ANNUAL REPORT
1999

Department of Mechanical and Manufacturing Engineering
Faculty of Engineering
University of Calgary

2500 University Drive N.W.
Calgary, Alberta
Canada T2N 1N4
Telephone: (403) 220-5771
Fax: (403) 282-8406
Web Site: http://www.eng.ucalgary.ca/Mechanical

TABLE OF CONTENTS

MESSAGE FROM THE DEPARTMENT HEAD

The Department of Mechanical and Manufacturing Engineering offers two major programmes in Mechanical and Manufacturing Engineering and three minor programmes in Computer Integrated Manufacturing, Mechanical and Petroleum Engineering. Between these two undergraduate programmes, the department has an undergraduate enrolment of 450 students. In 1999, the Department graduated 110 students. The graduates were comprised of 88 undergraduate students with B.Sc. degrees (75 in Mechanical Engineering and 13 in Manufacturing Engineering) and 22 graduate students (7 Ph.D., 13 M.Sc. and 2 M.Eng.).

One of the most important accomplishments of the year is that both B.Sc. programmes have been accredited for six years. The Mechanical Engineering programme continues to be one of the most popular programmes in the Faculty attracting a large number of second year applicants, while the Manufacturing programme has grown to be the largest one of its kind in Canada.

The Department was pleased to welcome three new faculty members, Dr. Richie Gill, Dr. Ron Hugo and Dr. Nancy Papanikolaou to the Department in July 1999. We have also recruited three new faculty members who will be joining the Department in the latter part of 2000 and early 2001.

In this reporting year, our research productivity and quality have reached a new high with a total of 40 journal papers, 107 conference papers/book chapters published and many more in press, and a new patent issued. A new book is in print. Several members delivered keynote and invited lectures at international conferences and various institutions. Our staff has attracted research funding from various sources including NSERC Strategic Project Grants, CRD & IOR Grants, Research Grants and research contracts. We expect that the research funding will continue to grow with NSERC chairs, the CFI New Opportunity Award, and major research contracts and grants.

Our staff and students have been recognized nationally and internationally for their outstanding achievements in education, research and public and professional service. Our students participated in and won many international competitions.

The members of the Department continued to play leadership roles in international collaborations and professional societies. Our research strengths in Applied Mechanics, Thermo-Fluids / Energy Systems / Environment, Controls / Robotics / Mechatronics, Manufacturing and Design, and Materials have been recognized nationally and internationally. The members of the Department were active in professional services with editorial appointments of professional journals, organizing and chairing conferences and sessions, and providing services to professional societies such as ASME, SAE, SME, IIE and CSME.

I hope that you find the report informative. We'd love to hear from you if you are interested in hiring a graduate, sponsoring a project, or just giving us some suggestions. Please give me a call or send me an e-mail message to discuss how you can get involved in education and/or research activities in the Department.

P. Gu, Ph.D., P.Eng.

Head, Department of Mechanical and Manufacturing Engineering

AWARDS AND RECOGNITION

Dr. L. Bauwens

- Research Excellence Award, Department of Mechanical and Manufacturing Engineering

Dr. D. Caswell

- Professor of the Year Award, Manufacturing Engineering Program
- Teaching Excellence Award, Department of Mechanical and Manufacturing Engineering
- Teaching Excellence Award, Faculty of Engineering

Dr. M. Epstein

- Elected Fellow of American Academy of Applied Mechanics

Dr. H. S. Gill

- CRHA McCaig Development Award
- Young Innovators Award, Hunter Oil/Calgary Herald
- Presented a Keynote Lecture at International Society of Biomechanics XVIIth Congress, Calgary, Alberta

Dr. P. Gu

- Elected Corresponding Member of CIRP - International Institution for Production Research

Dr. J. Ronsky

- NSERC Women's Faculty Award
- CRHA McCaig Development Award
- YWCA Women of Distinction Award (Science and Technology) - Runner Up
- The Women in Engineering Committee, chaired by Dr. Ronsky, was recipient of two awards from Canadian Engineering Memorial Foundation: Most Improved Faculty Award and Dean's Millennium Award
- Professor of the Year Award, ESS 1st and 2nd Year Students

Dr. M. Ulieru

- Outstanding Research Award, International Institute for Advanced Studies in Systems Research and Cybernetics, Windsor, Canada

Dr. O. Vinogradov

- Killam Resident Fellowship Award, University of Calgary
- Learning Commons Fellowship Award, University of Calgary

Dr. I. Wierzba

- Presented a Key-note Address at the Third International Symposium on Hydrogen Power, Theoretical and Engineering Solutions - HYPOTHESIS III, Saint-Petersburg
- Board of Governors of ASME International Certificate for Services in Advancing the Engineering Profession

FACULTY MEMBERS AND SUPPORT STAFF

Faculty Members

Full Time Faculty Members

Luc Bauwens, Ph.D., P.Eng.
Professor

Engineer (ECAM, Brussels) 1970
M.A.Sc. (British Columbia) 1986
Ph.D. (California, Berkeley) 1989

Computational fluid dynamics; combustion and reacting flows; combustion instabilities; numerical modeling of Stirling engines and cryocoolers.

Telephone: (403) 220-5792, E-mail: bauwens@ucalgary.ca

Robert W. Brennan, Ph.D., P.Eng.
Assistant Professor

B.Sc. (Calgary) 1984
Ph.D. (Calgary) 1996

Manufacturing control architectures; discrete-event simulation; perturbation analysis; computer integrated manufacturing.

Telephone: (403) 220-5798, E-mail: brennan@enme.ucalgary.ca

Daryl Caswell, Ph.D., P.Eng.
Assistant Professor

B.Mus. (Toronto) 1973
M.Mus. (Northwestern) 1981
B.Sc. (Calgary) 1987
M.Sc. (Calgary) 1992
Ph.D. (Calgary) 1996

Musical acoustics; room acoustics; multi-disciplinary design; musical instrument design and manufacturing.

Telephone: (403) 220-5160, E-mail: caswell@enme.ucalgary.ca

Kashmiri L. Chowdhury, Ph.D.
Associate Professor

B.A. (Hons) (Panjab) 1958
M.A. (Delhi) 1961
Ph.D. (I.I.T., Delhi) 1968

Solid and continuum mechanics; constitutive theory in elastic dielectrics; stability and vibration; mathematical modelling and simulation; artificial intelligence.

Telephone: (403) 220-4150, E-mail: chow@enme.ucalgary.ca

S. T. Van Enns, Ph.D., P.Eng.

Associate Professor

B.Sc. (Manitoba) 1977
MBA (Manitoba) 1984
Ph.D. (Minnesota) 1991

Manufacturing planning and control systems; production system design and analysis; quality management and process improvement; manufacturing strategy; product design management.

Telephone: (403) 220-5802, E-mail: enns@enme.ucalgary.ca

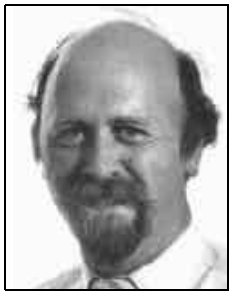
Marcelo Epstein, Ph.D., P.Eng.

Professor
Adjunct Professor, Faculty of Kinesiology

Ing. Civ. (Buenos Aires) 1967
M.Sc. (Technion) 1970
D.Sc. (Technion) 1972
B.A. Classics (Calgary) 1993

Continuum mechanics; biomechanics; nonlinear shell theory; oriented media; constitutive theory; continuous distributions of dislocations; wave propagation; geomechanics.

Telephone: (403) 220-5791, E-mail: epstein@enme.ucalgary.ca



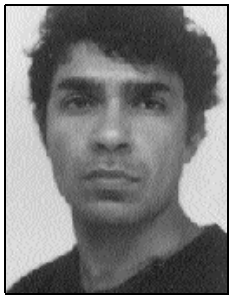
Owen R. Fauvel, Ph.D., P.Eng.

Professor

B.Sc. (Calgary) 1977
Ph.D. (Newcastle Upon Tyne) 1981

Cutting/excavation of rock and coal; mechanical design systems; computer aided design and manufacturing (CAD/CAM); Stirling engine power plants.

Telephone: (403) 220-7474, E-mail: fauvel@enme.ucalgary.ca



H.S. (Richie) Gill, Ph.D.

Assistant Professor

B.Eng. (Bristol) 1989
D.Phil. (Oxford) 1996

Orthopaedic biomechanics; gait analysis; knee and atellofemoral joint modelling; migration measurement of implanted prostheses.

Telephone: (403) 220-5779, E-mail: gill@ucalgary.ca

Peter Goldsmith, Ph.D., P.Eng.

Associate Professor

B.Sc. (Calgary) 1987
M.Eng. (Calgary) 1989
Ph.D. (Toronto) 1995

Robotics; dynamics; control systems; computer integrated manufacturing; artificial intelligence.

Telephone: (403) 220-7779, E-mail: pgold@enme.ucalgary.ca

Peihua Gu, Ph.D., P.Eng.

Professor and Head
Director of Manufacturing Engineering Program

B.Eng. (Tianjin) 1980
M.Eng. (Tianjin) 1982
Ph.D. (McMaster) 1989

Life cycle design engineering; design of manufacturing systems; rapid product realization.

Telephone: (403) 220-7163, E-mail: gu@enme.ucalgary.ca

Ronald J. Hugo, Ph.D.

Assistant Professor

B.Sc. (Calgary) 1989
M.Sc. (Notre Dame) 1991
Ph.D. (Notre Dame) 1995

Non-intrusive optical measurement of flowfields; axisymmetric jets; flow control and diagnostics; high-temporal-bandwidth optical wavefront sensors.

Telephone: (403) 220-2283, E-mail: hugo@ucalgary.ca

Ghazi A. Karim, Ph.D., P.Eng.

Professor

B.Sc. (Hons.) (Durham) 1956
D.I.C. (Imperial College) 1960
Ph.D. (London) 1960
D.Sc. (London) 1972

Combustion and flames; reaction kinetics; air pollution; fuel technology; thermal power engineering; problems associated with the use of hydrogen and other alternative fuels; analysis of fire and explosion failures; combustion of oil sands.

Telephone: (403) 220-5775, E-mail: karim@enme.ucalgary.ca

John A. C. Kentfield, Ph.D.

Professor

B.Sc.(Southampton) 1959
D.I.C. & Ph.D. (Imperial College) 1963

Unsteady compressible flow phenomena; pressure exchangers; pulsating combustion; power transmission; wind energy systems.

Telephone: (403) 220-5777, E-mail: kentfiel@enme.ucalgary.ca

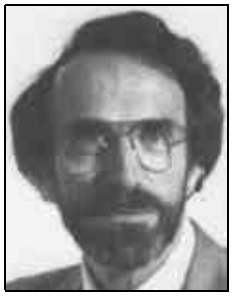
Stanislaw A. Lukasiewicz, Ph.D., P.Eng.

Professor

M.Eng. (Warsaw) 1952
Ph.D. (Warsaw) 1961
Habilitation (Warsaw) 1966

Theory of plates and shells; stability and nonlinear behaviour of structures; plasticity theory, fatigue and creep behaviour of materials; design and optimization of thin-walled elements including pipelines, pressure vessels, cranes, elevators, pumps, airplane-structures.

Telephone: (403) 220-4146, E-mail: lukasiew@enme.ucalgary.ca



Douglas H. Norrie, Ph.D., P.Eng.

Professor
Adjunct Professor, Computer Science
U of C Nortel Chair in Intelligent Manufacturing

B.Eng. (Canterbury) 1951
B.Sc. (Otago) 1952
Ph.D. (Adelaide) 1965

Computer aided design and manufacturing; computer integrated manufacturing; expert systems; object oriented programming.

Telephone: (403) 220-5787, E-mail: norrie@enme.ucalgary.ca

Nancy Papanikolaou, Ph.D., P.Eng.

Assistant Professor

B.Sc. (Distinction) (Calgary) 1993
Ph.D. (Calgary) 1998

Combustion; jet flames; alternative fuels; flame stability; emissions.

