

# **CANCAM 2005 PROGRAM**

## **Symposia and Sessions**

**Each session: 1hr, 40min; 4 or 5 papers**

**Presentations are either on overheads or via electronic projection**

**Each room is equipped with a PC and an electronic projector**

**Authors are to provide an electronic file (PPT, PDF, ...) to the technical staff in the conference room before the session**

**Use of author's own computer will not be allowed**

### May 30, Monday

8:00-9:00 Registration in Lobby of McConnell Engineering Bldg.

9:00-9:30 Opening Ceremony, McConnell 204

9:30-10:25 Keynote Lecture 1: M.J. Floryan, Chair: D.S. Weaver

|             |       |        |        |     |      |
|-------------|-------|--------|--------|-----|------|
| 11:00-12:40 | FSI-1 | FFHT-1 | MTMM-1 | D-1 | FM-1 |
| 14:00-15:40 | FSI-2 | FFHT-2 | MTMM-2 | D-2 | FM-2 |
| 16:00-17:40 | AE-1  | FFHT-3 | SM-1   | D-3 | FM-3 |

18:00-20:00 Reception at Faculty Club, 3450 McTavish Street

### May 31, Tuesday

9:30-10:25 Keynote Lecture 2: S.C. Cowin, Chair: M. Ostoja-Starzewski

|             |       |        |       |      |      |     |
|-------------|-------|--------|-------|------|------|-----|
| 10:30-12:10 | FSI-3 | FFHT-4 | SM-2  | D-4  | FM-4 | T-1 |
| 14:00-15:40 | FSI-4 | MS-1   | DNM-1 | SS-1 | FM-5 | T-2 |
| 16:00-17:40 | AE-1  | MS-2   | DNM-2 | SS-2 | FM-6 | T-3 |

### June 1, Wednesday

9:30-10:25 Keynote Lecture 3: F.C. Moon, Chair: M.P. Paidoussis

|             |       |      |       |      |      |     |
|-------------|-------|------|-------|------|------|-----|
| 10:30-12:10 | FSI-5 | MS-3 | BRM-1 | SS-3 | FM-7 | T-4 |
|-------------|-------|------|-------|------|------|-----|

14:00-14:55 Keynote Lecture 4: C.M. Gosselin, Chair: J. Angeles

18:00-21:00 *Congress Banquet* at Centre Mont-Royal, 2200 Mansfield

### June 2, Thursday

9:30-10:25 Keynote Lecture 5: E.H. Dowell, Chair: A.K. Misra

|             |       |      |       |      |      |
|-------------|-------|------|-------|------|------|
| 10:30-12:10 | FSI-6 | MS-4 | BRM-2 | SS-4 | MD-1 |
| 14:00-15:40 | FSI-7 | US-1 | BRM-3 | SS-5 | MD-2 |
| 16:00-17:40 | TEP   | US-2 | BRM-4 | SS-6 | MD-3 |

AE - Aeroelasticity

BRM - Bio-Rheological Modeling

DNM - Discrete and Nano-Mechanics

D - Dynamics

FFHT - Fluid Flow and Heat Transfer

FM - Fluid Mechanics

FSI - Fluid-Structure Interaction

KL - Keynote Lecture

MD - Manufacturing & Design

MS - Mechanical Systems

MTMM - Modern Topics in Mechanics of Materials

SM - Solid Mechanics

SS - Solids & Structures

TEP - Thermo-Electric Phenomena

T - Turbulence

US - Uncertain Systems

## **AE - Aeroelasticity**

Session 1 (May 30, 16:00-17:40), Chair: F. Nitzsche

### **Review of Grid Deformation Methods for Aeroelasticity Simulations**

C. Liauzun

### **Low Frequency Aeroelastic Oscillations at Low Re Numbers**

D. Poirel, Y. Harris

### **An Experimental Investigation of the Limit Cycle Oscillations of a Structurally Nonlinear, Two-dimensional Airfoil in Subsonic Flow**

C. Marsden, S.J.Price

### **Transient Growth of Energy in an Experiment of Airfoil Flutter**

P. Hémon, E. de Langre, P. Schmid

Session 2 (May 31, 16:00-17:40), Chair: E. de Langre

### **Approximation of Unsteady Aerodynamic Forces by Use of Combination of Fuzzy Clustering and Shape Preserving Techniques**

