monitoring for Anti-Friction Spindle Bearings of High-Speed Machine Tools," *J. of Dynamic Systems Measurement and Control*, 117, 1, 43–53, March, 1995.

Conference Proceedings

Ben Amara, F.; Kabamba, P.T.; Ulsoy, A.G.; "Adaptive Vibration Suppression in a Flexible Single-Link Robot," *27th CIRP Seminar on Manufacturing Systems*, Ann Arbor, May, 1995.

Borenstein, J.; "Control and Kinematic Design for Multi-Degree-of-Freedom Mobile Robots with Compliant Linkage," *IEEE Trans. on Robotics and Automation*, 11, 1, 21–35, February, 1995.

Bridges, M.M.; Dawson, D.M.; "Adaptive Control of Rigid-Link Electrically Driven Robots Actuated with Switched Reluctance Motors," *Proc. of the 1995 American Control Conf.*, 2, 1392–1396, Seattle, June, 1995.

Ervin, R.D.; "For Meaningful Evaluation of the Safety Impacts of ITS Products," Paper Commissioned by the Intelligent Transportation Society of American, *Proc. of the Workshop on ITS Safety Evaluations*, Reston, VA, May, 1995.

Fancher, P.; Peng, H.; Bareket, Z.; "Comparison Analyses of Three Types of Headway Control Systems for Heavy Commercial Vehicles," *Proc. of the 14th IAVSD Symp. on Dynamics of Vehicles on Roads and Tracks*, Ann Arbor, August, 1995.

Ferris J.B.; Stein, J.L.; "Development of Proper Models of Hybrid Systems: A Bond Graph Formulation," *Proc. of the 1995 Int. Conf. on Bond Graph Modeling*, 43–48, Las Vegas, 1995.

Jee, S.; Koren, Y.; "A Self-Organizing Fuzzy Logic Control for Friction Compensation in Feed Drives," *Proc. of the 1995 American Control Conf.*, 1, 205–209, Seattle, June, 1995.

Jee, S.; Koren, Y.; "Cross-Coupling Control by Fuzzy Logic," *Proc. of the 1st Int. Machining and Grinding Conf.*, 605–614, Dearborn, September, 1995.

Koren, Y.; Jee, S.; "Fuzzy Logic Cross-Coupling Control," *Proc. of the 27th CIRP Int. Seminar on Manufacturing Systems*, 104–108, Ann Arbor, May, 1995.

LeBlanc, D.J.; Venhovens, P.J.Th.; Lin, C.-F.; Pilutti, T.E.; Ervin, R.E.; Ulsoy, A.G.; MacAdam, C.C.; Johnson, G.E.; "A Warning and Intervention System to Prevent Road Departure Accidents," *Proc. of the 14th IAVSD Symp. on Dynamics of Vehicles on Roads and Tracks*, L. Segele (ed), Ann Arbor, August, 1995.

Lin, C.-F.; Ulsoy, A.G.; "Time to Lane Crossing Calculation and Characterization of its Associated Uncertainty," *Proc. of the American Control Conf.*, Seattle, June, 1995.

Lin, C.-F.; Ulsoy, A.G.; LeBlanc, D.J.; "Lane Geometry Perception and the Characterization of its Associated Uncertainty," *Proc. of the ASME, IMECE*, San Francisco, November, 1995.

Liu, C.; Peng, H.; "Tire-Road Friction Estimation for the CAPC System," *Proc. of the 1995 Int. Mechanical Engineering Congress and Expo.*, November, 1995.

Liu, C.; Peng, H.; "Road Friction Coefficient Estimation for Vehicle Path Prediction," *Proc. of the 14th IAVSD Symp. on Dynamics of Vehicles on Roads and Tracks*, Ann Arbor, August, 1995.

Park, J.; Pasek, Z.J.; Koren, Y.; Shin, K.G.; Ulsoy, A.G.; Shan, Y.; "An Open-Architecture Testbed for Real-Time Monitoring and Control of Machining Processes," *Proc. of the 1995 American Control Conf.*, Seattle, June, 1995.

Peng, H.; "Link-Layer Vehicle Control System for AHS," *Proc. of the 1995 American Control Conf.*, Seattle, June, 1995.

Pilutti, T.; Ulsoy, A.G.; Hrovat, D.; "Vehicle Steering Intervention Through Differential Braking," *Proc. of the 1995 American Control Conf.*, Seattle, June, 1995.

Shan, Y.; Koren, Y.; "Obstacle Accommodation Motion Planning," *IEEE Trans. on Robotics and Automation*, 11, 1, 36–49, February, 1995.

Sluis, W.M.; Tilbury, D.M.; "A Bound on the Number of Integrators Needed to Linearize a Control System," *Proc. of the 1995 IEEE Conf. on Decision and Control*, 602–607, New Orleans, December, 1995.

Stein, J.L.; Louca, L.S.; "A Component-Based Modeling Approach for System Design: Theory and Implementation," *Proc. of the 1995 Int. Conf. on Bond Graph Modeling*, 109–115, Las Vegas, 1995.

Stein, J.L.; Wang, C.W.; "Automatic Detection of Clearance in Mechanical Systems: Theory and Simulation," *Proc. of the 1995 American Control Conf.*, Seattle, 1995.

Tilbury, D.M.; Sastry, S.; "The Multi-Steering N-Trailer System: A Case Study of Goursat Normal Forms and Prolongations," *Preprints of the IFAC Nonlinear Control Systems Design Symp.*, 555–560, Lake Tahoe, June, 1995.

Books

Dawson, D.M.; Bridges, M.M.; Qu, Z.; *Nonlinear Control of Robotic Systems for Environmental Waste and Restoration*, Prentice Hall series on *Environmental and Intelligent Manufacturing Systems*, M. Jamshidi (Series ed), Englewood Cliff, NJ, 1995.

Peng, H.; Freeman, J.S.; *Advanced Automotive Technologies*, 1995, ASME Publications, New York, November, 1995.

Design

Contributing Faculty: Diann Brei, Debasish Dutta, Rida Farouki, Noboru Kikuchi, Sridhar Kota, Nestor Michelena, Panos Papalambros, John Taylor.

Journal Articles

Allen, S.W.; Dutta, D.; "Computation and Evaluation of Part Orientations Using Support Structures in Layered Manufacturing," *J. of Design & Manufacturing*, 5, 153–162, 1995.

Ananthasuresh, G.K.; Kota, S.; "Designing Compliant Mechanisms," *ASME Mechanical Engineering*, 93–96, November, 1995.

Brei, D.; "Design and Development of a Bi-Directional Polymeric Piezoelectric Microactuator," *IEEE/ASME J. of Microelectromechanical Systems*, August, 1995.

Dutta, D.; Kikuchi, N.; Papalambros, P.Y.; "Project MAXWELL: A Technical Overview," *Design for Manufacturability of Ceramic Components*, *Ceramic Transactions*, American Ceramic Society, 53–66, Columbus, OH, 1995.

Dutta, D.; Woo, T.C.; "Algorithms for Multiple Disassembly and Parallel Assemblies," *ASME J. of Engineering for Industry*, 117, 102–109, February, 1995.