Telephone: (403) 220-5918, E-mail: papaniko@enme.ucalgary.ca

Jeff K. Pieper, Ph.D., P.Eng.

Associate Professor
Director of Mechanical Engineering Program

B.Sc. (Queen's) 1987
M.Sc. (California) 1988
Ph.D. (Queen's) 1992

Application of optimal and robust control; process control especially metal machining; active suspension and air/fuel ratio control in automotive systems; helicopter flight control systems; sliding mode control.

Telephone: (403) 220-5776, E-mail: pieper@enme.ucalgary.ca

Paul Rogers, Ph.D., P.Eng.

Associate Professor

B.A. (Cambridge) 1984
M.Eng. (Cambridge) 1985
Ph.D. (Cambridge) 1989

Computer integrated manufacturing; object-oriented modelling; discrete-event simulation; design of intelligent manufacturing systems; manufacturing planning, control, and management; manufacturing information systems.

Telephone: (403) 220-8574, E-mail: rogers@enme.ucalgary.ca

Janet L. Ronsky, Ph.D., P.Eng.

Associate Professor
Director of Graduate Program
Adjunct Associate Professor, Faculty of Kinesiology

B.A.Sc. (Waterloo) 1983
Ph.D. (Calgary) 1994

Biomechanics; joint contact mechanics, measurement of in vivo joint contact using MRI and pressure sensitive film; surface modelling techniques, analytical and FEA modelling of articular cartilage contact; biomechanical analysis of normal and pathological joints during movement, effect of orthopaedic procedures on joint biomechanics, effects of agining on gait.

Telephone: (403) 220-8134, E-mail: jlronsky@ucalgary.ca

William J. D. Shaw, Ph.D., P.Eng.

Professor

B.Sc. (Saskatchewan) 1968
M.Sc. (Saskatchewan) 1972
Ph.D. (Saskatchewan) 1979

Characteristics of mechanical alloys; fatigue crack propagation; fracture mechanics; corrosion science and stress corrosion cracking; mechanical behavior of materials; high temperature deformation and superplasticity; fractography; high strength composite materials; metallography and material characterization; environmental interactions with materials.

Telephone: (403) 220-5801, E-mail: shaw@enme.ucalgary.ca

Michael A. Slawinski, Ph.D., P. Geoph.

Industrial Research Assistant Professor

Ph.D. (Calgary) 1996

Fundamentals of geomechanics; stress, strain and their linear relationship; strain-energy function and its implications on stability conditions; seismological elements of the calculus of variations and differential geometry; strength of materials; seismic waves in complex media; seismic anisotropy.

Telephone: (403) 220-2716, E-mail: geomech@telusplanet.net

Qiao Sun, Ph.D., P.Eng.

Assistant Professor

B.Sc. (Shanghai Jiao Tong) 1982
M.Sc. (Shanghai Jiao Tong) 1986
Ph.D. (Victoria) 1996

Robotics; cooperative control of multiple manipulators; dynamics modelling; flexible manipulators; vibration; mechanical signature analysis; optimization techniques; control of mechanical systems.

Telephone: (403) 220-4141, E-mail: qsun@enme.ucalgary.ca

Mihaela Ulieru, Ph.D.

Associate Professor
U of C Nortel Junior Chair in Intelligent Manufacturing

Dr.-Ing. (Darmstadt) 1995

Intelligent manufacturing systems; intelligent control systems; computational intelligence (fuzzy reasoning, neural-learning, evolutionary computing); diagnostic expert systems; decision support systems; multi-agent systems; supply chain management; distributed virtual organizations.

Telephone: (403) 220-8976, E-mail: ulieru@ucalgary.ca

Oleg G. Vinogradov, Ph.D., P.Eng.

Professor

B.A.Sc. (Kharkov) 1960
M.Sc. (Rostov-on-Don) 1968
Ph.D. (St. Petersburg) 1968

Mechanics of cables; linear; nonlinear and random vibrations, multi-body dynamics; computer simulation of multibody systems.

Telephone: (403) 220-7187, E-mail: vinograd@enme.ucalgary.ca

Ida Wierzba, Ph.D., P.Eng.

Professor

M.Sc. (Moscow)
Ph.D. (Warsaw)

Combustion processes and emissions; catalytic combustion; flame stability; alternative fuels; flammability and ignition; gas turbines; burners.

Telephone: (403) 220-4156, E-mail: wierzba@enme.ucalgary.ca

Deyi Xue, Ph.D., P.Eng.

Associate Professor

B.Sc. (Tianjin) 1985
M.Sc. (Tokyo) 1989
Ph.D. (Tokyo) 1992

Concurrent engineering; intelligent computer-aided design and manufacturing; intelligent planning, scheduling, and control; engineering optimization; tolerance modeling; artificial intelligence applications; object oriented modeling.

Telephone: (403) 220-4168, E-mail: xue@enme.ucalgary.ca

Professor/Associate Professor Emeritus

- Dr. P. Glockner
  Telephone: (403) 220-6171, E-mail: glockner@ucalgary.ca
- Dr. E. Mikulcik
  Telephone: (403) 220-5789, E-mail: mikulcik@ucalgary.ca
- Dr. M. Singh
  Telephone: (403) 220-5773, E-mail: singh@enme.ucalgary.ca
- Prof. A. A. Torvi
  Telephone: (403) 220-5790, E-mail: torvi@enme.ucalgary.ca
- Dr. P. J. Vermeulen
  Telephone: (403) 220-5789, E-mail: peterj@enme.ucalgary.ca
- Dr. G.Walker
  Telephone: (403) 220-5772, E-mail: walker@enme.ucalgary.ca

Adjunct Professors

- Dr. W. Herzog
  Telephone: (403) 220-3438, E-mail: walter@kin.ucalgary.ca
- Dr. J. Love
  Telephone: (403) 220-7428, E-mail: love@ucalgary.ca
- Dr. B. M. Nigg
  Telephone: (403) 220-3435, E-mail: nigg@ucalgary.ca
- Prof. V. Panlilio
  Telephone: (403) 531-3383
- Dr. R. Zernicke
  Telephone: (403) 220-8666, E-mail: zernicke@ucalgary.ca

Support Staff

Administrative Support Staff

- Maria Berry, Administrative Manager
  Telephone: (403) 220-5770, E-mail: mberry@ucalgary.ca
- Marion Engels, Resource and Administration Assistant
- Nareeza Khan, Graduate Administrator
- Valentina Kouznetsova, Secretary
- Joanne Ouellet, Administrative Secretary
- Lois Phillips, Receptionist/Record Coordinator
- Karen Undseth, Projects and Technical Resources Person

Technical Support Staff

- Greg East, Machinist Technologist
- Brandon Ferguson, Engineering Laboratory Technician
- Daniel Forre, System Analyst
- David Genge, Robotics Technician
- Mike Johnson, Machinist Technologist
- Art Moehrle, Instrumentation Technician
- Ben Sanders, Electronics Technician
- Nick Vogt, Technical Manager
- Khee Teck Wong, Computer System Manager

UNDERGRADUATE STUDIES

Undergraduate Programs

The Mechanical and Manufacturing Engineering Department offers two major programs, Mechanical Engineering and Manufacturing Engineering, with the following Bachelor of Science (B.Sc.) degrees for undergraduate studies:

- Mechanical Engineering (ENME)
- Mechanical Engineering with a Minor in Computer Integrated Manufacturing (CPIM)
- Mechanical Engineering with a Minor in Petroleum Engineering (ENPM)
- Manufacturing Engineering (ENMF)
- Manufacturing Engineering with a Minor in Mechanical Engineering (ENMM)

Both the Mechanical Engineering program and the Manufacturing Engineering program are fully accredited programs. The Manufacturing Engineering program is the largest in Canada and the only one in Western Canada.

The first and foremost objective of all undergraduate programs is to provide our students with an engineering education commensurate with academic background and qualifications necessary for the practice of the engineering profession. This is achieved through a 4 year, 8 term degree program consisting of a 1 year common curriculum in engineering for all students followed by a more specialized 3 year program in either Mechanical Engineering or Manufacturing Engineering. Thus, the graduating student is provided with a general engineering education plus appropriate in-depth knowledge of selected areas in Mechanical Engineering or Manufacturing Engineering.

To achieve this objective, the programs include a broad and appropriate education in the physical science, mathematics, computer sciences and the principles of engineering science and design. In addition the students are provided with the opportunity to study courses designed to improve societal awareness, communication and business skills and to make them aware of the pervasive impact of technology on society.

The students are encouraged to take the Engineering Internship Program (EIP) that provides them with a broad array of personal and interpersonal skills, and a strong process and business orientation, in addition to technical competence.

Undergraduate Enrolment and Degrees Granted

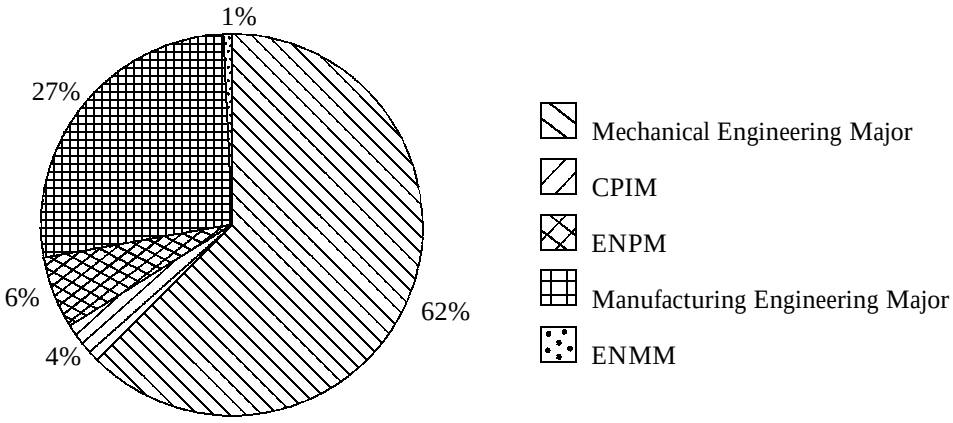
In 1999, the Mechanical Engineering remained a very popular program and the enrolment in Manufacturing Engineering increased significantly. The second year enrolments for both Mechanical and Manufacturing Engineering programs reached their quotas.

Many students also participated in the Engineering Internship Program (EIP). Some students were enrolled as part-time students or part-time evening students in the programs. In 1999, 88 students were granted B.Sc. degrees.