A. Hiliuta, R.M. Botez, M. Brenner

### **Corrected Least Squares Method for AeroServoElasticity Studies**

D.E. Biskri, R.M. Botez, N. Stathopoulos, S. Thérien, A. Rathe, M. Dickinson

### **A Fast Aeroelasticity Computational Technique for Aircraft Wing Structure Optimization**

S.-M. Roth, A. Soulaïmani

### **Control of Vibration and Noise in Helicopter Blades Using the Smart Spring Device**

G. Oxley, F. Nitzsche, V. Wickramasinghe

## **BRM - Bio-Rheological Modeling**

Session 1 (June 1, 10:30-12:10), Chair: R. Mongrain

**Towards Patient-Specific CFD Modelling of Endovascular Aneurysm Therapy**

D.A. Steinman

**Modeling of Blood in Fluid-Structure Interaction Simulations**

A. Ranga, R. Mongrain, R.L. Leask, O. Bouchot, R. Cartier

**Some Aspects of the Rheology of Blood**

M. Scott, G. Tenti, and W.-K. Liu

**Development of Non-Newtonian Blood Analogs for Flow Visualization and Hemolysis Investigation**

R. Mongrain, P. Rousselin, T. Nguyen, J.C. Tardif

Session 2 (June 2, 10:30-12:10), Chair: A. Shirazi-Adl

**Thermo-Bioconvection of Gravitactic Microorganisms in a Fluid-Saturated Porous Medium**

T. Nguyen-Quang, T. H. Nguyen, G. LePelec and P. Bournot

**Microcracks Factor and Free Surface Density in the Bone Remodeling Equations**

G.R. Rouhi, W. Herzog, L.J. Sudak, M. Epstein

**Modeling Bone Resorption Using Mixture Theory: Mechanical and Biological Factors**

G.R. Rouhi, W. Herzog, L.J. Sudak, M. Epstein

**Nonlinear Composite Modeling of Articular Cartilage with Collagen Fibrils as Membrane Elements**

R. Shirazi, A. Shirazi-Adl

**Aspects of Micromechanics of a Lamella in Bone**

I. Jasiuk, M. Ostoj-Starzewski

Session 3 (June 2, 15:00-16:40), Chair: G. Baroud

**Biomechanical FE Analysis Subsequent to Vertebroplasty**

G. Baroud

**Biomechanisms Underlying Cement Injection Process in Vertebroplasty**

G. Baroud

**Stresses in Stented Hyperelastic Artery Models**

J. Bedoya, C. Meyer, M.R. Moreno, J.E. Moore, Jr.

**Sensitivity of Trunk Model Predictions to Changes in Load Position in Upright Postures -  
Effects on Muscle Forces, Internal Loads and Stability**