Farouki, R.T.; Kaul, A.; "Computing Minkowski Sums of Plane Curves," *Int. J. of Computational Geometry and Applications*, 5, 413–432, 1995.

Farouki, R.T.; Koenig, T.; Tarabanis, K.; Korein, J.U.; Batchelder, J.S.; "Path Planning with Offset Curves for Layered Fabrication Processes," *J. of Manufacturing Systems*, 14, 355–368, 1995.

Farouki, R.T.; Neff, C.A.; "Hermite Interpolation by Pythagorean-Hodograph Quintics," *Mathematics of Computation*, 64, 1589–1609, 1995.

Farouki, R.T.; Sederberg, T.W.; "Analysis of the Offset to a Parabola," *Computer Aided Geometric Design*, 12, 639–645, 1995.

Gelston, S.; Dutta, D.; "Boundary Surface Recovery from Skeleton Curves and Surfaces," *Computer Aided Geometric Design*, 12, 27–51, January, 1995.

Kim, D.W.; Papalambros, P.Y.; Woo, T.C.; "Tangent, Normal, and Visibility Cones for Bézier Surfaces," *Computer Aided Geometric Design*, 12, 1995.

Kim, D.S.; Papalambros, P.Y.; "Detection of Degenerate Normal Vectors on Parametric Surfaces Using Tangent Cones," *Computer Aided Geometric Design*, 12, 1995.

Kulkarni, P.; Dutta, D.; Saigal, R.; "An Investigation of Techniques for Asymmetry Rectification," *ASME J. of Mechanical Design*, 117, 4, 620–626, December, 1995.

Kumar, V.; Dutta, D.; "Quadric Shell Intersections," *Computer Aided Design*, 27, 8, 573–586, August, 1995.

Lo, C.; Papalambros, P.Y.; "On Global Feasible Search for Global Design Optimization with Application to Generalized Polynomial Models," *ASME J. of Mechanical Design*, 117, 3, 1995.

Lootsma, F.A.; Athan, T.W.; Papalambros, P.Y.; "Controlling the Search for a Compromise Solution in Multi-Objective Optimization," *J. of Engineering Optimization*, 25, 1, 65–81, 1995.

Moskalik, A.; Brei, D.; "Deflection-Voltage Behavior of Individual Polymeric Multilayer Arched Piezoelectric Actuators," *Int. Mechanical Engineering Congress and Exposition*, *ASME J. of Mechatronics*, San Francisco, November 12–17, 1995.

Michelena, N.F.; Papalambros, P.Y.; "A Network Reliability Approach to Optimal Decomposition of Design Problems," *ASME J. of Mechanical Design*, 117, 3, 1995.

Michelena, N.F.; Papalambros, P.Y.; "Optimal Model-Based Decomposition of Powertrain System Design," *ASME J. of Mechanical Design*, 117, 4, 1995.

Papalambros, P.Y.; "Optimal Design of Mechanical Components and Systems," *ASME J. of Mechanical Design*, Special 50th Anniversary Design Issue, 117, 55–62, 1995.

Pomrehn, L.P.; Papalambros, P.Y.; "Discrete Optimal Design Formulations with Application to Gear Train Design," *ASME J. of Mechanical Design*, 117, 3, 1995.

Pomrehn, L.P.; Papalambros, P.Y.; "Infeasibility and Non-Optimality Tests for Solution Space Reduction in Discrete Optimal Design," *ASME J. of Mechanical Design*, 117, 3, 1995.

Seeley, C.; Chattopadhyay, A.; Brei, D.; "Development of a Piezoelectric C-Block Actuator Using a Hybrid Optimization Technique," *AIAA/ASME/ASCE/AHS/ASC 36th Structures, Structural Dynamics and Materials Conf. and Adaptive Structures Forum*, AIAA Journal, New Orleans, April 10–14, 1995.

Srinivas, Y.L.; Dutta, D.; "Cyclides in Geometric Modeling: Computational Tools for an Algorithmic Infrastructure," *ASME Trans. J. of Mechanical Design*, 117, 3, 363–373, September, 1995.

Srinivas, Y.L.; Dutta, D.; "Rational Parametric Representation of Parabolic Cyclide: Formulation and Applications," *Computer Aided Geometric Design*, 12, 551–566, 1995.

Yip-Hoi, D.; Dutta, D.; "Data Extraction from Geometric Models for Process Planning for Parallel Machining," *J. of Manufacturing Systems*, 14, 5, 307–318, 1995.

Conference Proceedings

Athan, T.W.; Papalambros, P.Y.; "Multicriteria Optimization of ABS Control Algorithms Using a Quasi Monte Carlo Method," *XII Int. Conf. on Multiple Criteria Decision Making*, Hagen, Germany, June, 1995.

Brei, D.; "Force and Deflection Behavior for C-block Piezoelectric Actuator Architectures," *Proc. of the SPIE 1995 North American Conf. on Smart Materials and Structures*, San Diego, 1995.

Dutta, D.; Kikuchi, N.; Papalambros, P.Y.; "Project MAXWELL: A Technical Overview," *Ceramic Trans.*, 50, "Design for Manufacturability of Ceramic Components," Ghosh, Hiremath, Halloran (eds), American Ceramic Society, Columbus, OH, April, 1995.

Frecker, M.; Kota, S.; Fonceco, J.; Kikuchi, N.; "Systematic Synthesis of Distributed Compliant Mechanisms," *4th National Conf. on Applied Mechanisms and Robotics*, Cincinnati, December 12–15, 1995.

Jiang, T.; Papalambros, P.Y.; "A First Order Method of Moving Asymptotes for Structural Optimization," *OPTI 95, Fourth Int. Conf. on Computer Aided Optimum Design of Structures*, Miami, September, 1995.

Kota, S.; Ananthasuresh, G.K.; Saggere, L.; Crary, S.B.; "Design Tools for MEMS: Synthesis and Applications," *Proc. of the 1995 ASME Summer Annual Meeting*.

Kulkarni, P.; Dutta, D.; "Adaptive Slicing of Parametrizable Algebraic Surfaces for Layered Manufacturing," *Proc. of ASME Design Automation Conf.*, Boston, September, 1995.

Marsan, A.; Dutta, D.; "Construction of a CAD Model from Homogenization Output," *Proc. of ASME Design Automation Conf.*, Boston, September, 1995.

Michelena, N.F.; Tao, J.; Papalambros, P.Y.; "Optimal Model-Based Decomposition for Design Optimization of Large-Scale Systems," *First World Congress of Structural and Multidisciplinary Optimization*, Goslar, Germany, June, 1995.

Michelena, N.F.; Papalambros, P.Y.; "Optimal Model-Based Partitioning of Powertrain System Design," *1995 ASME Design Automation Conf.*, Boston, September, 1995, Best Paper Award.

Papalambros, P.Y.; Michelena, N.F.; "Model-Based Decomposition in Optimal Design of Large Engineering Systems," *NASA ICASE/LaRC Workshop on Multidisciplinary Design Optimization*, Hampton, VA, March, 1995.