Full-time Undergraduate Student Enrolment and Degrees Granted

Program		Year 2	Year 3	Year 4	Year 5	Total	Degrees Granted
Mechanical Engineering	Total	80	103(16)	110 (43)	15 (12)	308 (71)	75 (29)
	CPIM			13	5	18	14
	ENPM			26		26	15
Manufacturing Engineering	Total	61	32 (5)	27 (13)		120 (18)	13 (7)
	ENMM			5		5	
Total		141	135 (21)	137 (56)	15 (12)	428 (89)	88 (36)

The numbers in brackets indicate the numbers of students participated in Engineering Internship Program (EIP)
CPIM: Mechanical Engineering with a Minor in Computer Integrated Manufacturing
ENPM: Mechanical Engineering with a Minor in Petroleum Engineering
ENMM: Manufacturing Engineering with a Minor in Mechanical Engineering



Undergraduate Student Distribution by Programs

Undergraduate Awards

Undergraduate Awards 1999

Recipient	Award
Ali, Riaz Ricardo	Student Peer Assistance Undergraduate Bursary
Andersen, Stephen William	BP Amoco Bursary in Engineering
Attia, Joseph Nabil	Student Peer Assistance Undergraduate Bursary
Baker, Mackenzie Jean	University of Calgary Undergraduate Merit Award
Brandstadt, Katrina	University of Calgary Undergraduate Merit Award University of Calgary Engineering Class of '70 Jim Low Memorial Scholarship
Branner, Sarah Catherine	DOSCO Supply Bursary in Mechanical Engineering Student Peer Assistance Undergraduate Bursary
Brown, Gregory Anthony	University of Calgary Undergraduate Merit Award
Busse, Greg John	Student Peer Assistance Undergraduate Bursary Talisman Energy Bursary
Chan, Ivy	University of Calgary Undergraduate Merit Award
Cheung, Kevin	Student Peer Assistance Undergraduate Bursary
Corbiell, Ramona Laura Marga	The Peter Glockner Engineering Scholarship for Excellence
Davis, Darcy Lee	Gerald Roberts Mortimer and Victor Emanuel Mortimer Scholarship
Diaz, May Nicole	Petroleum Society of CIM Scholarship
Dolynchuk, Peter Andrew	Student Peer Assistance Undergraduate Bursary
Donaldson, Brian Mackay	Engineering Students' Society Memorial Award
Donnelly, Sarah Evelyn	Maurice Paulson Athletic Award University of Calgary Undergraduate Merit Award
Dubetz, Tyler Paul Arthur	University of Calgary Undergraduate Merit Award Student Peer Assistance Undergraduate Bursary Alberta Heritage Scholarship (Louise McKinney)

Undergraduate Awards 1999 (continued)

Esmail, Husain Mansoor	Canamera United Supply Ltd. Bursary
Exley, David Cameron	W.G. (Bill) Howard Memorial Foundation Award
Federkeil, Michael	Student Peer Assistance Undergraduate Bursary
Gatzke, Aaron Geoffery	Student Peer Assistance Undergraduate Bursary
Grant, Ryan James	Student Peer Assistance Undergraduate Bursary
Hamel, Jennifer Irene	Chancellor's Club Scholarship
Hamm, Mark Lewis	Alberta Heritage Scholarship (Louise McKinney)
Hansen, Ryan Arnold	Gemini Engineering Inc. Bursary Student Peer Assistance Undergraduate Bursary
Honsek, Raimund	Alberta Heritage Scholarship (Louise McKinney)
Jalotjot, Nelson	Student Peer Assistance Undergraduate Bursary
Jamin, Yorwearth Lewis J	Barrington Petroleum Ltd. Bursary The Cliff Marteinson Memorial Bursary
Jones, Heather Lynn	Delta Hudson Engineering Ltd. Bursary Student Peer Assistance Undergraduate Bursary
Koay, Kelvin Chung Kwan	University of Calgary Undergraduate Merit Award Petroleum Society of CIM Scholarship
Kwan, Ulric	Student Peer Assistance Undergraduate Bursary The Darren Cooper Memorial Award
Law, Derek	University of Calgary Undergraduate Merit Award
Le, Doris	The Anderson Exploration Ltd. Bursary in Engineering Student Peer Assistance Undergraduate Bursary
Lee, Joonee	Student Peer Assistance Undergraduate Bursary
Leung, Bernard Lai-wo	Student Peer Assistance Undergraduate Bursary
Leung, Ka-wai	University of Calgary Undergraduate Merit Award Nabors Drilling Limited Scholarship CSME MEDAL Canadian-Montana Gas Company Limited Scholarship in Engineering
Littlejohn, Gunnar Lewis	Student Peer Assistance Undergraduate Bursary
Mcbeth, Paul Bradley	Association of Professional Engineers, Geologists and Geophysicists of Alberta Gold Medals in Engineering
Mckeague, Darren Christopher	University of Calgary Undergraduate Merit Award Alberta Heritage Scholarship (Louise McKinney)
Miller, Brock James	BP Amoco Bursary in Engineering
Miller, Jonathan Israel	University of Calgary Undergraduate Merit Award TransAlta Corporation Memorial Scholarship
Moore, Adam James Lee	Shell Canada Recruitment Bursary - Engineering

Undergraduate Awards 1999 (continued)

Muwanga, Roland Ssonko	The Al Kemp Memorial Bursary The Dr. Alex Petrunic Memorial Scholarship Student Peer Assistance Undergraduate Bursary
Ooi, Phaik-chen	University of Calgary Alumni Association International Student Bursary
Repka, Melina	University of Calgary Undergraduate Merit Award
Rhynes, David John	Alberta Heritage Scholarship (Louise McKinney) University of Calgary Undergraduate Merit Award
Robson, Darren Robert	Archibald Waynne Dingman Memorial Scholarship University of Calgary Undergraduate Merit Award
Romer Segal, Yannai Zev	University of Calgary Undergraduate Merit Award
Rosales, Vicente Ignacio	University of Calgary Undergraduate Merit Award
Rumsey, Kenneth Daniel	Student Peer Assistance Undergraduate Bursary
Runka, Joel Cameron	Viscount Bennett Scholarship University of Calgary Undergraduate Merit Award
Sanden, Grant Ian	William Lemond Hamilton Bursary
Scase, Michael James	University of Calgary Undergraduate Merit Award
Schuster, Glenn Donald	Student Peer Assistance Undergraduate Bursary
Sennhauser, Daniel Jeffrey	The Peter Glockner Engineering Scholarship for Excellence
Sharpe, Miranda Lynn	Student Peer Assistance Undergraduate Bursary
Shaw, Kevin Daniel	Chevron Canada Resources Limited Scholarship in Engineering
Soeder, Jennifer Anne	Student Peer Assistance Undergraduate Bursary
Stammer, Meredith Lara	Student Peer Assistance Undergraduate Bursary Campus Recycling Board Bursary
Swirp, Mikael James H	Del Henderson Memorial Bursary Student Peer Assistance Undergraduate Bursary
Thomas, Jason Brent	University of Calgary Undergraduate Merit Award
Thomlinson, Katherine Ruth	University of Calgary Undergraduate Merit Award
Tilleman, Murray James	Student Peer Assistance Undergraduate Bursary
Truong, Thuy-vi	Student Peer Assistance Undergraduate Bursary Talisman Energy Inc. (1995) Bursary
Van Beurden, Ryan Henricus	University of Calgary Undergraduate Merit Award
Virdi, Sarbjit Singh	Student Peer Assistance Undergraduate Bursary
Vogler, Joseph Osgood	University of Calgary Undergraduate Merit Award Alberta Heritage Scholarship (Louise McKinney)

Undergraduate Awards 1999 (continued)

Walls, Elizabeth Anne	Hans M. Nielsen Memorial Undergraduate Bursary
Walls, John Christopher	Phillips Petroleum Resources, Ltd. Bursary Student Peer Assistance Undergraduate Bursary
Wessner, Craig Harvey	William Lemond Hamilton Bursary
Wheatley, Stephen	Student Peer Assistance Undergraduate Bursary
Wolff, Todd David	University of Calgary Undergraduate Merit Award
Woo, Stephen Haun Woon	Student Peer Assistance Undergraduate Bursary
Yacyshen, Richard	University of Calgary Undergraduate Merit Award
Yaki, David Arnold	University of Calgary Undergraduate Merit Award
Young, Darren	John and Anthony Pearson Memorial Bursary Travel Cuts Native Student Bursary

Undergraduate Design Projects

The full-year design project course for all fourth-year mechanical and manufacturing students was run the first time with a huge success. The project course was coordinated by Dr. Caswell and Dr. Fauvel. In this course, the fourth-year students engaged in real-world open-ended design or research projects. Some projects were initiated by students' internship companies, others were of types of competition designs, such as the Formula One Racecar. Most of the projects were sponsored by industrial partners such as TENET. At the end of the full-year course, students presented their results to their peers, faculty members, and industry clients.

1999 Undergraduate Design Projects

Project Title	Student Names
Chemical Injection Pump Check Valve	Taylor, C., Rach, D., Thompson, J.
Design of Teaching Aids for Engineering Dynamics Course	Hardie, S., Hircock, C., Wellwood, M.
SAE Heavy Lift Aircraft Design Competition	Rundle, M., Schaan, K., David, C.
Design of a Test Model for the Type 2400 Upholder Class Submarine	Patino, F., Dhar, P., Gessner, D.
Infant Car Seat Swivel Chair Design	Ngai, K., Luk, R., Tiu, W.H.
Design of a Bone Vise Kit for Bone Graft Procedures	Fricker, T., King, J., Virdi, B.
Design of a Hand Table for Hand Surgery Operations	Gerrard, B., Christensen, T., Peperkorn, D.
Design of a Removable Cup Holder for Military Vehicles	Hillaby, D., Fisher, J., Rubie, G.
Design of a Gearbox for a Dynometer	Wu, M., Clark, B., Tran, T.
Design of an Alternative to the Lead Hand Currently Used during Hand Surgery to Hold the Hand in Place	Lauder, J., Leckie, J., McLintock, K.
Design of an Auto-claveable, Multi-purpose Tray for Storing, Cleaning and Sorting Surgical Instruments	Donaldson, B., Sprenger, N., Ragan, S.
Design of an Extraction Mechanism for the Removal of Bone Pins	Ducatel, A., Rakhra, C., Sauder, S.

1999 Undergraduate Design Projects (continued)

Design of a Pipeline Sampling Tool to Remove Material Samples from Pipeline in the Field	Gerlitz, J., Graham, T., Sandau, M.
Design of an Osteotomy Distractor for Distal Radius (Wrist) Surgery	Robertson, S., Cheung, M., McGowan, B.
Design of a Combustion Chamber for a Diver Propulsion Vehicle	Lambert, C., Currie, C., Wenger, P.
Design of a Mechanism to Turn a Patient over on the Operating Table after General Anesthetic has been Administered	Dabbous, R., Sorial, N., Kreuz, S.
Design of a Force Platform to Evaluate Proprioception (Balance) in a Standing Patient	Porteous, D., Retzlaff, K., Gawron, M. Dingman, C.
Design of a Tooth Viability Probe to Test for Interior Tooth Vitality and Health	Davies, C., Kimery, D., Outtrim, R.
Design of a Small Hand Table for Use in Hand Surgery	Ho, K. C., Wibowo, A., Stanford, T.
Design of a Leg Positioning Device for Use in Leg Surgery	Raffin, D., Chui, D., Nodrick, J.
Design of a Single Cylinder Heat Engine for Use in 3rd World Countries	Olafson, L., Frede, R., Mah, J., Ngai, A.
Design of a Helix Cable Stripper for Use in Telecommunications Assemblies	Kurelski, M., Sparkes, M., Anning, G., Macleod, A.
SAE Mini Baja Vehicle Design Competition	McBeth, P., Frayn, K., Lucier, L., Balog, C., James, A.
SAE Formula 1 Car Design Competition	Essel-Ampah, J., Holowachuk, B., Summers, S., Peters, J., Taylor, B.

The Formula One Team Led by Dr. Caswell for SAE Competition at Detroit

GRADUATE STUDIES

Graduate Programs

The Department of Mechanical and Manufacturing Engineering offers graduate programs leading to the Master of Engineering (M.Eng.), Master of Science (M.Sc.), and Doctor of Philosophy (Ph.D.) degrees in the areas of

- Applied Mechanics
- Automation, Control and Robotics
- Bioengineering
- Thermo-Fluids, Energy Systems & Environment
- Manufacturing Engineering
- Design & Materials

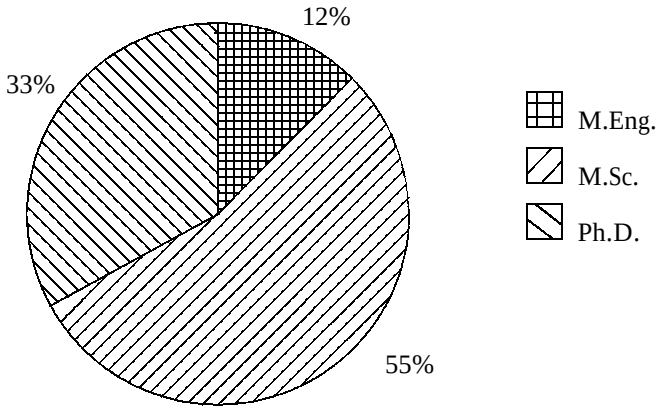
In addition, the Department of Mechanical and Manufacturing Engineering offers a Master of Engineering program (course-based route or thesis route) with specialization in Engineering for the Environment.