M. El-Rich, A. Shirazi-Adl

Session 4 (June 2, 17:00-18:40), Chair: R.L. Leask

**Effect of Formalin Fixation on the Local Mechanical Properties of Aortic Tissue**

L. Rouleau, S. Delorme, F. Thibault, R. Mongrain, R.L. Leask

**Issues in Modelling the Mechanics of the Middle Ear**

W.R.J. Funnell, S.J. Daniel

**A Kinematic Model to Predict Ankle Ligament Elongation During Snowboarding**

S. Delorme, M. Lamontagne, S. Tavoularis

**Explicit Analytical Models for the Aortic Transvalvular Pressure Gradients**

D. Garcia, L. Kadem, D. Savéry, P. Pibarot, L.-G. Durand

**Effects of Quadriceps and Restraining Forces on Knee Joint Mechanics in Flexion**

W. Mesfar, A. Shirazi-Adl

## **DNM - Discrete and Nano-Mechanics**

Session 1 (May 31, 14:00-15:40), Chair: O. Vinogradov

### **Multi-Scale Modeling of the Indentation of Nickel-Aluminum Nano-layers**

I. Shabib, K. Chen, R.E. Miller, L.R. Zhao

### **Testing a Criterion for Dislocation Nucleation using Molecular Dynamics Simulations of Nano-Indentation**

Y.J. Zhao, R.E. Miller

### **Monte Carlo Lattice Based Simulation of Polymer Nanocomposites**

M. Ghiass, A.D. Rey

### **Are Polymer-Matrix Nanocomposites Useful Structural Materials for Microsystem Applications?**

B. Ashrafi, P. Hubert, S. Vengallatore

### **Gorsky Damping in Nanomechanical Structures**

S. Vengallatore

Session 2 (May 31, 16:00-17:40), Chair: S. Vengallatore

### **Spring-Particle Model for Hyperelastic Cloth**

M. García, O. Ruiz, M. Gomez, P. Boulanger

### **Modelling Convective and Diffusive Transfer on Networks of Discrete Values**

P.O. Dallaire, G. Payre

### **A Static Analogue of Molecular Dynamics Method for Crystals**

O. Vinogradov

### **Atomistic Simulation of Hydrogen-Assisted Cracking in bcc Iron**

I.Y. Telitchev, O. Vinogradov

### **Particle Modeling of Dynamic Fragmentation**

G. Wang, M. Ostoja-Starzewski

## **D - Dynamics**

Session 1 (May 30, 11:00-12:40), Chair: M. Nahon

### **Free Vibration Analysis of a Crankshaft using FEA**

P. Marchand, D. Redekop

### **Vibration Analysis of a Toroidal Shell Using MAPLE**

W. Jiang, X.J. Hu, D. Redekop

### **Linux, Open-Source Software, and Multibody Dynamics**

B. Minaker

### **A Forward Dynamics Algorithm for State- and Phase-Space Based Simulations of Multi-body Systems**

J. Kovecses

### **A Difficult Problem in Nonholonomic Dynamics**

L. Liang, L. Dai, Q. Guo

Session 2 (May 30, 14:00-15:40), Chair: J. Becker

### **Study of Active Anti-roll Bar Controller for off Road Vehicle**

S. Gosselin-Brisson

### **Stability and Active Roll Control of Heavy Road-Vehicles**

Y.Tian S. F. Asokanthan

### **Ride Performance of Heavy Vehicle Using 3D Finite Element Model**

M.A. Chowdhury, W. Ahmed, R. Sedaghati

### **Model Predictive Control and Dynamic Inversion for Unmanned Aerial Vehicles Navigation Control**

Z. Cheng, D. Neculescu, B. Kim

### **Evaluation of the ROPOS Liveboating Configuration Using Dynamics Simulation**

B. Buckham, D. Steinke, S. Prabhakar

Session 3 (May 30, 16:00-17:40), Chair: J. Kovecses

### **Rigid Body Impact Modeling Using Integral Formulation**

Y. Zhang, I. Sharf

### **A Contact Dynamics Model for Space Robotic Systems**

L. Luo, M. Nahon

**Lagrangian Point Multi-Tether Systems**

B. Wong, A. Misra

**Dynamic Response of a Diffuser Pipe Subject to a Harmonic Follower Force**

E. Texier and H. Alighanbari

**Natural Frequencies of Completely Free Stepped Plates**

A. Shafiee, Y. Dong, D. Redekop

Session 4 (May 31, 10:30-12:10), Chair: I. Sharf

**A Nonlinear Control Algorithm for Semi-Active Structural Vibration Damping by Adaptive Friction Dampers**

J. Becker, L. Gaul

**Vibration Suppression in a Flexible Gyroscopic System Using Internal Resonance Control Strategy**

S. Siddiqui, Y. Zhao, B. Singh