Sreeram, P.; Dutta, D.; "Determination of Optimal Orientation Based on Variable Slicing Thickness in Layered Manufacturing," *Proc. of ASME Winter Annual Conf.*, San Francisco, November, 1995.

Yip-Hoi, D.; Dutta, D.; "Characterization of Mill-Turns and Their Impact on Process Planning Issues," *Proc. of the 27th CIRP Int. Seminar on Manufacturing Systems*, Ann Arbor, May 21–23, 1995.

Dynamics

Contributing Faculty: Gregory Hulbert, Noel Perkins, Christophe Pierre, William Schultz, A. Galip Ulsoy.

Journal Articles

Al-Jawi, A.N.; Ulsoy, A.G.; Pierre, C.; "Vibration Localization in Band/Wheel Systems: Theory and Experiment," *J. of Sound and Vibration*, 179, 2, 289–312, January, 1995. [Also published in the *Proc. of the ASME Vibration Conf.*, September, 1993.]

Al-Jawi, A.N.; Pierre, C.; Ulsoy, A.G.; "Vibration Localization in Dual-Span, Axially Moving Beams, Part I: Formulation and Results," *J. of Sound and Vibration*, 179, 2, 243–266, January, 1995. [Also published in the *Proc. of the ASME Vibration Conf.*, September, 1993.]

Al-Jawi, A.N.; Pierre, C.; Ulsoy, A.G.; "Vibration Localization in Dual-Span, Axially Moving Beams, Part II: Perturbation Analysis," *J. of Sound and Vibration*, 179, 2, 267–287, January, 1995.

Boivin, N.; Pierre, C.; Shaw, S.W.; "Nonlinear Modal Analysis of Structural Systems Featuring Internal Resonances," *J. of Sound and Vibration*, 182, 2, 336–341, April, 1995.

Boivin, N.; Pierre, C.; Shaw, S.W.; "Nonlinear Normal Modes, Invariance, and Modal Dynamics Approximations of Nonlinear Systems," *Nonlinear Dynamics*, 8, 3, 315–346, October, 1995.

Bouzit, D.; Pierre, C.; "An Experimental Investigation of Vibration Localization in Disordered Multi-Span Beams," *J. of Sound and Vibration*, 187, 4, 649–669, November, 1995.

Bouzit, D.; Pierre, C.; "Localization of Vibration in Disordered Multi-Span Beams with Damping," *J. of Sound and Vibration*, 187, 4, 625–648, November, 1995.

Castanier, M.P.; Pierre, C.; "Lyapunov Exponents and Localization Phenomena in Multi-Coupled Nearly-Periodic Systems," *J. of Sound and Vibration*, 183, 3, 493–515, June, 1995.

Lee, C.L.; Perkins, N.C.; "Experimental Investigation of Isolated and Simultaneous Internal Resonances in Suspended Cables," *ASME J. Vibration and Acoustics*, 117, 4, 385–391, October, 1995.

Lee, C.L.; Perkins, N.C.; "Three-dimensional Oscillations of Suspended Cables Involving Simultaneous Internal Resonances," *J. Nonlinear Dynamics*, invited paper, 8, 45–63, August, 1995.

Lin, H.P.; Perkins, N.C.; "Free Vibration of Complex Cable/Mass Systems: Theory and Experiment," *J. of Sound and Vibration*, 179, 1, 131–149, January, 1995.

Lu, C.-L.; Perkins, N.C.; "Complex Spatial Equilibria of U-Joint Supported Cables Under Torque, Thrust and Self-Weight," *Int. J. Nonlinear Mechanics*, 30, 3, 271–285, May, 1995.

Pierre, C.; Murthy, D.; Ottarsson, G.; "Efficient Design Constraint Accounting for Mistuning Effects in Engine Rotors," *AIAA J.*, 33, 5, 960–962, May, 1995.

Rincon, D.M.; Ulsoy, A.G.; "Complex Geometry, Rotary Inertia and Gyroscopic Moment Effects on Drill Vibrations," *J. of Sound and Vibration*, 188, 5, 701–715, December, 1995.

Turnbull, P.F.; Perkins, N.C.; Schultz, W.W.; "Contact-Induced Nonlinearity in Oscillating Belts and Webs," *J. Vibration and Control*, invited paper for inaugural volume, 1, 459–479, November, 1995.

Conference Proceedings

Behbahani, M.; Nejad, M.; Perkins, N.C.; "Forced Wave Propagation in Elastic Cables with Small Curvature," *Proc. 15th ASME Biennial Conf. on Mechanical Vibration and Noise*, 84, 2, 1457–1464, Boston, September, 1995.

Behbahani, M.; Nejad, M.; Perkins, N.C.; "Motion and Tension Waves in Elastic Cables," *Int. Symp. on Cable Dynamics*, invited paper, Liege, Belgium, 37–44, 1995.

Morgan, J.A.; Pierre, C.; Hulbert, G.M.; "Calculation of Component Mode Synthesis Matrices from Measured Frequency Response Functions," *Proc. of the 15th Biennial Conf. on Mechanical Vibration and Noise*, ASME, DE 84-1, 3—B, Boston, September, 1995.

Ottarsson, G.; Pierre, C.; "On the Effects of Interblade Coupling on the Statistics of Maximum Forced Response Amplitudes in Mistuned Bladed Disks," *Structures, Structural Dynamics and Materials Conf.*, AIAA, 95–1494, New Orleans, April 10–13, 1995.

Ulsoy, A.G.; Pierre, C.; Choi, S.; "Vibration Localization in Rotating Shafts, Part I: Theory," *Proc. of the 15th Biennial Conf. on Mechanical Vibration and Noise*, ASME 84-1, 3—C, Boston, September, 1995.

Ulsoy, A.G.; Pierre, C.; Choi, S.; "Vibration Localization in Rotating Shafts, Part II—Experiment," *Proc. of the 15th Biennial Conf. on Mechanical Vibration and Noise*, ASME 84-1, 3—C, Boston, September, 1995.

Book Chapters

Pierre, C.; Shaw, S.W.; "Normal Modes and Model Analysis Techniques for Nonlinear Structural Systems," in *Nonlinear Dynamics and Stochastic Mechanics*, 95–119, CRC *Mathematical Modeling Series*, N.S. Namachchivaya, W. Kliemann (eds), CRC Press, 1995.

Fluid Dynamics

Contributing Faculty: Rayhaneh Akhavan, Claus Borgnakke, Steven Ceccio, Walter Debler (emeritus), David Dowling, William Schultz, Grétar Tryggvason, Alan Wineman, Wen-Jei Yang.

Journal Articles

Ay, H.; Lee, G.; Lee, J.-S.; Yang, W.-J.; "Surface Flows Inside Automotive Torque Converters," *J. of Flow Visualization and Image Processing*, 2, 3, 251–258, 1995.

Ceccio, S.L.; George, D.L.; "A Review of Electrical Impedance Techniques for the Measurement of Multiphase Flows," *J. Fluids Engineering*, 1995.

Ginder, J.M.; Ceccio, S.L.; "Observations of the Response of Electro-Rheological Materials to Step Electrical Transients," *J. of Rheology*, 39, 1, 211–234, 1995.