Graduate Enrolment

The number of graduate students remained steady in 1999. These students were from many different countries, working on their programs leading to M.Eng., M.Sc., and Ph.D. degrees.

Graduate Enrolment

Program	M.Eng.	M.Sc.	Ph.D.	Total
Number of Full-time Students	3	48	30	81
Number of Part-time Students	8	2		10
Total	11	50	30	91



Graduate Student Distribution by Programs

Graduate Degrees Granted

There were 22 students who graduated in 1999, 7 with a Ph.D. degree, 13 with a M.Sc. degree, and 2 with a M.Eng. degree. The theses and dissertations leading to M.Eng., M.Sc. and Ph.D. degrees are summarized in the following table.

Graduate Degrees Granted 1999

Thesis/Dissertation Title	Student Name	Degree	Supervisor
Decision-making in Manufacturing Systems: An IPA/ Fuzzy Approach	Behzad Foroughi	MSc	Dr. Brennan
The Effect of Exercise-Induced Mechanical Stimuli on Cortical Bone	Stefan Judex	PhD	Dr. Zernicke
Performance Limitations of a Force-Controlled Industrial Manipulator	Yajaira Herrera	MSc	Dr. Goldsmith
Mixed Norm Control of a Helicopter	Michael Trentini	PhD	Dr. Pieper
Dynamics of Unbalanced Rotors on Rigid and Flexible Bearings	Tilak Asoka Jayasuriya Arachige	MSc	Dr. Singh
Discrete Mechanics of Granular Matter	Dmitri Gavrilov	PhD	Dr. Vinogradov
Evaluation of the Hydrogen Vacuum Foil Permeation Method	Dinu Gheorghe Matei	MSc	Dr. Shaw
Design and Evaluation of a Non-invasive Spinal Indentation Device for Assessing Stiffness of Human Musculoskeletal System	Jan Dmowski	MEng	Dr. Fauvel
A Predictive Model for Gas Fueled Spark Ignition Engine Applications	Shiva Om Bade Shrestha	PhD	Dr. Karim
An Investigation of the Processes During the Rapid Compression of Premixed Fuel-Air Systems	Kai Chen	PhD	Dr. Karim
SCC Initiation Study of X-52 Pipeline Steel and Its Various Microstructures in Near Neutral pH Bicarbonate Solution	Vladimir Evguenievitch Sizov	MSc	Dr. Mao
Human Patellofemoral Kinematics and Related Joint Surface Geometry	Marilyn Joy Powers	MSc	Dr. Ronsky
Lower Extremity Biomechanics of Children with Clubfoot	Theresa Claire Davies	MSc	Dr. Zernicke
An Examination of Fugitive Methane Emissions and Combustion of Ultra Lean Mixtures within Gas Turbines	Todd Michael Parker	MEng	Dr. Karim
An Analytical Examination of the Autoignition Process in Gas Fuelled Compression-Ignition Engines in the Presence of Recycled Exhaust Products	Yan Kwok Wong	PhD	Dr. Karim
Discrete Sliding Mode Control of Magnetic Bearings	Shane Lee Edmonds	MSc	Dr. Pieper
Comparison of Human and Prosthetic Forefoot Stiffness	Mark Arthur Oleson	MSc	Dr. Goldsmith
Mechanistic Studies of Stress Corrosion Cracking of Pipeline Steel in Various Near Neutral pH Environment	Biao Gu	PhD	Dr. Mao
Familiarization: An Approach to Multidisciplinary Design	Ernest Baraniecki	MSc	Dr. Caswell
Quality Enhancement and Model Layout Optimization of Rapid Prototyping	Xiaochen Zhang	MSc	Dr. Gu
Development of an Intelligent Production Scheduling System	Jun Sun	MSc	Dr. Xue
Bifurcations and Chaos in the Froude Pendulum	Subramanian Ramakrishnan	MSc	Dr. Singh

Graduate Awards

Graduate Awards 1999

Recipient	Award
Baker, N.	NSERC Scholarship
Boyd, S.	NSERC Scholarship AHFMR Scholarship Silver Anniversary Graduate Scholarship
Busnello, L.	The Faculty of Graduate Studies Fee Scholarship
Chow, D.	NSERC Scholarship AHFMR Scholarship Silver Anniversary Graduate Scholarship The Faculty of Graduate Studies Fee Scholarship
Couillard, S.	NSERC Scholarship The Faculty of Graduate Studies Fee Scholarship
Dudley, R.	NSERC Scholarship AHFMR Scholarship The Faculty of Graduate Studies Fee Scholarship
Edmonds, S.	Province of Alberta Graduate Scholarship
Fang, L.	The Faculty of Graduate Studies Fee Scholarship
Figueroa, L.	The Faculty of Graduate Studies Fee Scholarship
Kan, S.	Canadian Commonwealth Scholarship
Kaya, M.	AHFMR Scholarship
Kilchyk, V.	The Faculty of Graduate Studies Fee Scholarship
Kralovic, B.	NSERC Scholarship AHFMR Scholarship
Li, L.	Mobil Oil Scholarship Nesbit Burns Scholarship The Faculty of Graduate Studies Fee Scholarship
Matei, D.	NSERC Scholarship
McBeth, P.	Province of Alberta Graduate Scholarship
Moss, R.	NSERC Scholarship AHFMR Scholarship
Scovil, C.	NSERC Scholarship AHFMR Scholarship
Suwanruji, P.	Canadian Pacific Scholarship The Faculty of Graduate Studies Fee Scholarship
Tapper, J.	NSERC Scholarship The Faculty of Graduate Studies Fee Scholarship

Graduate Seminars

Graduate students are required to give seminars to report their research progress. A number of guest speakers were also invited in 1999 for the graduate seminars. The graduate seminars given in 1999 are summarized in the following table.

Graduate Seminars in 1999

Name	Topic
de Hoop, M. V.	Maslov Asymptotic Extension of Generalized Radon Transform Inversion in Anisotropic Elastic Media: A Least-Squares Approach
Zhang, J.	Improving Quality for Rapid Prototyping
Matei, D. G.	Evaluation of the Vacuum Foil Method for Monitoring Permeable Hydrogen Through Steels
Chen, P.	Condition Monitoring and Diagnostics of Rolling Element Bearings Using Pattern Recognition Analysis
Sun, J.	Development of an Intelligent Production Scheduling System
Bruehlmann, S.	The Mechanical Behaviour of Cells from the Annulus Fibrosus of the Intervertebral Disc
Kilchyk, V.	Experimental Studies of Flammability Limits of Carbon Monoxide and Carbon Monoxide-Hydrogen Mixtures in Air
Shepit, B.	A Tutorial in Sliding Mode Control
Scovil, C. Y.	Quantification of the Effects of Tibial Malrotation Gait Using a Forward Dynamics Model
Sharf, I.	Dynamics Validation and Control Experiments on the Uvic Robotics Test-bed
O, W.	Analysis and Design of a Shop Floor Scheduling and Control System Using an Object-Oriented Approach
Edmonds, S.	Discrete Sliding Mode Control of Magnetic Bearings
Dudley, R.	"Moving Microenvironment" System for the Promotion of Spinal Nerve Regeneration in Rats
Kaya, M.	Direct Measurement of In Vivo Muscle Force during the Different Speed of Treadmill Walking
Zeng, Y.	A Mathematical Theory of Product Design

RESEARCH

Major Research Areas

The research activities of the Department are organized in six research groups.

1. Applied Mechanics

K.L. Chowdhury, M. Epstein, P.G. Glockner (Emeritus), S.A. Lukasiewicz, E.C. Mikulcik (Emeritus), M.C. Singh (Emeritus), O. Vinogradov

Areas of research interests:

- Continuum Mechanics
- Granular Mechanics
- Finite Element Modelling
- Constitutive Modelling of Biological Tissue
- Continuous Distributions of Defects in Solids
- Shell Structures
- Membrane Wrinkling
- Dynamical Systems
- Cable Structures
- Optimization of Structures
- Data Filtering and Systems Identification
- Fracture in FGM's
- Dynamics of Manipulators

Facilities:

- Computer Lab.
- Vibration Lab.
- Strength of Materials Lab.
- Software: Mathematica, Matlab, Maple, ANSYS

2. Automation, Control and Robotics

R. Brennan, P. Goldsmith, E.C. Mikulcik (Emeritus), J. Pieper, Q. Sun, M. Ulieru

Areas of research interests:

- Distributed Control Architectures for Manufacturing Systems
- Intelligent Planning & Control of Manufacturing Systems
- Multiple Manipulator Systems with Flexible Components
- Sensor-Based Control of Manipulators
- Intelligent Planning & Control of Robotic Systems
- Adaptive Control of Helicopters
- Robust Control
- Control of Outboard Horizontally Stabilized Aircraft
- Micro/Nano Robotics, Modelling & Design Implications Using Parallel Mechanisms

Facilities:

- CNC Milling and CNC Turning Centres
- CNC Co-ordinate Measuring Machine
- Robotic Workcell (4 Robots, Material Handling and Various Sensors)
- Programmable Logic Controllers
- Computer Hardware (SUN, SGI, and PC Networks)

3. Bioengineering

M. Epstein, R. Gill, W. Herzog (Adj.), B.M. Nigg (Adj.), J.L. Ronsky, R.F. Zernicke (Adj.)

Areas of research interests:

- Musculo-skeletal Biomechanics
- Joint Contact Mechanics & Modelling
- Roentgen Stereometric Analysis
- Orthopaedic Mechanics
- Modelling of Bone Load Response
- Clinical Gait Analysis & Movement Simulation
- Mathematical Modelling of Skeletal Muscles
- Energy Aspects during Locomotion
- Mechanical & Biological Effects of Ligament Injury
- Advanced Medical Imaging
- Design & Development of Medical Devices

Facilities:

- Two Video-based Motion Analysis Systems, for Studying Human and Animal Locomotion
- Five Force Platforms, for Determining Ground Reaction Forces
- EMG Measurement System
- Specialized Mechanical Testing Laboratory for Studying Behaviour of Biological Tissues
- High Definition X-ray Digitizer
- EMED & Tekscan Pressure Measurement Systems
- Access to MRI/Laser Scanning System

4. Thermo-Fluids, Energy Systems & Environment

L. Bauwens, O.R. Fauvel, R. Hugo, G.A. Karim, J.A.C. Kentfield, V.P. Panlilio (Adj.), N. Papanikolaou, J. Pieper, P.J. Vermeulen (Emeritus), G. Walker (Emeritus), I. Wierzba

Areas of research interests:

- Combustion and Reacting Flows
- Internal-combustion Engines
- Catalytic Combustion
- Alternative Fuels and Fire Research
- Environmental-impact Mitigation
- Aerodynamics
- Atmospheric Turbulence
- Wind Energy
- Computational Fluid Dynamics
- Stirling Engines
- Passive and Active Flow Control
- Non-intrusive Optical Diagnostics
- Advanced Flow Metering

Facilities:

- Atmospheric and Low-turbulence Open Jet Wind Tunnels
- Vertical Water Tunnel
- Fully Instrumented Internal-combustion Engines
- Cross-flow and Co-flow Combustion Facilities
- Flammability Test Apparatus
- Reactor for Catalytic Combustion Research
- Gas Chromatography Equipment and Gas Analyzers
- Two Component Laser Doppler Velocimeter, Thermal Anemometry Systems

- Coherent and Incoherent Optical Diagnostics
- Planar Laser Induced Fluorescence Measurement System
- Multi-component Force Balance and Automated Traversing Mechanisms
- Numerous Digital Data-acquisition Systems

5. Manufacturing Engineering

R. Brennan, D. Caswell, S. T. Enns, O. R. Fauvel, P. Goldsmith, P. Gu, D. H. Norrie, J. Pieper, P. Rogers, Q. Sun, A. A. Torvi (Emeritus), M. Ulieru, D. Xue

Areas of research interests:

- Modelling of Manufacturing Systems
- Intelligent Manufacturing Systems
- Production Planning and Control
- Rapid Prototyping
- CAD/CAM
- Quality Management
- Discrete-event Simulation
- Robotics
- Supply Chain Management
- Machinery and Process Diagnosis
- Process Control Systems Analysis & Design
- Manufacturing System Design
- Process Planning