**Stability of Harmonically Perturbed Vibratory Beam-type Angular Rate Sensors**

J. Cho, S.F. Asokanathan

**Optical Modal Analysis Using a Phase Shifting Technique**

A.K. Mitchell

**Dynamic Stability of a Translation-based Vibratory Rate Gyroscope**

T. Wang, S.F. Asokanathan

## **FFHT - Fluid Flow and Heat Transfer**

Session 1 (May 30, 11:00-12:40), Chair: B.R. Baliga

### **Spacing Effects of Four Opposed Jets in a Cross-flow**

A. Pollard, C.G. Ball, D. Bepalko, F. Secretain, M. Uddin, L. Wei, R. Fernandes

### **Second Law Analysis of a Natural Gas Fired Combined Cycle**

K. Mohamed, B.V. Reddy

### **Tip Vortex Behind a Swept Wing with Winglet**

P. Gerontakos, D. Birch, T. Lee.

### **Dissipation of Intense Disk-like Eye Vortices**

Y. Aboelkassem, G.H. Vatistas

### **Turbulence by Kelvin-Helmholtz and Rayleigh-Taylor Instabilities**

C. Pinilla, V.H. Chu

Session 2 (May 30, 14:00-15:40), Chair: D. Naylor

### **Adaptive Modelling Applied to Impacting Droplets**

S. Afkhami, M. Bussmann

### **Measurement of Bulk Temperature in Thermally Developed Laminar Flows in Pipes**

N. Atabaki, B.R. Baliga

### **Modelling of Heat Transfer in a Facade with Integrated Photovoltaic Solar Panels**

L. Liao, A.K. Athienitis, K.W. Park

### **Improved Zonal Models for Indoor Airflow**

E.J. Teshome, F. Haghighat

### **Performance Simulation of a Combined Cycle Cogeneration System**

B. Law, B.V. Reddy

Session 3 (May 30, 16:00-17:40), Chair: B.V. Reddy

### **Mixing by a Buoyant Jet in a Room with Side Chamber**

W.D. Baines

### **Shielding Gas Flow in High-Rate Gas Metal Arc Welding Torches: Design Implications**

R.W. Hill, K.J. Cragin, N. Elkouh, S. Luckowski

### **Surface Heat Emissions from the Back of a Circular Cylinder in a Crossflow**

S. Bouhairie, V.H. Chu

**Oscillating Wing Loadings with Small Trailing-Edge Strips**

P. Gerontakos, T. Lee

**Particle Sizing using Elements of a Particle Tracking Velocimetry System for Granular Flows**

N. Jesuthasan, B.R. Baliga, S.B. Savage

Session 4 (May 31, 10:30-12:10), Chair: B.R. Baliga

**Creeping Flow Through a Model of Fibrous Porous Media**

J. Zhong, I.G. Currie, D.F. James

**Determination of Maximum Effective Pore Size of Sintered Porous Metal Plates**

N. Atabaki, B.R. Baliga

**Heat Exchange Efficiency of Exterior Building Wall Based on Transport in Porous Media**

K. Qiu, F. Haghghat

**Mechanistic Model to Estimate Heat Transfer Coefficient in a Circulating Fluidized Bed Combustor**

G.N. Vijay, B.V. Reddy

**Validation of a Numerical Model of a Complex Fenestration System**

T. Avedissian, D. Naylor

## **FM - Fluid Mechanics**

Session 1 (May 30, 11:00-12:40), Chair: D. Mateescu

### **Development of a Trailing Vortex Formed with Spanwise Tip Blowing**

A.G.L. Holloway, J. Bettle, S. Richardson

### **Boundary Layer Separation and Control at Low Reynolds Numbers**

S. Yarusevych, J.G. Kawall, P.E. Sullivan

### **Computational Solutions for Steady and Unsteady Viscous Flows**

E. Zuppel, D. Mateescu

### **Experimental and Numerical Investigation of Transition in a Separated Shear Layer**

S. Yarusevych J.G. Kawall P.E. Sullivan

### **The Impact of the Airside Velocity Field on the Latent Heat Transfer during Natural Convection**

S.J.K. Bukhari, K. Siddiqui

Session 2 (May 30, 14:00-15:40), Chair: D. Grecov

### **Critical Features of Flow Around an Axisymmetric Body**

C.R. Baker, T.L. Jeans, A.G. Gerber, A.G.L. Holloway, G.D. Watt

### **Vortex-Shedding from Step-Cylinders in Shear Flow**

W. Dunn, S. Tavoularis

### **Combined Effect of a Short Roughness Strip and Localised Wall Suction on the Evolution of Anisotropy in a Turbulent Boundary Layer**