Kim, Y.; Sonntag, R.E.; Borgnakke, C.; "Generalized Equation of State for Refrigerants," *ASHRAE Trans.* 101, 1, 3833, 1995.

Kuhn De Chizelle, Y.; Ceccio, S.L.; Brennen, C.E.; "Observations, Scaling, and Modeling of Traveling Bubble Cavitation," *J. Fluid Mech.*, 293, 99–126, 1995.

Tassin, A.L.; Li, C.-Y.; Ceccio, S.L.; Bernal, L.P.; "Velocity Field Measurements in Cavitating Flows," *Experiments in Fluids*, 20, 125–130, 1995.

Turner, S.E.; Dowling, D.R.; "Acoustic Precondensation Phenomena in Freons," *J. of Acoustical Soc. of America*, 97, 2, 1014–1018, 1995.

Yang, W.-J.; Kawashima, G.; Ohue, H.; "Experimental Study on Flow Patterns in Suddenly Accelerated Rotating Drums (Measurement of Velocity by LDV and Flow Visualization)," *Trans. JSME*, 61—B, 61, 588, 2918–2923, 1995.

Yang, W.-J.; Kawashima, G.; Ohue, H.; "Ekman Boundary Layers and Energy Dissipation in Rotating Drums During Spin-Down Process," *Int. J. of Rotating Machinery*, 2, 2, 113–121, 1995.

Yang, W.-J.; Kawashima, G.; Ohue, H.; "Flow Visualization in a Helmholtz Resonator at Apex of Flow Bifurcation," *Flow Visualization VII*, J. Crowder (ed), Begell House, New York, 102–106, 1995.

Yang, W.-J.; Torii, S.; "Numerical Prediction of Fully-Developed Turbulent Swirling Flows in an Axially Rotating Pipe by Means of a Modified k- ϵ Turbulent Model," *Int. J. of Numerical Methods for Heat & Fluid Flow*, 5, 2, 175–183, 1995.

Yang, W.-J.; Torii, S.; "A Numerical Analysis on Flow and Heat Transfer in the Entrance Region of an Axially Rotating Pipe," *Int. J. of Rotating Machinery*, 2, 2, 123–129, 1995.

Yang, W.-J.; Torii, S.; "A Numerical Study on Turbulent Couette Flow and Heat Transfer in Concentric Annuli by Means of Reynolds Stress Turbulence Model," *Int. J. of Rotating Machinery*, 2, 2, 131–138, 1995.

Yang, W.-J.; Torii, S.; "Flow Characteristics of Gas-Liquid-Particle Mixing in a Gas-Stirred Ladle System with Throughflow," *Experiments in Fluids*, 19, 5, 328–335, 1995.

Yang, W.-J.; Umeda, S.; "Visualization of Flow along Cross-Sectional Variation Inside Intersecting Ducts," *J. of Flow Measurements*, 12, 16, 33–38, 1995.

Yang, W.-J.; Umeda, S.; "Flow Visualization in Two Intersecting Ducts with a Circular Perforated Zone," *J. of the Visualization Society of Japan*, 15, 2, 229–236, 1995. [Also *JSME*, 954, 4, 250–256, November, 1995].

Yang, W.-J.; Umeda, S.; "Flow Visualization in Two Intersecting Vertical Ducts—Characteristics of Resistance and Flow Rates," *J. of the Visualization Society of Japan*, 15, 59, 273–278, 1995.

Yang, W.-J.; Umeda, S.; "Flow Visualization Using String Method in Two Intersecting Ducts," *J. of the Visualization Society of Japan*, 15, 58, 190–195, 1995.

Yang, W.-J.; Umeda, S.; "Flow Visualization in Intersecting Ducts Using Laser Doppler Velocimetry," *Flow Visualization VII*, J. Crowder (ed), Begell House, New York, 354–358, 1995.

Yang, W.-J.; Umeda, S.; "Flow Visualization in Four Intersecting Ducts," *J. of the Visualization Society of Japan*, 115, 1, 93–100, 1995.

Yang, W.-J.; Umeda, S.; "Flow Characteristics in Multiple Intersecting Ducts," *J. of the Visualization Society of Japan*, 15, 1995. [Also *JSME Proc.* 954, 4, 296–298, November, 1995.

Yang, W.-J.; Umeda, S.; "Visualization of Flow in Intersecting Ducts with Different Converging and Diverging Angles," *J. of Flow Measurements*, 12, 17, 15–25, 1995.

Yu, P.-W.; Ceccio, S.L.; Tryggvason, G.; "The Collapse of a Cavitation Bubble in Shear Flows—A Numerical Study," *Physics of Fluids*, 7, 2608–2616, 1995.

Conference Proceedings

Armfield, S.W.; Debler, W.R.; Asaeda, T.; "A Surge Wave Scaling for the Purging of Density Stabilised Ponds," *Australian Fluid Mechanics Conf.*, Sydney, December, 1995.

Ceccio, S.L.; Gindroz, B.; Gowing, S.; "A Comparison of CSM Bubble Detection Methods," *Proc. ASME Symp. on Cavitation and Gas-Liquid Flows in Fluid Machinery*, ASME, FED 226, 43–49, Hilton Head, 1995.

Gundlapalli, R.; Kang, S.; Akhavan, R.; "Large-Eddy Simulation of Free-Surface Turbulence," *48th Ann. Meeting Div., Fluid Dynamic Amer. Phys. Soc.*, Abstract in *Bull. Amer. Phys. Soc.*, 40, 12, 1983, Irvine, November, 1995.

Han, H.-C.; Schultz, W.W.; Boyd, J.P.; Schumack, M.R.; "J. Bearing Dynamic Stability," *48th Annual Meeting of the American Physical Society, Division of Fluid Dynamics*, Irvine, November, 1995.

Juric, D.; Tryggvason, G.; "A Front-Tracking Method for Liquid-Vapor Phase Change," in *Advances in Numerical Modeling of Free Surface and Interface Fluid Dynamics*, Raad, Huang, Tryggvason (eds), ASME, FED-234, 141–148, 1995.

Juric, D.; Tryggvason, G.; "Full Simulations of Flows with Phase Change," *3rd AIAA Aerospace Sciences Meeting*, AIAA, 95-0700, 1995.

Kang, S.; Akhavan, R.; "Large-Eddy Simulation of Turbulence with Dynamic Subgrid-Scale Models," *48th Ann. Meeting Div. Fluid Dynamic Amer. Phys. Soc.* Abstract in *Bull. Amer. Phys. Soc.*, 40, 12, 2012, Irvine, November, 1995.

Li, C.-Y.; Ceccio, S.L.; Bernal, L.; "Interaction of Traveling Bubbles with the Boundary Layer and Attached Cavitation," *Proc. Int. Symp. on Cavitation*, 329–344, Deauville, France, 1995.

Mangiavacchi, N.; Gundlapalli, R.; Akhavan, R.; "Direct Numerical Simulation of a Turbulent Jet Interacting with a Free Surface," *Proc. Fifth European Turbulence Conf.*, 1995.