Facilities:

(1) Equipment

- CNC Milling and CNC Turning Centres
- CNC Co-ordinate Measuring Machine
- Robotic Workcell (4 Robots, Material Handling and Various Sensors)
- Rapid Prototyping Machine
- Programmable Logic Controllers
- Computer Hardware including SUN, SGI, and PC Networks

(2) Computer Software

- Minitab (Statistical Process Control)
- MPX (Queuing-based Rapid Modelling)
- Arena (Discrete-event Simulation)
- Mathematica, Matlab and Maple V (Numeric and Symbolic Computation)
- Working Model (Modelling and Simulation)
- Pro-Engineer and AutoCAD (Computer-aided Design and Engineering)
- SmartCAM (CNC Software)
- ANSYS (Finite Element Modelling)

6. Design & Materials

D. Caswell, O. R. Fauvel, P. Gu, W. J. D. Shaw, O. Vinogradov, D. Xue

Areas of research interests:

- Design Theory & Methodology
- Design for Manufacturing
- Life Cycle Design Engineering
- Intelligent & Integrated Design
- Design Information Systems
- Simulation of Complex Systems

- New Polymeric Alloy Development
- Corrosion
- Stress Corrosion Cracking
- Hydrogen Embrittlement
- Sound Analysis Technique Development
- Stirling Cycle Machine Design
- Nonlinear Vibration of Cables

Facilities:

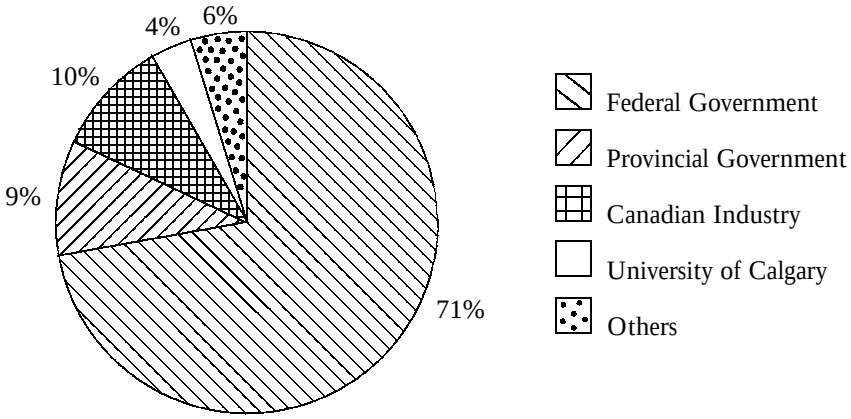
- Two Rapid Prototyping Machines: FDM 2000 and Cubital 4600
- Optical and Electron Microscopes
- EDX System
- MTS Facilities
- Corrosion and Preparation Labs

Research Financial Support

In 1999, the Department of Mechanical and Manufacturing Engineering raised over $1.5 million research funding from various sources including NSERC Strategic Grant, as well as a variety of contracts from industry. The research financial support is summarized in the following table.

Research Financial Support

Source	Amount
Federal Government	$1,114,962
NSERC	$852,211
Individual Operating Grant	$578,411
Industrially Oriented Research	$126,900
Strategic Grant	$146,900
Others	$262,751
Provincial Government	$139,588
Canadian Industry	$160,500
Foreign Agencies	$3,200
University of Calgary	$59,753
Others	$90,000
Total	$1,568,003



Distribution of Funding Sources

PROFESSIONAL SERVICES

Dr. Luc Bauwens

- President and Member, Board of Directors, The CFD Society of Canada
- Member, American Institute of Aeronautics and Astronautics Technical Committee, Propellants and Combustion
- Member, CFD99 Organizing Committee, Halifax, NS
- Member, Paper Review Subcommittee, Twenty Eighth International Symposium on Combustion, Pittsburgh, PA
- Member, Program Committee, Second ICHMT Symposium on Advances in Computational Heat Transfer, Palm Cove, Queensland, Australia

Dr. Robert W. Brennan

- Member, SAIT Industrial Engineering Technology Advisory Committee
- Session Chair, Third International Conference on Industrial Automation, Montreal
- Session Chair, Second International Workshop on Intelligent Manufacturing Systems, Leuven, Belgium

Dr. Kashmiri L. Chowdhury

- Director, McLeod Institute for Simulation Sciences, Calgary Branch of the Society for Computer Simulation International
- Session Co-chair, Third International Congress on Thermal Stresses, Cracow, Poland

Dr. S. T. Van Enns

- Chair, SME Chapter 242

Dr. H. S. (Richie) Gill

- Session Chair, International Society of Biomechanics XVIIth Congress, Calgary, Alberta

Dr. Peter Goldsmith

- Faculty Advisor, Student Chapter of Society of Manufacturing Engineers

Dr. Peihua Gu

- Associate Editor, Journal of Manufacturing Systems
- Associate Editor, Journal of Manufacturing Processes
- Member, Editorial Review Board, Journal of Concurrent Engineering: Research and Applications
- Member, Editorial Board, Journal of Robotics and CIM
- Member, International Program Committee, IASTED International Conference on Robotics and Manufacturing
- Vice Chair and Member, Program Committee, The 4th International Conference on the Frontiers of Design and Manufacturing
- Member, Steering Committee, Canadian Design Engineering Network (C-DEN)

Dr. Ghazi A. Karim

- Advisor, SAE Students Chapter
- Member, Technical Editorial Board, International Journal of Dirasat Hundasia in English and Arabic
- Vice Chairman, SAE Alberta Chapter
- SAE Faculty Advisor, The University of Calgary
- Examiner, Association of Professional Engineers and Geologists of Alberta (APEGGA)
- Member, Sub-Committee of the Board of Examiners of APEGGA
- Member, Organizing Committee of the Hydrogen Conference (HYPOTHESIS III), St. Petersburg
- Session Chairs, International Conferences in Rio de Janero, Houston, St. Petersburgh, and Ann Arbor

Dr. John A. C. Kentfield

- Member, Board of Directors, Energreen Foundation, Canada

Dr. Douglas H. Norrie

- Member, Program Committee, Second International Workshop on Intelligent Manufacturing Systems, Leuven, Belgium
- Member, Program Committee, Pacific Rim International Workshop on Multi-Agents 1999 (PRIMA '99), Kyoto, Japan
- Member, Program Committee, IEEE International Conference on Systems, Man and Cybernetics SMC-99, Tokyo, Japan
- Member, International Organizing Committee, Seventh International Conference on Computers in Education, Chiba, Japan

Dr. Jeff K. Pieper

- Member, SAIT Mechatronics Engineering Technology Advisory Board
- Member, Technical Program Committee, The Second International Conference on Intelligent Processing and Manufacturing of Materials, Honolulu, Hawaii
- Vice-Chair, IEEE Southern Alberta Section
- Member, APEGGA Calgary Office

Dr. Paul Rogers

- Member, Editorial Board, International Journal of Computer Integrated Manufacturing
- Member, Board of Examiners of the Association of Professional Engineers, Geologists and Geophysicists of Alberta

Dr. Janet L. Ronsky

- Symposia Chair, Organizing Committee, International Society of Biomechanics XVIIth Congress, Calgary, Alberta
- Member-at-large, Executive Committee, Canadian Society of Biomechanics

Dr. Qiao Sun

- Treasurer, ASME Southern Alberta Section
- Member, International Program Committee, Seventh IASTED International Conference on Robotics and Manufacturing
- Member, International Program Committee, IASTED International Conference on Control and Applications

Dr. Mihaela Ulieru

- Chair, BISC - Special Interest Group on Intelligent Manufacturing and Fault Diagnosis
- Chair and Organizer, Invited Session on Soft Computing Applications to Manufacturing, NAFIPS'99, New York, NY
- Chair and Organizer, Invited Session on Intelligent Manufacturing and Fault Diagnosis, IMACS/IEEE CSCC'99, Athens, Greece

Dr. Oleg G. Vinogradov

- Examiner, Association of Professional Engineers and Geologists of Alberta (APEGGA)

Dr. Ida Wierzba

- Chair, ASME International Southern Alberta Section
- Faculty Advisor, ASME University of Calgary Student Section
- Member of Organizing Technical Committee and Session Chair, Emerging Energy Technology Symposium, ASME International Energy Sources Technology Conference & Exhibition 99, Houston, TX
- Member of Organizing Technical Committee, Emerging Energy Technology Symposium, ASME International Energy Sources Technology Conference & Exhibition 2000, New Orleans, LA
- Member, Organizing Committee, International Conference on Computational Heat and Mass Transfer, Gazimagusa, N. Cyprus
- Organized the ASME International Region VIII Administrative Conference, Banff, Alberta
- Examiner, Association of Professional Engineers and Geologists of Alberta (APEGGA)
- Session Chair, 6th PAN-AMERICAN Congress of Applied Mechanics and 8th International Conference on Dynamic Problems in Mechanics, Rio de Janeiro, Brazil

Dr. Deyi Xue

- Session Chair, The Third International Conference on Industrial Automation, Montreal
- Paper Review Coordinator and Session Chair, The 1999 ASME Design Engineering Technical Conferences and Computers in Engineering Conference, Las Vegas, Nevada
- Member, International Paper Reviewing Panel, The Third International Symposium on Tools and Methods of Competitive Engineering, Delft, Netherlands

A Tour at Prudential Steel Coordinated by Dr. Enns

RESEARCH PUBLICATIONS

Journal Publications

Alfaro-Adrian, J., Gill, H. S., and Murray, D. W., 1999, "Cement Migration after THR - A Comparison of Charnley and Exeter Femoral Stems Using RSA," *JBJS*, Vol. 81-B, pp. 130-134.

Bade Shrestha, S. O. and Karim, G. A., 1999, "Hydrogen as an Additive to Methane for Spark Ignition Engine Applications," *Journal of Hydrogen Energy*, Vol. 24, No. 6, pp. 577-586.

Bade Shrestha, S. O. and Karim, G. A., 1999, "A Predictive Model for Gas Fueled Spark Ignition Engine Applications," *SAE SP-1481 Modelling and Diagnostics in SI Engines*, pp. 35-52.

Bade Shrestha, S. O. and Karim, G. A., 1999, "An Investigation of the Effects of the Addition of Dissociated Water Products to a Gas Fueled Spark Ignition Engine," *SP-1482 Alternative Fuels*, pp. 57-64.

Badr, O., Karim, G. A., and Liu, B., 1999, "An Examination of the Flame Spread Limits in a Dual Fuel Engine," *Journal of Applied Thermal Engineering*, Vol. 19, pp.1071-1080.

Boyd, S. K., Ronsky, J. L., Lichti, R. D., Salkauskus, K., and Chapman, M. A., 1999, "Joint Surface Modelling with Thin-Plate Splines," *Journal of Biomechanical Engineering*, Vol. 121, pp. 525-532.

Brennan, R. W. and Foroughi, B., 1999, "A Control Framework to Support Responsive Manufacturing," *International Journal of Agile Management Systems*, Vol. 1, No. 3, pp. 159-168.

Bunama, R., Karim, G. A., and Zhang, C. Y., 1999, "An Investigation of the Formation and Venting of Flammable Mixtures Formed Within Liquid Fuel Vessels," *Journal of Engineering for Gas Turbines and Power, Transactions of the ASME*, Vol. 121, pp. 68-73.

Chen, K. and Karim, G. A., 1999, "The Effects of Charge Non-Uniformity on Autoignition in a Gas Fuelled Motored Engine," *SP-1481 Modeling and Diagnostics in SI Engines*, pp. 13-26.

Enns, S. T., 1999, "The Effect of Batch Size Selection on MRP Performance," *Computers and Industrial Engineering*, Vol. 37, No. 1, pp. 15-19.

Enns, S. T., 1999, "A Simple Spreadsheet Approach to Understanding the Effects of Routings, Loadings, Variance and Covariance in Production Facilities," *Total Quality Management*, Vol. 10, No. 1, pp. 107-119.