O.M. Oyewola, O.O. Tomori

### **High-Speed Flow Visualization of an In-Line Multiphase Pipe Vortex**

R.J. Hugo, B. de Witt

### **Modélisation Aérodynamique Tridimensionnelle d'une Aile Battante Propulsive**

A. Brakez, Z. Zrikem, A. Mir

Session 3 (May 30, 16:00-17:40), Chair: M.J. Floryan

### **Acoustic Resonance of Closed Coaxial Side Branches in an Annular Duct**

R. Bravo, S. Ziada, M. Dokainish

### **Qualitative Study of the FENSAP-ICE Anti-Icing Procedure**

F. Morency, H.Z. Wang, W.G. Habashi, A. Pueyo, F. Kafyeke

**Study of Close Contact Melting of Ice From a Sliding Heated Flat Plate**

D. Groulx, M. Lacroix

**Finite Element Modelling of Flow In a Highly Permeable Porous Media Using Bubble Function Method**

M. Parvazinia, V. Nassehi, R.J. Wakeman, M.H.R. Ghoreishy

**Numerical Simulation of an In-Line Vortex Pipe Flow**

A.A. Mohamad, R.J. Hugo

Session 4 (May 31, 10:30-12:10), Chair: A. Vinogradov

**Numerical Study of Laminar Flow around a Sphere Using Finite Volume Blocked-off Treatment**

M.M. Abou Al-Sood, M. Birouk

**Numerical Evaluation of Mean Wind Pressures on Flat Roofs with Parapets**

R. Bedair, T. Stathopoulos

**Computer Simulation of a Pump-Less Absorption System Using Bubble Pump**

Y. Rezvanifer, M.N. Zadegan

**Wind Driven Flow through Building Openings: A Wind Tunnel Study**

P. Karava, T. Stathopoulos, A.K. Athienitis

**A New Experimental Method for the Determination of the Effective Orifice Area based on the Acoustical Term Source**

L. Kadem, Y. Knapp, P. Pibarot, E. Bertrand, L.G. Durand, R Rieu

Session 5 (May 31, 14:00-15:40), Chair: S. Dost

**Phase Ordering in Multi-Phase Polymer-Liquid Crystalline Materials**

S.K. Das, A.D. Rey

**A Visualization Technique for Determining the Chemical Concentration in a Porous Column**

W. Dong, A.P.S. Selvadurai

**Shear Rheology of Textured Carbonaceous Mesophases**

D. Grecov, A.D. Rey

**A Weight Loss Technique for Measuring Gas Solubility in Polymers**

L. Ji, T.W. Forest, P.-Y.B. Jar

**A Model for the Growth of SixGe<sub>1-x</sub> Single Crystals by Liquid Phase Diffusion**

M. Yildiz, S. Dost, B. Lent

Session 6 (May 31, 16:00-17:40), Chair: C. Meskell

**Simulation of a Starting Jet Flow Using a 3D Vortex Method**

D. Cox, C. Meskell

**Off Design Velocity Measurements in an Impeller of a Centrifugal Volute Pump**

D.A Johnson, N. Pedersen, C.B. Jacobsen

**Forced Convection From A Rotating Circular Cylinder In A Uniform Shear Flow: Part 1: Analytical Results**

M.L. Williams, A.S. Korobov, S.J.D. D'Alessio, J.P. Pascal

**Forced Convection From A Rotating Circular Cylinder In A Uniform Shear Flow. Part 2: Numerical Results**

A.S. Korobov, M.L. Williams, S.J.D. D'Alessio, J.P. Pascal

**A Critical Review of Classical Force Estimation Methods for Streamlined Underwater Vehicles Using Experimental and CFD Data**