Taeibi-Rahni, M.; Loth, E.; Tryggvason, G.; "Unsteady Forces on Large Spherical and Ellipsoidal Bubbles," in *Gas Liquid Flows*, Rohatgi, O'Hern, Shoukri, Fukano (eds), 225, 9–16, ASME, 1995.

Tryggvason, G.; Esmaeeli, A.; Juric, D.; Nas, S.; Saeed, M.; "A Front-Tracking Method for Direct Simulations of Multiphase Flows," in *Boundary Elements XVII*, C.A. Brebbia, S. Kim, T.A. Osswald, H. Power (eds), Comp. Mech. Pub., 653–660, Southampton, 1995.

Yang, W.-J.; Inada, S.; "Enhancement of Liquid-Solid Contact in Miniaturization Phenomena," *Flow Visualization and Image Processing of Multiphase Systems*, W.-Y. Yang, F. Yamamoto, F. Mayinger (eds), ASME, FED 209, 155–169, 1995.

Yang, W.-J.; Inada, S.; Tsuchiya, M.; "Enhancement of Liquid-Solid Contact in Miniaturization Phenomena (in Japanese)," *Proc. of the 30th Annual Meeting of JSME Northeastern Section*, Sendai, Japan, 951-1, 70–71, 1995.

Yang, W.-J.; Shimizu, I.; Suzuki, S.; Akino, N.; "Optical Image Processing of Various Size/Shape Particles in Multiphase Flow," *Flow Visualization and Image Processing of Multiphase Systems*, W.-J. Yang, F. Yamamoto, F. Mayinger (eds), ASME, FED 209, 1–11, 1995.

Yang, W.-J.; Torii, S.; "Penetration of an Injected Gas-Particle Mixture into a Melt," *Flow Visualization and Image Processing of Multiphase Systems*, W.-J. Yang, F. Yamamoto, F. Mayinger (eds), ASME, FED 209, 137–144, 1995.

Yang, W.-J.; Umeda, S.; "Flow Visualization in Reservoir with Multiple Intersecting Ducts," *Proc. of 14th Multiphase Flow Symp.* '95, 47–50, 1995.

Yang, W.-J.; Umeda, S.; Ojima, M.; "Visualization of Wake Flow and Solid-Fluid Interaction Inside Packed Pebble Beds," *Flow Visualization and Image Processing of Multiphase Systems*, W.-J. Yang, F. Yamamoto, F. Mayinger (eds), ASME, FED 209, 145–150, 1995.

Yu, P.-W.; Ceccio, S.L.; Tryggvason, G.; "Direct Numerical Simulation of Cavitation Bubbles," *Proc. Int. Symp. on Cavitation*, 407–416, Deauville, France, 1995.

Books

Yang, W.-J.; Yamamoto, F.; Mayinger, F.; *Flow Visualization and Image Processing of Multiphase Systems*, ASME, FED 209, New York, 1995.

Manufacturing

Contributing Faculty: James Barber, Darek Ceglarek, Michael Chen, William Endres, S. Jack Hu, Elijah Kannatey-Asibu, Jr., Yoram Koren, Kenneth Ludema, Jun Ni, A. Galip Ulsoy, Jingxia Yuan.

Journal Articles

Ceglarek, D.; Shi, J.; "Dimensional Variation Reduction for Automotive Body Assembly," *Manufacturing Review*, 8, 2, 139–154, 1995.

Chen, T.-C.; Kannatey-Asibu, Jr., E.; "Dual Beam Laser Systems and Their Impact on Weld Pool Convection and Surface Deformation," *Trans. of NAMRI*, 151–156, 1995.

Choa, S.-H.; Ludema, K.C.; Potter, G.E.; DeKoven, B.M.; Morgan, T.A.; Kar, K.K.; "A Model for the Boundary Film Formation and Tribological Behavior of Phosphazene Lubricant on Steel," *Tribology Trans.*, 38, 3, July, 1995.