Epstein, M., 1999, "On the Anelastic Evolution of Second-Grade Materials," *Extracta Mathematicae*, Vol. 14, No. 1, pp. 1-10.

Epstein, M., 1999, "Toward a Complete Second Order Evolution Law," *Mathematics & Mechanics of Solids*, Vol. 4, No. 2, pp. 251-266.

Epstein, M, 1999, "On Material Evolution Laws," *Geometry, Continua and Microstructure, Collection Travaux en cours*, Vol. 60, Hermann, Paris, pp. 1-10.

Epstein, M. and Johnston, C., 1999, "Improved Solution for Solitary Waves in Arteries," *Journal of Mathematical Biology*, Vol. 39, pp. 1-18.

Farid, M. and Lukasiewicz, S. A., 1999, "Optimal Control of Multilink Manipulators with Both Flexible Links and Joints," *Journal of Systems and Control Engineering, Proc. Inst. Mech Engrs*, Vol. 213, Part 1.

Forcinito, M., Epstein, M., and Herzog, W., 1999, "Can a Rheological Muscle Model Predict Force Depression/Enhancement?" *Journal of Biomechanics*, Vol. 31, pp. 1093-1099.

Gavrilov, D. and Vinogradov, O., 1999, "Micro Instabilities in a System of Particles in Silos during Filling," *Computational Mechanics*, Vol. 51, No. 3, pp.166-174.

Gavrilov, D., Vinogradov, O., and Shaw, W. J. D., 1999, "Simulation of Grinding in a Shaker Ball Mill," *Powder Technology*, Vol. 101, pp. 63-72.

Goldsmith, P. B., 1999, "Global Asymptotic Stability of Hybrid Position/Force Control Applied to Compliant Unilateral Constraints," *Mechanism and Machine Theory*, Vol. 34, pp. 1009-1021.

Goldsmith, P. B., Francis, B. A., and Goldenberg, A. A., 1999, "Stability of Hybrid Position/Force Control Applied to Manipulators with Flexible Joints," *International Journal of Robotics and Automation*, Vol. 14, No. 4, pp. 146-160.

Gu, P. and Sosale, S., 1999, "Product Modularization for Life Cycle Engineering," *Journal of Robotics & Computer Integrated Manufacturing*, Vol. 15, No. 5, pp. 387-402.

Lukasiewicz, S. A. and Palka, K., 1999, "On Detection of Defects in Beams and Trusses from Dynamic Responses," *Transactions of the Canadian Society of Mechanical Engineers*, Vol. 22.

Maturana, F., Shen, W., and Norrie, D. H., 1999, "MetaMorph: An Adaptive Agent-Based Architecture for Intelligent Manufacturing," *International Journal of Production Research*, Vol. 37, No. 10, pp. 2159-2173.

McMackin, L., Hugo, R. J., Bishop, K. P., Chen, E. Y., Pierson, R. E., and Truman, C. R., 1999, "High Speed Optical Tomography System for Quantitative Measurement and Visualization of Dynamic Features in a Round Jet," *Experiments in Fluids*, Vol. 26, pp. 249-256.

Monagan, M. B. and Slawinski, M. A., 1999, "The Sensitivity of Travel-time Inversion for an Anisotropic Parameter in Seismology," *MapleTech.*, Vol. 5, No. 2/3, pp. 107-116.

Rao, H. and Gu, P., 1999, "Re-Design of Manufacturing Systems: An Industrial Case Study," *International Journal of Production Research*, Vol. 37, No. 3, pp. 557-580.

Ronsky, J. L., Boyd, S. K., Lichti, D. D., Chapman, M. A., and Salkauskas, K., 1999, "Precise Measurement of Cat Patellofemoral Joint Surface Geometry with Multi-station Digital Photogrammetry," *Journal of Biomechanical Engineering*, Vol. 121, pp. 196-205.

Shaw, W. J. D., Fraser, M. A., and Nijjar, T. S., 1999, "Effects of Re Aging 2024-T3 and 7075-T6 Aluminum Alloys on the Microstructure and Mechanical Properties," *Microstructural Science*, Vol. 26, pp. 269-276.

Shen, W. and Norrie, D. H., 1999, "Agent-Based Systems for Intelligent Manufacturing: A State-of-the-Art Survey," *Knowledge and Information Systems*, Vol. 1, pp. 129-156.

Slawinski, M. A., Slawinski, R. A, Brown, R. J., and Parkin, J. M., 1999, "On Generalized Form of Snell's Law in Anisotropic Media," *Geophysics*, Vol. 65, No. 2.

Sun, Q., Sharf, I., and Nahon, M., 1999, "Stability Analysis for the Force Distribution Algorithm for Flexible-link Cooperating Manipulators," *Journal of Mechanism and Machine Theory*, Vol. 34, No. 5, pp. 753-763.

Sun, Q., Sharf, I., and Nahon, M., 1999, "Stabilizing the Inverse Dynamics Solution for Flexible-link Cooperating Manipulators by Internal Forces," *International Journal of Robotics and Automation*, Vol. 14, No. 3, pp. 96-106.

Vinogradov, O., 1999, "On the Accuracy and Efficiency of Simulation of an Impact Problem in Granular Mechanics," *Computer Modeling and Simulation in Engineering*, Vol. 4, No. 3, pp. 287-290.

Wierzba, I. and Ale, B. B., 1999, "The Effect of Time and Exposure to Elevated Temperatures on the Flammability Limits of Some Common Gaseous Fuels in Air," *Journal of Engineering for Gas Turbines and Power, Transactions of ASME*, Vol. 121, pp. 74-79.

Wong, Y. K. and Karim, G. A., 1999, "A Kinetic Examination of the Effects of the Presence of Some Gaseous Fuels and Preignition Reaction Products With Hydrogen in Engines," *Journal of Hydrogen Energy*, Vol. 24, No. 5, pp.473-478.

Wu, J. Z., Herzog, W., and Epstein, M., 1999, "Modelling of Location-and-time-dependent Deformation of Chondrocytes during Cartilage Loading," *Journal of Biomechanics*, Vol. 32, pp. 563-572.

Xue, D., Yadav, S., and Norrie, D. H., 1999, "Knowledge Base and Database Representation for Intelligent Concurrent Design," *Computer-Aided Design*, Vol. 31, No. 2, pp. 131-145.

Zeng, Y. and Gu, P., 1999, "A Science-Based Approach to Product Design Theory Part I: Formulation and Formalization of Design Process," *Journal of Robotics & Computer Integrated Manufacturing*, Vol. 15, No. 4, pp. 331-339.

Zeng, Y. and Gu, P., 1999, "A Science-Based Approach to Product Design Theory Part II: Formulation of Design Requirements and Products," *Journal of Robotics & Computer Integrated Manufacturing*, Vol. 15, No. 4, pp. 341-352.

Book Chapters/Contributions

Nikolic, M., Williams, D. N., and Bauwens, L., 1999, "Simulation of Detonation Cells in Wide Channels," *Gaseous and Heterogeneous Detonations*, Roy, G., Frolov, S., Kailasanath, K., and Smirnov, N. (eds.), ENAS Publishers, Moscow, pp. 153-162.

Poncet, P., Delorme, S., Ronsky, J., Dansereau, J., Clynch, G., Harder, J., Dewar, R., Labelle, H., Gu, P., Zernicke, R., 1999, "3D Reconstructions of the External and Internal Geometries of the Trunk Using Laser and Stereoradiographic Imaging Techniques," *Technology and Informatics: Research into Spinal Deformaties 2*, Stokes, I. (ed.), IOS Press, Amsterdam, The Netherlands, pp. 21-24.

Ulieru, M. and Norrie, D. H., 1999, "A Multi-Agent System for Supply Chain Management," *Progress in Simulation, Modelling, Analysis and Synthesis of Modern Electrical and Electronic Devices and Systems*, Mastorakis, N. (ed.), World Scientific and Engineering Society Press, pp. 342-348.

Ulieru, M. and Ramakhrishnan, S., 1999, "An Approach to the Modelling of Multi-Agent Systems as Fuzzy Dynamical Systems," *Advances in Artificial Intelligence and Engineering Cybernetics, Vol. V: Multi-Agent Systems/Space-Time Logic/Neural Networks*, Lasker, G. (ed.), IIAS-68-99.

Xue, D., 1999, "Modeling of Product Life-cycle Knowledge and Data for an Intelligent Concurrent Design System," *Knowledge Intensive Computer Aided Design*, Finger, S., Tomiyama, T., and Mantyla, M. (eds.), Kluwer Academic Publishers, pp. 117-142.

Conference Publications

Ait-Haddou, R. and Slawinski, M. A., 1999, "Finslerian Model for Anisotropic-inhomogeneous Medium," *Proceedings of Canadian Geophysical Union*, Banff.

Babaei, R. and Lukasiewicz, S. A., 1999, "Parameter Identification in Functionally Graded Materials," *Proceedings on Minisymposium on Functionally Graded Materials, Fifth National Congress on Computational Mechanics*, Boulder, Colorado.

Bade Shrestha, S. O. and Karim, G. A., 1999, "Experimental and Analytical Examination of the Combustion Period in a Spark Ignition Engine Fueled with Gaseous Fuels and their Mixtures," *The Combustion Institute (Canadian Section) Spring Technical Meeting*, Edmonton, Alberta, pp. 1-24.

Balsley, B. B., Jensen, M. L., Frehlich, R. G., Eaton, F. D., Bishop, K., and Hugo, R. J., 1999, "In-situ Turbulence Measurement Techniques Using State-of-the-art Kite/blimp Platforms," *Airborne Laser Advanced Technology II*, Steiner, T. D. and Merritt, P. H. (eds.), SPIE - International Society of Optical Engineering, Vol. 3706-01, Bellingham, WA.

Bauwens, L., 1999, "Ignition between a Shock and a Material Surface with Arbitrary Acoustic Reflection Coefficient," *17th International Colloquium on Dynamics of Explosions and Reactive Systems*, Heidelberg, Germany.

Bauwens, L., 1999, "Acoustics between a Shock and a Contact Surface - Relevance to Galloping Detonations," *17th International Colloquium on Dynamics of Explosions and Reactive Systems*, Heidelberg, Germany.

Bauwens, L., 1999, "Shock-Initiated Ignition: The Influence of the Downstream Boundary Condition," *Joint AIAA/ASME/SAE Propulsion Conference*, Los Angeles, CA.

Bauwens, L., Williams, D. N., and Nikolic, M., 1999, "Failure and Recognition of One-Dimensional Detonations - The High Activation Energy Limit," *Proceedings of the 27th International Symposium on Combustion*, Combustion Institute, Pittsburgh, pp. 2319-2326.

Brennan, R. W., 1999, "The Effect of Planning Horizon on Manufacturing Control Architecture Performance," *Proceedings of the 17th Canadian Congress of Applied Mechanics Symposium on Manufacturing, Robotics and Automation*, Hamilton, pp. 361-362.

Brennan, R. W., 1999, "Metrics for Evaluating Alternative Manufacturing Control Architectures," *Proceedings of the Third International Conference on Industrial Automation*, Montreal, pp. 19.5-19.8.

Brennan, R. W., 1999, "Distributed Control System Design for Manufacturing Using IEC 1499," *The 1999 IEEE Western Canada Council Conference on Electrical Engineering*, Calgary.

Brennan, R. W. and Norrie, D. H., 1999, "The Performance of Partial Dynamic Hierarchies for Manufacturing," *Proceedings of the 2nd International Workshop on Intelligent Manufacturing Systems*, Leuven, Belgium, pp. 5-13.

Bunama, R., Karim, G. A., and Zhang, C. Y., 1999, "An Experimental Investigation of the Transient Formation of Flammable Atmospheres within Cylindrical Liquid Fuel Containers," *Proceedings of Computational Heat and Mass Transfer International Conference, International CHMT - 99*, Famagusta, N. Cyprus, pp. 367-372.

Caswell, D., 1999, "Practical Reed Knife Mechanics," *International Double Reed Society Conference*, Madison, Wisconsin.