T.L. Jeans, C.R. Baker, A.G.L. Holloway, A.G. Gerber, G.D. Watt

Session 7 (June 1, 10:30-12:10), Chair: A. Dolatabadi

**Evaporation of Carbene Dioxide: A Comparative Study With Refrigerants R22 and R134A**

Z. Aidoun, M. Ouzzane

**An Isothermal Water Model of the Twin Belt Aluminum Casting Process**

I. Mcleod, A.G.L. Holloway, A.G. Gerber

**Numerical Analysis of the Effect of Substrate Location and Shape in a Cold Spray Process**

Q. Zhu, V. R. Srivatsan., A. Dolatabadi

**Stability of Gravitactic Suspensions Contained in a Rectangular Cavity**

Z. Alloui, T.H. Nguyen, E. Bilgen

**Unsteady State Thermalhydraulic Modelling of Candu Reactor Fuel Channels**

N. Mesmous, E. Varin, A. Teyssedou

## **FSI - Fluid-Structure Interaction**

Session 1 (May 30, 11:00-12:40), Chair: M.P. Paidoussis

### **Free Vibration Effects on the Three-Dimensional Wake of an Elastic Cylinder**

Y. Liu, R. M.C. So, C.H. Zhang, X.Q. Wang

### **Turbulent Wake Structure of a Finite Circular Cylinder of Small Aspect Ratio**

M.S. Adaramola, O.G. Akinlade, D. Sumner, D.J. Bergstrom, A.J. Schenstead

### **Three-Dimensional Dynamics of Cantilevered Pipes Conveying Fluid in the Presence of an End-Mass**

M. Wadham-Gagnon, M. P. Paidoussis, C. Semler

### **Stability of Deploying/Extruding Beam in Dense Fluid**

F. Gosselin, M.P. Paidoussis, A.K. Misra

### **A Simple Wake Model for Damping Controlled Fluidelastic Instability**

C. Meskell

Session 2 (May 30, 14:00-15:40), Chair: D.S. Weaver

### **Stability of the Nonlinear Dynamics of Clamped Shells in Contact with Fluid**

K.N. Karagiozis, M.P. Paidoussis, A.K. Misra

### **Reduced-order Pod Models for Nonlinear Vibrations of Fluid-filled, Circular Cylindrical Shells**

M. Amabili, A. Sarkar, M.P. Paidoussis

### **Two-Phase Fluidelastic Instability of Heat Exchanger Tube Arrays with Asymmetric Tube Support Stiffness**

P.A. Feenstra, D.S. Weaver, T. Nakamura

### **Two-Phase Flow Induced Vibration of an Array of Tubes Preferentially Flexible in the Flow Direction**

R. Violette, N.W. Mureithi, M.J. Pettigrew

### **Etude Expérimentale et Numérique de l'Écoulement Autour d'un Cul de Chalut**

D. Marichal, G. Germain, J-V. Facq

Session 3 (May 31, 10:30-12:10), Chair: M.J. Pettigrew

### **Influence of Velocity Ratio on the Turbulent Wake of a Short Stack**

M.S. Adaramola, D. Sumner, D.J. Bergstrom

### **Effect of Cylinder Diameter on Acoustic Resonance of Two Tandem Cylinders in Cross Flow**

A. Mohany and S. Ziada

**Flutter of Long Cantilevered Cylinders in Axial Flow**

E. de Langre, M. P. Paidoussis, O. Doaré

**Couplage Fluide-Structure par Couplage des Codes Fluent et Abaqus : Application au Calcul d'une Voile**

D. Marichal, B. Peseux, O. Collin, P. Muller

**Fluidelastic Instability in Serrated Finned Tube Bundles**

R.H. Lumsden, D.S. Weaver

Session 4 (May 31, 14:00-15:40), Chair: S. Ziada

**Numerical Simulation of a Non Linear Coupled Fluid/Structure Problem by Explicit Finite Element/Finite Volume Coupling**

J.-F. Sigrist, B. Peseux, C. Lainé

**Nonlinear Dynamics of Slender Flexible Cylinders Clamped at Both Ends and Subjected to Axial Flow**

Y. Modarres-Sadeghi, M.P. Paidoussis, C. Semler

**A New Method for Measuring Damping in Two-Phase Flow**

J.E. Moran, D.S. Weaver, P.A. Feenstra

**Experimental Study of Vibration Excitation Force of a Rotated Triangular Tube Bundle in Two-Phase Cross-Flow**

C. Zhang, M.J. Pettigrew, N.W. Mureithi

**Fluidelastic Instability in a Tube Array Subjected to Axisymmetric Jet Flow**

B.J. Ledger, D.S. Weaver

Session 5 (June 1, 10:30-12:10), Chair: S.J. Price

**Towards the Numerical Simulation of Acoustic and Flow Field Interactions in Flows over Bluff Bodies**

B. Selent, C. Meskell

**Dynamics of a Forced 2D Cylinder Wake**

M. Rodriguez, N.W. Mureithi

**Wakes and Vortex Streets Generated by Translating Force and Force Doublet**

Y.D. Afanasyev, V.N. Korabel

**Approximation of Axial Displacement in a Two-Dimensional Fluid-Filled Elastic Tube**

C.R. Johnston, M. Epstein

## **Flutter Motion of the Cylinders Conducting Annular Laminar Flows**

A. Mekanik

Session 6 (June 2, 10:30-12:10), Chair: E. de Langre

### **Experimental Characterization of a Tethered Spherical Helium Balloon in an Outdoor Environment**

P. Coulombe-Pontbriand, M. Nahon

### **X-Y Towing Tank for Unsteady Fluid Mechanics Experiments**

D. Sumner, J.E. Barth, O.J.P. Dansereau, J.L. Heseltine, M.G. Crane

### **Universal Wake Number Data for Two Staggered Circular Cylinders**

D. Sumner, A.J. Schenstead

### **An Experimental Investigation of the Cross-Flow around a Pair of Staggered Cylinders with the Downstream Cylinder Subjected to Forced Transverse Harmonic Oscillation**