- Endres, W.J.; DeVor, R.E.; Kapoor, S.G.; "A Dual-Mechanism Approach to the Prediction of Machining Forces, Part I—Model Development," *ASME J. of Engineering for Industry*, 117, 526-533, 1995.
- Endres, W.J.; DeVor, R.E.; Kapoor, S.G.; "A Dual-Mechanism Approach to the Prediction of Machining Forces: Part 2—Calibration and Validation," *ASME J. of Engineering for Industry*, 117, 534-541, 1995.
- Fang, C.-K.; Kannatey-Asibu, Jr., E.; Barber, J.R.; "Acoustic Emission Investigation of Cold Cracking in Gas Metal Arc Welding of AISI 4340 Steel," *Welding Journal*, 74, 177s-184s, 1995.
- Gandhi, U.N.; Hu, S.J.; "Data Based Approach in Modeling Automobile Crash," *Int. J. of Impact Engineering*, 16, 1, 95-118, 1995.
- Huang, P.S.; Ni, J.; "On-Line Error Compensation of Coordinate Measuring Machines," *Int. J. of Machine Tools and Manufacture*, 35, 5, 725-738, May, 1995.
- Huang, P.S.; Ni, J.; "Angle Measurement Based on the Internal-Reflection Effect and the Use of Right-Angle Prisms," *Applied Optics*, 34, 22, 4976-4981, August, 1995.
- Jones, S.D.; Ulsoy, A.G.; "An Optimization Strategy for Maximizing Coordinate Measuring Machine Productivity, Part I—Quantifying the Effects of Operating Speed on Measurement Quality," *ASME J. of Engineering for Industry*, 117, 4, 601-609, November, 1995.
- Jones, S.D.; Ulsoy, A.G.; "An Optimization Strategy for Maximizing Coordinate Measuring Machine Productivity, Part II—Problem Formulation, Solution and Experimental Results," *ASME J. of Engineering for Industry*, 117, 4, 610-618, November, 1995.
- Kim, K.T.; Ludema, K.C.; "A Correlation between Low Cycle Fatigue Properties and Scuffing Properties of 4340 Steel," *J. Tribology*, 117, April, 1995.
- Liu, S.C.; Lee, H.-W.; Hu, S.J.; "Variation Simulation for Deformable Sheet Metal Assemblies Using Mechanistic Models," *Trans. of NAMRI/SME*, 235-241, May, 1995.
- Liu, S.C.; Hu, S.J.; "An Offset Finite Element Model and Its Application in Predicting Sheet Metal Assembly Variation," *Int. J. of Machine Tools and Manufacture*, 35, 11, 1545-1557, 1995.
- Lo, C.H.; Yuan, J.; Ni, J.; "An Application of Real-Time Error Compensation on a Turning Center," *Int. J. of Machine Tools and Manufacture*, 3, 12, 1669-1682, December, 1995.
- Meng, H.C.; Ludema, K.C.; "Wear Models and Predictive Equations: Their Form and Content," *Wear*, 181-183, 443-457, 1995.
- Mimatsu, J.; Bos, J.A.; Kannatey-Asibu, Jr., E.; Chen, M.M.; "Determination of Energy Absorption During Laser Welding by an Iterative Conduction Method," *J. of Laser Applications*, 7, 162-1268, 1995.
- Purvis, A.L.; Kannatey-Asibu, Jr., E.; Pehlke, R.; "Linear Discriminant Function Analysis of Acoustic Emission Signals Generated During Solidification," *Trans. American Foundrymen Society*, 103, 1995.
- Roan, C.; Hu, S.J.; "Monitoring and Classification of Dimensional Faults for Automotive Body Assembly," *Int. J. of Flexible Manufacturing Systems*, 7, 2, 103-125, April, 1995.
- Zhang, H.Y.; Ni, J.; "Phase Difference and Its Sensitivity Analysis for a Nonlinear Difference-Differential Machining Chatter Model," *Trans. of NAMRI*, 23, 1995.
- Conference Proceedings**
- Ceglarek, D.; Shi, J.; "Model-Based Control of Dimensional Variability for Automatic Fixturing of Sheet Metal Assemblies," *IV Int. Conf. on Monitoring and Automatic Supervision in Manufacturing-AC '95*, sponsored by International Institution for Production Engineering Research (CIRP) and Polish Academy of Sciences, 191-202, Warsaw, August 28-29, 1995.
- Ceglarek, D.; Shi, J.; "Design Evaluation of Sheet Metal Joints for Dimensional Integrity," *ASME Int. Mechanical Engineering Congress and Expo.*, MED 1, 117-128, San Francisco, 1995.
- Demeri, M.Y.; Hall, A.; Adamson, A.; Ulsoy, A.G.; "The Effect of Binder Force Profile on the Formability of AA6111 Sheet," *Proc. of the Japan Institute of Metals Conf.*, Hawaii, December, 1995.
- Endres, W.J.; "Analytical Approximations for Efficient Computation of Effective Lead Angle in Turning, Boring, and Face Milling Models," *Tech. Papers of NAMRI/SME*, 23, 147-152, 1995.
- Jin, J.; Shi, J.; Ni, J.; "An On-Line Automatic Modeling System with Implementation," *Proc. of Intelligent, Knowledge and Integration for Manufacturing*, Nanjing, China, April, 1995.
- Khan, A.; Ceglarek, D.; Shi, J.; Ni, J.; "An Optimal Sensor Optimization for Fault Diagnosis in Single Fixture Systems: A Methodology," *ASME Int. Mechanical Engineering Congress and Expo. Med 2*, 2 1165-1176, San Francisco, 1995.
- Khorzad, D.; Shi, J.; Hu, S.J.; Ni, J.; Seliger, G.; "Multiple Panel Fitting for Automobile Manufacturing," *Trans. of NAMRI/SME*, 241-247, May, 1995.
- Liu, S.C.; Hu, S.J.; "Spot Weld Sequence: Its Analysis and Synthesis," *1995 ASME IMECE Proc. of Manufacturing Science and Engineering-1995*, MED 2, 2, 1145-1156, 1995.
- Ludema, K.C.; "Lubricated Sliding: A Review of Chemical and Physical Effects," Keynote papers for the 1994 Leeds-Lyon Symp. on Tribology, 381, Elsevier Tribology Series 30, *Lubricants and Lubrication*, Dowson, Taylor, Childs, Dalmaz (eds), 1995.
- Ni, J.; Wang, J.; Zhang, L.; Lin, X.; "Development of a Science Base for Drills and Drill Grinding Process," *Proc. of the 1995 NSF Design and Manufacturing Grantees Conf.*, 463-465, San Diego, 1995.
- Ni, J.; "Computer Enhanced Machine Accuracy for CNC Machine Tools and Coordinate Measuring Machines," *Proc. of the First World Congress on Intelligent Manufacturing Processes and Systems*, Puerto Rico, 1995.
- Park, J.; Pasek, Z.J.; Shan, Y.; Koren, Y.; Shin, K.G.; Ulsoy, A.G.; "An Open-Architecture Real-Time Controller for Machining Processes," *Proc. of the 27th CIRP Seminar on Manufacturing Systems*, Ann Arbor, May, 1995.
- Pasek, Z.J.; Cristiano, J.J.; Ulsoy, A.G.; "A Decision-Support Approach to Machine Tool Concept Evaluation," *27th CIRP Seminar on Manufacturing Systems*, Ann Arbor, May, 1995.
- Wassink, D.A.; Lens, V.G.; Levitt, J.A.; Ludema, K.C.; Samus, M.A.; "Friction Dynamics of Lip Seals," *1995 Korea-USA Tribology Symp.*, 129, Korean Society of Tribologists and Lubrication Engineers, Seoul, October 23-28, 1995.

Weil, N.A.; Ni, J.; "Manufacturing Challenges for the Next Decade: Machine Tools Technologies," *Proc. of 3rd Int. Conf. on Manufacturing Technology*, Hong Kong, December, 1995.

Williams, W.; Koh, C.; Ni, J.; "Bearing Monitoring Using Reduced Interference Distributions," *Proc. of the 49th Meeting of the Society of Machinery Failure Prevention Technology*, April, 1995.

Yang, S.; Yuan, J.; Ni, J.; "Thermal Error Modeling of Machine Tools by Self-Learning Using CMAC Neural Network," *Proc. of 27th CIRP Int. Seminar on Manufacturing Systems*, May, 1995. *Int. Conf. on Manufacturing Technology*, Hong Kong, December, 1995.

Book Chapters:

Kunzmann, H.; Ni, J.; Waldele, F.; "Accuracy Enhancement," Chapter 10 in *Coordinate Measuring Machines and Systems*, Marcel Dekker, Inc., 1995.

Ni, J.; Waldele, F.; "Coordinate Measuring Machines," Chapter 2 in *Coordinate Measuring Machines and Systems*, Marcel Dekker, Inc., 1995.

Ni, J.; Lee, J.; "Non-Cartesian Coordinate Measuring Machines," Chapter 3 in *Coordinate Measuring Machines and Systems*, Marcel Dekker, Inc., 1995.

Ni, J.; "Accessory Elements," Chapter 4 in *Coordinate Measuring Machines and Systems*, Marcel Dekker, Inc., 1995.

Ni, J.; "Environmental Control," Chapter 9 in *Coordinate Measuring Machines and Systems*, Marcel Dekker, Inc., 1995.

Solid Mechanics and Materials

Contributing Faculty: Ellen Arruda, James Barber, Mehrdad Haghi, John Holmes, Elijah Kannatey-Asibu, Jr., Noboru Kikuchi, Jwo Pan, Ann Marie Sastry, William Schultz, Richard Scott, John Taylor, Michael Thouless, Alan Wineman, Xin Wu.

Journal Articles

Argento, A.; Scott, R.A.; "Elastic Wave Propagation in a Timoshenko Beam Spinning About Its Longitudinal Axis," *Wave Motion*, 21, 1, 1995.

Arruda, E.M.; Przybylo, P.A.; "An Investigation into the Three Dimensional Stress-Birefringence-Strain Relationship in Elastomers," *Polymer Engineering and Science*, 35, 5, 1-8, 1995.