Caswell, D., 1999, "If the Medium is the Message, Bring Back the Large," *Technology in Education Conference*, Calgary.

Caswell, D., Fauvel, O., Machacek, T., and Johnston, C., 1999, "Teaching Design through Collaborative Learning: A Match Made in Academia," *Society for Teaching and Learning in Higher Education*, Calgary.

Chen, K. and Karim, G. A., 1999, "An Analytical Examination of the Effects of the Addition of the Products of Electrically Dissociated Water to a Methane Fuelled Dual Fuel Engine," *ASME Energy Conference ETCE*, Houston, TX.

Chen, K. and Karim, G. A., 1999, "Examination of the Effects of Charge Inhomogeneity and Heat-Transfer on the Compression Ignition of Fuel-Air Mixtures," *Proceedings of Computational Heat and Mass Transfer International Conference, International CHMT - 99*, Famagusta, N. Cyprus, pp. 372-377.

Chen, K. and Karim, G. A., 1999, "The Effects of Charge Non-Uniformity on Autoignition in a Gas Fuelled Motored Engine," *The Combustion Institute (Canadian Section) Spring Technical Meeting*, Edmonton, Alberta, pp. 1-6.

Chen, K., Karim, G. A., and Watson, H. C., 1999, "Experimental and Analytical Examination of the Development of Inhomogeneities and Autoignition during Rapid Compression of Hydrogen-Oxygen-Argon Mixtures," *Proceedings of the Fall Technical Conference of the ASME ICE Division*, Ann Arbor, Michigan, Vol. 33-3, pp. 1- 8.

Chowdhury, K. L. 1999, "A Class of Exact Solutions in Elastic Dielectrics," *Canadian Congress of Theoretical and Applied Mechanics*, Hamilton, pp. 11 -12.

Chowdhury, K. L., 1999, "Axisymmetric Thermal Stresses in a Transversely Isotropic Semi-Space," *International Congress on Thermal Stresses*, THERMAL STRESSES'99, Cracow University of Technology, Cracow, Poland , pp. 107-110.

Deng, X., Mayzus, P., Bauwens, L., Fauvel, O., and Reader, G., 1999, "A Pulse-Tube Cryocooler for the SKA Radio Telescope," *Proceedings of the Cryogenic Engineering Conference/ICMC*, Montreal, P.Q.

Depiak, A. and Wierzba, I., 1999, "An Experimental Investigation of Catalytic Oxidation of Lean Premixed Methane-Air Mixtures," *Proceedings of the 11th International Conference on Thermal Engineering and Thermogrammetry*, Budapest, Hungary, pp. 285-290.

Depiak, A. and Wierzba, I., 1999, "An Experimental Investigation of Common Gaseous Fuels over Cobalt Oxide/Chromium Oxide Catalyst in a Packed-Bed Reactor," *Proceedings of the ASME International Energy Technology Conference and Exhibition 99*, Houston, Paper ETCE99-6709.

Eaton, F. D., Balsley, B. B., Bishop, K., Frehlich, R. D., Hugo, R. J., Jensen, M., and McCrae, K., 1999, "In-situ Turbulence Measurements over a Desert Basin Using a Kite/tethered Balloon Platform," *Airborne Laser Advanced Technology II*, Steiner, T. D. and Merritt, P. H. (eds.), SPIE - International Society of Optical Engineering, Vol. 3706-03, Bellingham, WA.

Eaton, F. D., Hugo, R. J., McCrae, K., Balsley, B. B., Frehlich, R. D., and Jensen, M., 1999, "High-Data-Rate Turbulent Measurements Using a Kite-Tethered Balloon Platform," *AIAA Paper Number 99-36-19*, Norfolk, VA.

Enns, S. T., 1999, "An Experimental Comparison Using Push versus Pull Shop Floor Control: Preliminary Results," *Proceedings of the Second World Manufacturing Congress*, UK, pp. 128-131.

Enns, S. T., 1999, "Queueing Development to Support Rapid Modelling of Manufacturing Systems," *First National Workshop on Queueing and Related Fields*, Sheraton Hotel, Winnipeg, MB, Canada.

Enns, S. T., 1999, "Planned Lead Time and Safety Stock Selection for Improved MRP Performance," *International Federation of Operational Research Societies (IFORS) Conference*, Friendship Hotel, Beijing, China.

Enns, S. T., 1999, "Work Load Management under Materials Requirements Planning (MRP) Logic," *Institute for Operations Research and Management Sciences (INFORMS) Fall National Meeting*, Marriott Hotel, Philadelphia, PA.

Epstein, M. and Johnston, C., 1999, "Analysis of Solitary Waves in Elastic Tubes," *Proceedings of the Joint Conference Sixth Pan American Congress of Applied Mechanics (PACAM VI) and Eight International Conference on Dynamic Problems in Mechanics (DINAME 99)*, Pontifical Catholic University, Rio de Janeiro, Brazil, Vol. 7, pp. 907-910.

Foroughi, B. and Brennan, R. W., 1999, "Decision-making in Manufacturing Systems: An IPA/fuzzy Approach," *Proceedings of the 8th Industrial Engineering Research Conference*, CD-ROM, Phoenix.

Gavrilova, M., Rokne, J., Vinogradov, O., and Gavrilov, D., 1999, "Collision Detection Algorithms in Simulation of Granular Materials," *Proceedings of the 1999 ASME Mechanics and Materials Conference*, Blacksburg, Virginia.

Gill, H. S., Alfaro-Adrian, J., and Murray, D. W., 1999, "The Effect of Anteversion on Femoral Component Stability Assessed by RSA," *Proceedings of the Orthopaedic Research Society 45th Annual Meeting*, Anaheim.

Goldsmith, P. B., 1999, "Robot Hybrid Position/Force Control for Non-Cartesian Constraints," *Progress in Simulation, Modeling, Analysis, and Synthesis of Modern Electrical and Electronic Devices and Systems, Proceedings of IMACS/IEEE International Conference on Systems*, Athens, Mastorakis, N. (ed.), World Scientific Engineering Society Press, pp. 275-281.

Hugo, R. J. and Jumper, E. J., 1999, "Constant Current Anemometry Applied to Aero-Optical Measurements," *AIAA Paper Number 99-3616*, Norfolk, VA.

Hugo, R. J., Nowlin, S. R., Eaton, F. D., Bishop, K. P., and McCrae, K., 1999, "Hot-wire Calibration in a Non-isothermal Incompressible Pressure Variant Flow," *Airborne Laser Advanced Technology II*, Steiner, T. D. and Merritt, P. H. (eds.), SPIE - International Society of Optical Engineering, Vol. 3706-02, Bellingham, WA.

Hugo, R. J., Nowlin, S. R., Hahn, I. L., Bishop, K. P., and McCrae, K., 1999, "Aircraft-based in-situ Calibration of a Hot-wire Anemometer in a Compressible Flow," *Airborne Laser Advanced Technology II*, Steiner, T. D. and Merritt, P. H. (eds.), SPIE - International Society of Optical Engineering, Vol. 3706-06, Bellingham, WA.

Hugo, R. J., Nowlin, S. R., Hahn, I. L., Eaton, F. D., and McCrae, K., 1999, "Acoustic Noise-Source Identification in Aircraft-Based Atmospheric Temperature Measurements," *AIAA Paper Number 99-3621*, Norfolk, VA.

Hugo, R. J., Nowlin, S. R., Hahn, I. L., Eaton, F. D., and McCrae, K., 1999, "Application of Acoustic Noise Removal Methods to Aircraft-Based Atmospheric Temperature Measurements," *AIAA Paper Number 99-3622*, Norfolk, VA.

Jaremko, J., Delorme, S., Dansereau, J., Labelle, H., Ronsky, J., Poncet, P., Harder, J., Dewar, R., and Zernicke, R., 1999, "Using Neural Networks to Correlate Spine and Rib Deformity in Scoliosis," *International Society of Biomechanics XVIIth Congress*, Calgary, AB, pp. 653.

Johnston, C. R. and Epstein, M., 1999, "Solitary Wave Solution for Axially and Radially Deforming Arteries," *4th International Congress on Industrial and Applied Mathematics*, Edinburgh, Scotland.

Jui, K. and Sun, Q., 1999, "A Study of Nano-manipulators," *The Seventh Foresight Conference on Molecular Nanotechnology*, Santa Clara.

Karim, G. A., Alizadeh Attar, A., and Bade Shrestha, S. O., 1999, "The Knock Rating of Gaseous Fuels Containing Hydrogen," *International Symposium HYPOTHESIS III*, St-Petersburg, Russia, pp. 1-8.

Karim, G. A. and Khalil, E., 1999, "Detailed Kinetic Modelling of the Effects of Changes in the Composition of Natural Gas on its Autoignition in Relation to Engine Applications," *International Conference on Thermal Engineering and Thermogrammetry*, Budapest, Hungary, pp. 1-4.

Karim, G. A. and Zhou, G., 1999, "An Analytical Examination of Various Criteria for Defining Autoignition within Heated Methane-Air Homogeneous Mixtures," *Proceedings of the PACAM VI Conference*, Rio de Janeiro, Brazil, Vol. 6, pp. 197-200.

Kawchuk, G., Fauvel, O., and Dmowski, J., 1999, "A Non-invasive Method of Quantifying Osseous Motion within Para-spinal Tissue under Externally Applied Loads," *Proceedings of the International Society for the Study of the Lumbar Spine*, Kona, pp. 179B.

Kawchuk, G., Kaigle, A., Holm, S., and Fauvel, O., 1999, "Respiration Effects on Spinal Biomechanics during Indentation Loading in Vivo," *Proceedings of the XVIIth Congress of the International Society of Biomechanics*, Calgary, pp. 790.

Kentfield, J. A. C., 1999, "Influence of Aspect Ratio on the Performance of Outboard-Horizontal-Stabilizer Aircraft," *AIAA 99-0531 at the 37th AIAA Aerospace Sciences Meeting*, Reno, NV.

Kentfield, J. A. C. and Sewalt, M., 1999, "A Small Water-Pumping Wind-Turbine with a Novel, Ultrasimple, Pump-Drive Mechanism," *The 1999 CANWEA Annual Conference*, Rimouski, Quebec.

Khalil, E., Boyce, T. R., and Karim, G. A., 1999, "Analytical and Experimental Investigation of the Role of the Preignition Reaction Activity of a Higher Hydrocarbon Fuel (n-heptane) in Air Under Steady Flow Conditions," *ASME Energy Conference ETCE*, Houston, TX.

Khalil, E., Boyce, T. R., and Karim, G. A., 1999, "Analytical and Experimental Investigation of the Role of the Preignition Reaction Activity of a Higher Hydrocarbon Fuel (n-heptane) in Air Under Steady Flow Conditions," *Proceedings of Computational Heat and Mass Transfer International Conference, International CHMT - 99*, Famagusta, N. Cyprus, pp. 388-393.

Kilchyk, V. and Wierzba, I., 1999, "Sensitivity of the Flammability Limits of Carbon Monoxide to the Presence of Water Vapour," *Proceedings of the Combustion Institute, Canadian Section Spring Technical Meeting*, Edmonton, Alberta, pp. 99-23-1 - 99-23-4.

Kralovic, B., Boyd, S., and Ronsky, J., 1999, "Dynamic In-situ Measurements of Patellofemoral Joint Congruence," *International Society of Biomechanics XVIIth Congress*, Calgary, AB, pp. 615.

Lin, F. and Norrie, D. H., 1999, "Schema-Based Conversation Modeling for Intelligent Agent-Oriented Manufacturing Systems," *Proceedings of the 2nd International Workshop on Intelligent Manufacturing Systems*, Leuven, Belgium, pp. 147-155.

Lin, F., Norrie, D. H., Shen, W., and Kremer, R., 1999, "A Schema-Based Approach to Specifying Conversation Policies," *Proceedings of Agents '99 Workshop on Agent Based Decision-Support for Managing the Internet-Enabled Supply-Chain*, Seattle, WA, pp. 55-63.