W.T. Pinto, S.J. Price, M.P. Païdoussis

### **Can CFD Help in the Design of the Fishing Gear? Study of Hydrodynamic Forces Acting on Nets**

D. Marichal

Session 7 (June 2, 15:00-16:40), Chair: D. Sumner

### **Acoustic Resonance of Transverse Modes of Axi-Symmetric Cavity**

K. Awny, S. Ziada

### **Flow-Acoustics of T-Junctions: Effect of T-Junction Geometry**

Y. Li, S. Ziada

### **Issues Regarding a Hardware in the Loop Experimental Setup for Room Acoustics**

D. Neculescu, W. Weiss, W. Zhang

### **Dynamical System Analysis and Chaos Detection of a Low Dimensional Model for 2D Flow around a Cylinder Obtained by POD**

S. Fardisi, S.A.Z. Jahromi, M. Mahzoon, H. Emdad

## **MD - Manufacturing and Design**

Session 1 (June 2, 10:30-12:10), Chair: W. Warren

### **Mining on Moon/Mars-A review**

H. Satish, P. Radziszewski, J. Ouellet

### **Exploring Tumbling Mill Natural Frequencies**

P. Radziszewski, Y.Y. Quan, J. Poirier

### **Methodology for Motion Error Diagnostic of a Machine Tool Trunnion Axis Using DBB**

S.H.H. Zargar, J.R.R. Mayer

### **Geometrical Modeling of a Booster Drive in Long Conveyors**

J. Szymanski, L. Gladysiewicz

### **Nonlinear Elliptic Inhomogeneity under General Non Uniform Loading**

M. Mahboob, P. Schiavone

Session 2 (June 2, 15:00-16:40), Chair: E. Byskov

### **An Instrumented Lifter for Tumbling Mill Wear Monitoring**

S. Martins, P. Radziszewski, W. Li, C. Benson

### **Liner Wear as a Function of Abrasive and Impact Wear Mechanisms**

C. Arekar, P. Radziszewski, D. Roy, A. Faucher, S. Caron

### **The Influence of High Mean Stress and High R Ratio on the Fatigue Behavior of Components**

S. Peng, M.N.K. Singh

### **Investigation of Critical Plane Models for Multiaxial Fatigue life assessment**

A.K. Bhowmick, F. Ghrib

### **Identification of CDM Based Fatigue Model Using Standard Fatigue Parameters**

F. Ghrib, M.D. M. Rahman, M.K.S. Madugula

Session 3 (June 2, 17:00-18:40), Chair: P. Radziszewski

### **Rebuilding of CAD Model Starting from the Finite Elements Results (Case of the Parts Undergoing Bending)**

B.L. Abdelmajid, B. Amara, V. François, L. Romdhane

### **The Design of a Spherical Multi-Lobe-Cam**

S. Bai, J. Angeles

**Experiments with Digital Force Control**

I. Baksa, K. Kisfalusi, G. Stépán

**A Novel Approach to Optimize Hydraulic Braking System in a Passenger Car**

S. Azari, A. Eskandari, S. Azadi

**On elastic and viscoelastic helices**

R. Shahsavari, M. Ostoja-Starzewski

## **MS - Mechanical Systems**

Session 1 (May 31, 14:00-15:40), Chair: C.M. Gosselin

### **Robotic Grasping of Unknown 3-D Objects**

G.M. Bone, Y. Li

### **Sensing System for Safer Human-Robot Interaction**

Y. Lu, L. Zeng, G.M. Bone

### **Powered Exoskeleton for the Human Arm**

G.M. Bone, P.W. Chan

### **Modelling of an Anti-Tilting Outdoor Mobile Robot**

D.S. Nasrallah, J. Angeles, H. Michalska

### **Modeling and Estimation of the Nonlinear Friction Characteristics in a Hydraulic Actuator**

Y. Chinniah, S. Habibi, R. Burton, E. Sampson

Session 2 (May 31, 16:00-17:40), Chair: J. Kovecses

### **A Simple Control Strategy for Overconstrained Parallel Cable Mechanisms**

S. Bouchard, C.M. Gosselin

### **Torque Minimization of the Delta Parallel Robot**

C. Baradat, V. Arakelian, S. Briot

### **A New Decoupled Parallel Manipulator with Four Degrees of Freedom**

V. Arakelian, S. Briot