Arruda, E.M.; Boyce, M.C.; "Effects of Strain Rate and Temperature on the Finite Strain Deformation Response of Glassy Polymers," *Mechanics of Materials*, 19, 193-212, 1995.

Chawla, N.; Holmes, J.W.; Mansfield, J.F.; "Surface Roughness Characterization of Nicalon and HI-Nicalon Fibers by Atomic Force Microscopy," *Materials Characterization*, 35, 199-206, 1995.

Chermant, J.-L.; Holmes, J.W.; "Creep Deformation of Fiber-Reinforced Ceramic Matrix Composite," *HT-CMC*, Santa Barbara, August, 1995.

Fang, C.-K.; Kannatey-Asibu, Jr., E.; Barber, J.R.; "Acoustic Emission Investigation of Cold Cracking in Gas Metal Arc Welding of AISI 4340 Steel," *Welding J.*, 177-184, June, 1995.

Haering, W.J.; Ryan, R.; Scott, R.A.; "New Formulation for General Spatial Motion of Flexible Beams," *AIAA J. of Guidance, Control and Dynamics*, 18, 1, 82-86, 1995.

Jeong, H.Y.; Pan, J.; "A Macroscopic Constitutive Law for Porous Solids with Pressure-Sensitive Matrices and its Implications to Plastic Flow Localization," *Internal J. of Solids and Structures*, 32, 3669-3691, 1995.

Jensen, H.M.; Thouless, M.D.; "Buckling Instability of Straight Edge Cracks," *J. Applied Mechanics*, 62, 620-625, 1995.

Li, N.-Y.; Hector, Jr., L.G.; Barber, J.R.; "Strain Rate Relaxation Effect on Freezing Front Growth Instability During Planar Solidification of Pure Metals," Part 2—Coupled Theory, *J. Thermal Stresses*, 18, 69-85, 1995.

Rahman, M.; Barber, J.R.; "Exact Expressions for the Roots of the Secular Equation for Rayleigh Waves," *ASME J. Applied Mechanics*, 62, 250-252, 1995.

Sørensen, B.F.; Holmes, J.W.; "Improvement in the Fatigue Life of Fiber-Reinforced Ceramics by Use of Interface Lubrication," *Scripta Metallurgica et Materialia*, 32, 9, 1393-1398, 1995.

Thouless, M.D.; "Modeling the Development and Relaxation of Stresses in Films," an invited review, *Annual Review of Materials Science*, 25, 69-96, 1995.

Thouless, M.D.; Liniger, W.; "Effects of Surface and Boundary Diffusion on Void Growth," *Acta Metallurgica et Materialia*, 43, 2493-2500, 1995.

Wineman, A.S.; Rajagopal, K.R.; "On Constitutive Equations for Electro-Rheological Materials," *Continuum Mechanics and Thermodynamics*, 7, 1-22, 1995.

Wineman, A.S.; Waldron, W.; "Yield-Like Response of a Compressible Nonlinear Viscoelastic Solid," *J. of Rheology*, 39, 401-423, 1995.

Wineman, A.S.; Kolberg, R.; "Mechanical Response of Beams of a Nonlinear Viscoelastic Material," *Polymer Engineering and Science*, 35, 1-6, February, 1995.

Yeo, T.; Barber, J.R.; "Stability of a Semi-Infinite Strip in Thermoelastic Contact with a Rigid Wall," *Int. J. Solids Structures*, 32, 553-567, 1995.

Yoo, H.H.; Ryan, R.R.; Scott, R.A.; "Dynamics of Flexible Beams Undergoing Large Overall Motions," *J. of Sound and Vibration*, 181, 261-278, 1995.

Conference Proceedings

Chou, C.H.; Tang, S.C.; Pan, J.; "Simulations of Sheet Metal Forming Operations by Considering Plastic Anisotropic Behavior of Sheet Metal," invited paper, in *Computational Mechanics '95*, S. N. Atluri, G. Yagawa, T. A. Cruse (eds), Springer-Verlag, 1384-1389, 1995.

Gupta, G.; Schultz, W.W.; Lu, X.; Arruda, E.M.; "Nonisothermal Study of Viscoelastic Slender Fiber Drawing," *Soc. Rheology Ann. Mtg.*, Sacramento, October, 1995.

Lee, K.; Barber, J.R.; "The Effect of Intermittent Contact on the Thermoelastic Instability of Automotive Brake Systems," *Proc. of ASME Applied Mechanics and Materials Summer Meeting*, UCLA, June, 1995.

Liao, K.C.; Friedman, P.; Pan, J.; Tang, S.C.; "Yield Criteria for Sheet Metal Forming Simulations," *Proc. of 1995 ASME Winter Annual Meeting*, San Francisco, November 12-17, 1995.

Lumsdaine, A.; Scott, R.A.; "Shape Optimization of Unconstrained Beam and Plate Damping Layers," *Proc. of the 15th ASME Biennial Conf. on Mechanical Vibration and Noise*, October, 1995.

Pan, J.; Jeong, H.-Y.; "Flow Localization in Porous Solids with Pressure-Sensitive Matrices," invited paper, in *Computational Mechanics '95*, S. N. Atluri, G. Yagawa, T. A. Cruse (eds), Springer-Verlag, 2493–2498, 1995.

Pan, J.; Chang, W.J.; Jeong, H.-Y.; "Effects of Constitutive Modeling on Near-Tip Deformation of Rubber-Toughened Epoxies," invited paper in *Proc. of ANTEC '95*, Society of Plastics Engineerings, Boston, May 7–11, 1995.

Sørensen, B.F.; Holmes, J.W.; "Fatigue of Ceramic Matrix Composites: Review of Mechanisms and Models," *Petten Research Center*, invited paper, The Netherlands, September, 1995

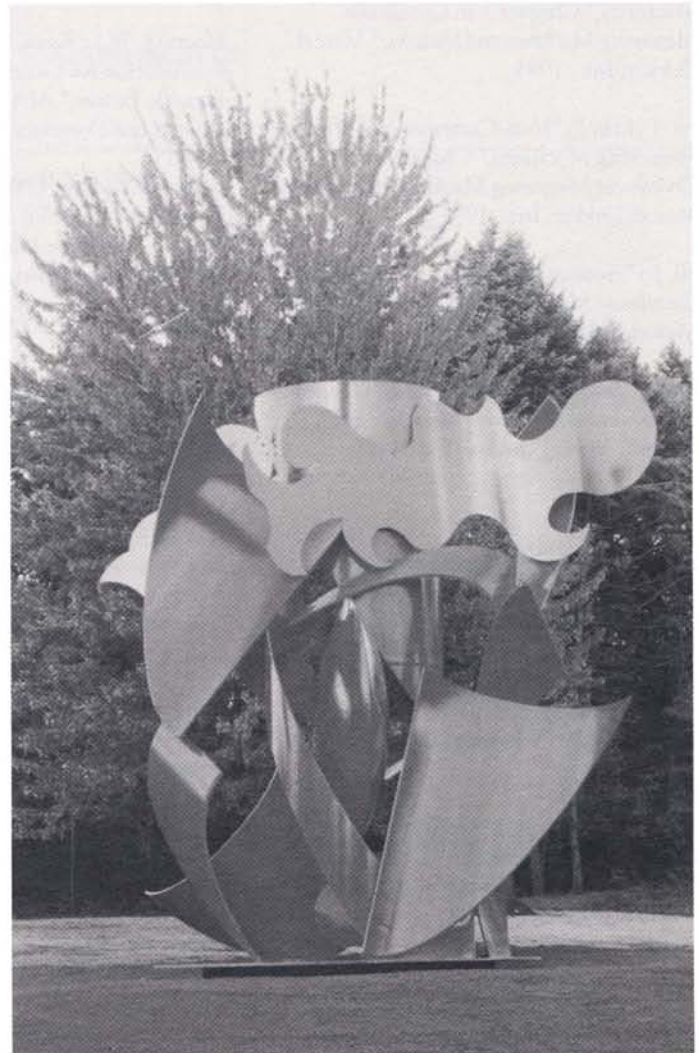
Sørensen, B.F.; Holmes, J.W.; Brondsted, P.; "Effect of Environment and Loading Rate on Fatigue Damage in Ceramic Matrix Composites," *HT-CMC2*, Santa Barbara, August, 1995.