Lukasiewicz, S. A. and Babaei, R., 1999, "On Identification of Vibrating Systems - Mixed Approach," *Proceedings of the Sixth International Congress on Sound and Vibrations*, Lyngby, Denmark.

Lukasiewicz, S. A. and Babaei, R., 1999, "On Inverse Problem in Thermoelasticity," *Proceedings of the Third International Congress on Thermal Stresses, Thermal Stresses 99*, Cracow, Poland.

Nikolic, M., Williams, D. N., and Bauwens, L., 1999, "Detonation Cell Sizes - A Numerical Study," AIAA Paper 99-0967, *36th Aerospace Sciences Meeting*, AIAA, Reno, NV.

Nowlin, S. R., Hahn, I. L., Hugo, R. J., and Bishop, K. P., 1999, "Statistical Comparison of Cn2 Measurements Made along Horizontal and Slant Aircraft Flight Paths and Balloon Ascent Paths," *Airborne Laser Advanced Technology II*, Steiner, T. D. and Merritt, P. H. (eds.), SPIE - International Society of Optical Engineering, Vol. 3706-10, Bellingham, WA.

Nowlin, S. R., Hahn, I. L., Hugo, R. J., Kramer, M. A., Grover, D., and Bishop, K. P., 1999, "Concurrent Aerial and Ground-based Cn2 Measurements along a Long, Elevated Horizontal Path," *Airborne Laser Advanced Technology II*, Steiner, T. D. and Merritt, P. H. (eds.), SPIE - International Society of Optical Engineering, Vol. 3706-07, Bellingham, WA.

O'Connor, J. J., Zavatsky, A. B., Wilson, D. R., Gill, H. S., Feikes, J. D., Lu, T. W., Leardini, A., and Rieger, C., 1999, "The Joints of the Skeleton: Kinematic Pairs, Mechanisms, or Flexible Structures?" *International Society of Biomechanics*, Calgary.

Papanikolaou, N. and Wierzba, I., 1999, "An Investigation on the Effects of Additives in the Jet Fuel and Co-flowing Air Stream on the Flow Structure of Jet Diffusion Flames," *Proceedings of the International Conference on Computational Heat and Mass Transfer*, Gazimagusa, N. Cyprus, pp. 393-397.

Papanikolaou, N. and Wierzba, I., 1999, "An Experimental Investigation of the Effects of Nozzle Ellipticity on the Flow Structure of Co-Flow Jet Diffusion Flames," *Proceedings of the Sixth PAN-AMERICAN Congress of Applied Mechanics and Eighth International Conference on Dynamic Problems in Mechanics*, Rio de Janeiro, Brazil, Vol. 6, pp. 127-131.

Pieper, J. K. and Mehrotra, R., 1999, "Air/Fuel Engine Control Using Sliding Modes," *Proceedings of the American Control Conference*, San Diego, pp. 1027-1031.

Powers, M. J., Ronsky, J. L., and Paulsen, D. K., 1999, "Effects of Axial Loading on Patella Tracking Kinematics - A Cadaver Model," *International Society of Biomechanics XVIIth Congress*, Calgary, AB, pp. 616.

Rosenfeld, L., Ronsky, J., Wiley, P., and Caswell, D., 1999, "Functionality of a New System of Calcaneal Marker Attachment Used to Collect Three-dimensional Kinematic Data both Shod and Barefoot," *International Society of Biomechanics XVIIth Congress*, Calgary, AB, pp. 710.

Rosenfeld, L. B., Ronsky, J., Wiley, P., and Caswell, D., 1999, "Are the Kinetic and Kinematic Changes to Gait Caused by Foot Orthotic Use in a Pronated Population Permanent, or Mitigated during a One-month Period of Adaptation," *Fourth Symposium on Footwear Biomechanics*, Canmore, pp. 82-83.

Scovil, C., Wright, I., Ronsky, J., Zernicke, R., and Powell, J., 1999, "Quantification of the Effects of the Angle of Tibial Malrotation on Ground Reaction Forces and Joint Moments Using a Forward Dynamics Model," *International Society of Biomechanics XVIIth Congress*, Calgary, AB, pp. 575.

Shaw, W. J. D., 1999, "Microscopy and Micro Structural," Analysis 99 Conference, Portland, OR.

Shen, W., Norrie, D. H., and Kremer, R., 1999, "Developing Intelligent Manufacturing Systems Using Collaborative Agents," *Proceedings of the 2nd International Workshop on Intelligent Manufacturing Systems*, Leuven, Belgium, pp. 157-166.

Shen, W., Norrie, D. H., and Kremer, R., 1999, "Towards an Infrastructure for Internet Enabled Collaborative Agent Systems," *Proceedings of the Twelfth Workshop on Knowledge Acquisition, Modeling and Management (KAW '99)*, Banff, Alberta, Canada, pp. 3-3-1:3-3-15.

Shen, W., Ulieru, M., Norrie, D. H., and Kremer, R., 1999, "Implementing the Internet Enabled Supply Chain through a Collaborative Agent System," *Proceedings of Agents '99 Workshop on Agent Based Decision Support for Managing the Internet-Enabled Supply-Chain*, Seattle, WA, pp. 55-62.

Shu, S. and Norrie, D. H., 1999, "Patterns for Adaptive Multi-Agent Systems in Intelligent Manufacturing," *Proceedings of the 2nd International Workshop on Intelligent Manufacturing Systems*, Leuven, Belgium, pp. 67-74.

Slawinski, M. A. and Webster, P. S., 1999, "On Conserved Quantities for Raypaths in Elastic-inhomogeneous-anisotropic Media," *Proceedings of International Workshop on Analysis of Vibrating Systems (IWAVS 99)*, Canmore.

Subramanian, R. and Ulieru, M., 1999, "Behavioral Analysis of Multi-agent Systems by Dynamic Modeling with Application to Technical and Social Systems," *InterSymp'99, International Conference of the Institute for Advance Studies in Systems Research, Informatics and Cybernetics*, Baden-Baden, Germany.

Sun, Q., 1999, "Object Trajectory Tracking Control of Flexible-link Multiple Manipulators," *ASME Design Engineering Technical Conferences and Computers in Engineering Conference*, Las Vegas.

Sun, Q., 1999, "Stable Inversion Control for Flexible-link Cooperating Manipulators: A Case Study of a Four-bar Linkage Mechanism," *IEEE/ASME International Conference on Advanced Intelligent Mechatronics*, Atlanta.

Sun, J., Kalenchuk, D. K., Xue, D., and Gu, P., 1999 "Neural Network-based Fuzzy Reasoning for Conceptual Design Evaluation," *CD-ROM Proceedings of ASME 1999 Design Engineering Technical Conferences and Computers in Engineering Conference*, Las Vegas, Nevada.

Sun Q., Xi, F., Chen, P., and Krishnappa, G., 1999, "Bearing Condition Monitoring through Pattern Recognition Analysis," The *6th International Conference on Sound and Vibration*, Denmark.

Sun, J., Xue, D., and Norrie, D. H., 1999, "An Intelligent Production Scheduling Mechanism Considering Design and Manufacturing Constraints," *Third International Conference on Industrial Automation*, Montreal, pp. 24.11-24.14.

Tardiff, N., Dansereau, J., Delorme, S., Zernicke, R., Ronsky, J., Poncet, P., and Labelle, H., 1999, "Evaluation of Two 3D Imaging Techniques for the Study of Scoliostic Deformities: Laser Scanning of the External Surface of the Trunk and Stereoradiographic Reconstruction of the Spine and Rib Cage," *International Society of Biomechanics XVIIth Congress*, Calgary, AB, pp. 455.

Ulieru, M. and Norrie, D. H., 1999, "A Multi-Agent System for On-Line Fault Recovery of Intelligent Manufacturing Systems," *Proceedings of NAFIPS'99*, New York, pp. 849-854.

Ulieru, M. and Norrie, D. H., 1999, "A Multi-Agent System for Supply Chain Management," *IMACS/IEEE International Conference on Systems, Communication and Controls*, Athens, Greece.

Vinogradov, O., 1999, "Micromechanical Properties of the Assembly of Two Types of Random Disks," *Proceedings of the 1999 ASME Mechanics and Materials Conference*, Blacksburg, Virginia.

Webster, P. S. and Slawinski, M. A., 1999, "On Conserved Quantities in Geometrical Optics for Inhomogeneous/anisotropic Media," *Proceedings of Canadian Conference on Nonlinear Solid Mechanics (CanCNSM)*, Victoria.

Webster, P. S. and Slawinski, M. A., 1999, "On Generalized Ray Parameters for Vertically Inhomogeneous and Anisotropic Media," *Proceedings of CSEG National Convention*, Calgary.

Wierzba, I., 1999, "Some Safety Considerations of Hydrogen as Fuel," Invited Key-Note Address at *The Third International Symposium on Hydrogen Power, Theoretical and Engineering Solutions - HYPOTHESIS III*, Saint-Petersburg, Russia.

Wierzba, I., 1999, "Lean Methane Combustion over Binary Metal Oxides Catalysts," *The 11th International Conference on Thermal Engineering and Thermogrammetry*, Budapest, Hungary.

Wierzba, I. and Ale, B. B., 1999, "Flammability of Propane-Air Mixtures at Elevated Temperatures," *Proceedings of the 16th International Symposium on Combustion Processes*, Karimierz Dolny, Poland, pp. 26.

Wierzba, I. and Ale, B. B., 1999, "Flammability Limits of Propane in Air at Elevated Temperatures," *Proceedings of the ASME International Energy Technology Conference and Exhibition 99*, Houston, Paper ETCE99-6698.

Winkelman, P. and Fauvel, O., 1999, "The Philosophical Basis of Engineering Standards," *Proceedings of International Conference on Engineering Design, ICED 99*, Munich, Vol. 3, pp. 1719-1724.

Xue, D., Sun, J., and Norrie, D. H., 1999, "Development of an Intelligent System for Building Product Design and Manufacturing - Part II: Production Process Planning and Scheduling," *Proceedings of the 2nd International Workshop on Intelligent Manufacturing Systems*, Leuven, Belgium, pp. 57-66.

Xue, D., Yadav, S., and Norrie, D. H., 1999, "Development of an Intelligent System for Building Product Design and Manufacturing - Part I: Product Modeling and Design," *Proceedings of the 2nd International Workshop on Intelligent Manufacturing Systems*, Leuven, Belgium, pp. 367-376.

Yadav, S. and Xue, D., 1999, "A Multi-level Heuristic Search Algorithm for Production Scheduling," *CD-ROM Proceedings of ASME 1999 Design Engineering Technical Conferences and Computers in Engineering Conference*, Las Vegas, Nevada.

Zeng, Y. and Gu, P., 1999, "A Set-Theoretic Model for Design Process," *Proceedings of the 12th International Conference on Engineering Design*, Munich, Germany, pp. 1117-1120.

Zeng, Y. and Gu, P., 1999, "A Set-Theoretic Model for Product Structure," *Proceedings of the 12th International Conference on Engineering Design*, Munich, Germany, pp. 1179-1182.

Zhang, X. and Norrie, D. H., 1999, "Holonic Control at the Production and Controller Levels," *Proceedings of the 2nd International Workshop on Intelligent Manufacturing Systems*, Leuven, Belgium, pp. 215-224.

Zhang, X., and Norrie, D. H., 1999, "Dynamic Reconfiguration of Holonic Lower Level Control," *IPMM '99 Conference*, Honolulu, Hawaii, pp. 887-893.

Zhang, S. and Sun, Q., 1999, "Distributed Control of Manipulators Using a Multi-agent Approach," *3rd International Conference on Industrial Automation*, Montreal.

Zhou, B., Wang, L., and Norrie, D. H., 1999, "Design of Distributed Real-Time Control Agents for Intelligent Manufacturing Systems," *Proceedings of the 2nd International Workshop on Intelligent Manufacturing Systems*, Leuven, Belgium, pp. 237-244.

Patent

Shaw, W. J. D., 1999, "Polymer Material and Process for Production Thereof," U.S.A. Patent #5,874,521.