Vadyanathan, K.R.; Cannon, W.R.; Danforth, S.; Tobin, A.; Holmes, J.W.; "Effect of Oxidation on the Mechanical Properties of Nextel 312/BN/Blackglass Composites," *Materials Research Society Proc.*, 365, 429–434, 1995.

Book Chapters

Holmes, J.W.; Wu, X.; "Elevated Temperature Creep Behavior of Continuous Fiber-Reinforced Ceramics" to appear in book *High Temperature Mechanical Behavior of Ceramic Composites*, S.V. Nair, K. Jakus (eds), Butterworth-Heinemann, 193–259, Newton, MA, 1995.

Wu, X.; Holmes, J.W.; Hilmas, G.E.; "Environmental Properties of Ceramic Matrix Composites," in *Handbook on Continuous Fiber Reinforced Ceramic Matrix Composites*, 12, R.L. Lehman, S.K. El-Rahaiby, J.B. Wachtman, Jr. (eds), CIAC/CINDAS and American Ceramics Society, 1995.



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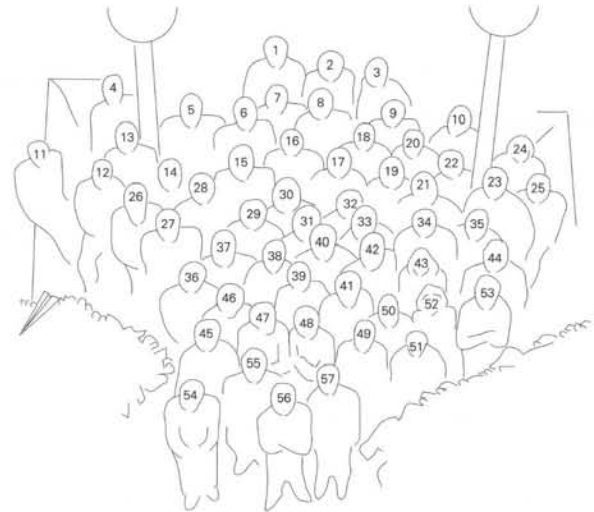


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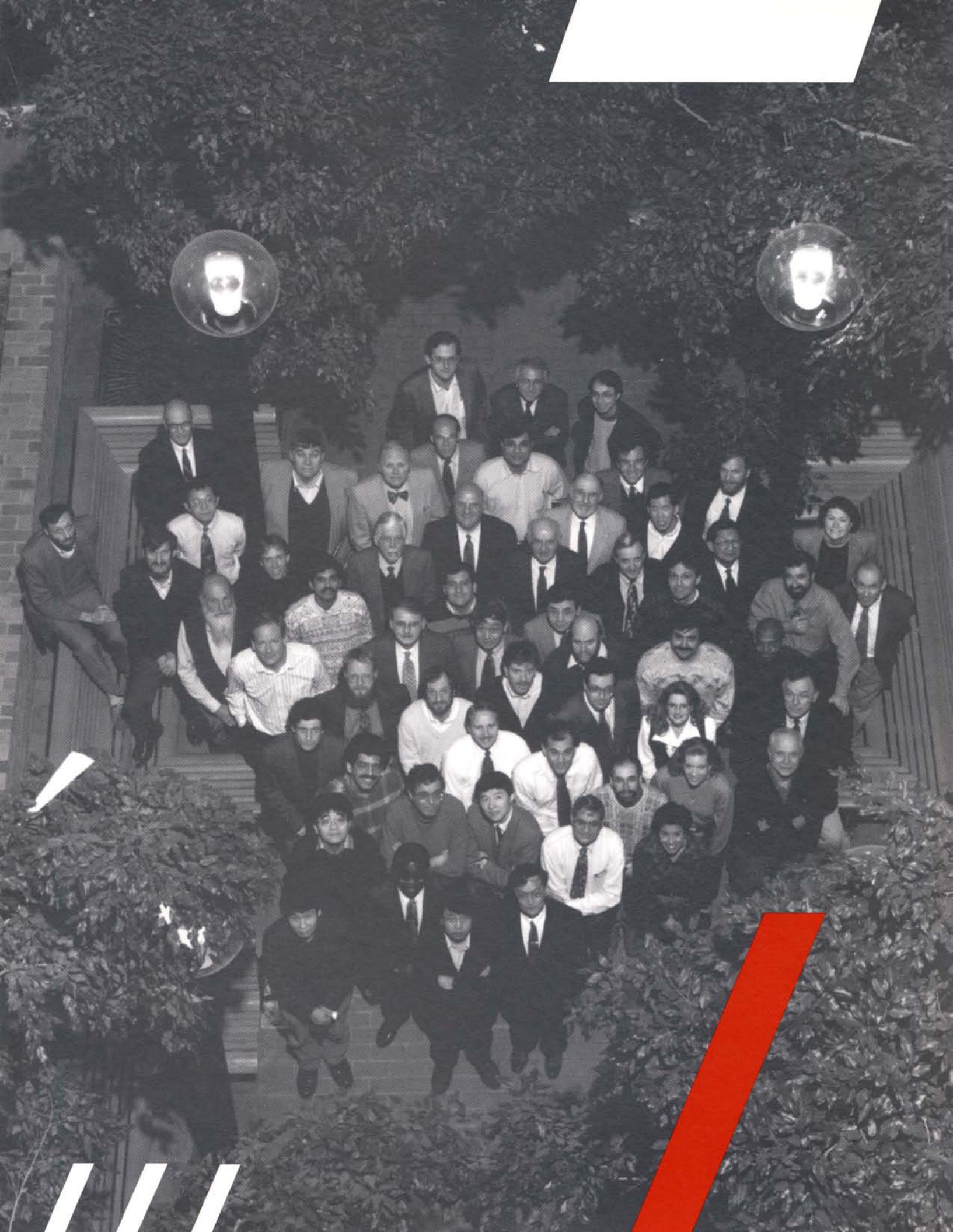
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