### **Type Synthesis of 4-DOF PS-Equivalent Parallel Manipulators: A Virtual-Chain Approach**

X. Kong, C.M. Gosselin

Session 3 (June 1, 10:30-12:10), Chair: G.M. Bone

### **Approaches to Modelling and Control of Contact Transitions in Mechanical Systems With Time-Varying Topology**

S.A. Modarres Najafabadi, J. Kovecses, J. Angeles

### **Mass-Spring Representation of a Single-Link Flexible-Link Manipulator**

M. Vakil, R. Fotouhi, P.N. Nikiforouk

### **Trajectory Tracking of a Single-Link Flexible-Link Manipulator**

M. Vakil, R. Fotouhi, P.N. Nikiforouk

**Comparing Robust-Adaptive Control Approach and PD Plus Gravity Compensation Method of Two 5 DOF Cooperating Robot Manipulators**

M. Azadi, M. Eghtesad, B. Gharesifard

Session 4 (June 2, 10:30-12:10), Chair: J. Angeles

**A Case Study on the Stability of Digital Force Control of Robotic Manipulators**

L. Kovacs, G. Stepan, J. Kovecses

**Extended Intersection Approach for Solving Serial Manipulator Inverse Kinematics**

G.M. Bone

**Comparison of Robustness Indices and Introduction of a Tolerance Synthesis Method for Mechanisms**

S. Caro, F. Bennis, P. Wenger

**A Generalized Transmission Index for Spatial Mechanisms and Its Application on Mechanisms with Higher Pairs**

C. Chen, J. Angeles

## **MTMM - Modern Topics in Mechanics of Materials**

Session 1 (May 30, 11:00-12:40), Chair: S. Potapenko

### **The Design of Harmonic Shapes in Finite Elasticity**

P. Schiavone, G.F. Wang, C-Q. Ru

### **The Effect of van der Waals Interaction on Free Vibration of Multiwall Carbon Nanotubes**

C.Y. Wang, C.Q. Ru, A. Mioduchowski

### **Fundamental Solutions in Piezoelectricity. The Application of Boundary Integral Equation Method in the Linear Theory of Piezoelectricity**

E. Lioubimova, P. Schiavone

### **Compression of a Flat Sheet of Dielectric Elastomer**

J.L. Wegner, J.B. Haddow

### **Brain Biomechanics: Quasi-linear Viscoelastic Models for Short and Long Time Scale Brain Injuries**

C.S. Drapaca, S. Sivaloganathan, G. Tenti

Session 2 (May 30, 14:00-15:40), Chair: P. Schiavone

### **Biomechanics of Brain Tissue: Constitutive Equations**

M. Kohandel, S. Sivaloganathan, G. Tenti

### **Modelling and Simulation of Bone Fracture Healing**

Y.G. Bao, X.D. Wang

### **Propagation of Torsional Waves in an Unbounded Cosserat Continuum**

S. Potapenko

### **Effect of Interphase Layer on Electroelastic Stresses within an Elliptical Inclusion in Anti-plane Shear**

L.J. Sudak

### **Mesoscale Bounds in Finite Elasticity of Random Composites**

Z. Khisaeva, M. Ostoja-Starzewski

## **SM - Solid Mechanics**

Session 1 (May 30, 16:00-17:40), Chair: M. Ostoja-Starzewski

### **Betti's Reciprocal Relationships for Disc Inclusion Problems**

A.P.S. Selvadurai

### **A General Solution to the Plane Problems of Micropolar Elasticity**

W.E. Warren and E. Byskov

### **A Micropolar Formulation of the Desai Hierarchical Model for Multiphase Materials**

A. Scarpas, X. Liu and C. Kasbergen

### **Mesoscale Bounds on Effective Thermal Expansion of Random Composites**

X. Du, M. Ostoja-Starzewski

### **Elastoplasticity of Random Heterogeneous Materials**

W. Li, M. Ostoja-Starzewski

Session 2 (May 31, 10:30-12:10), Chair: A.P.S. Selvadurai

### **Internal Voids and Crack Characterization in Cold Heading of Dual Phase Steel**

A. Sabih, J.A. Nemes, P. Wanjara

### **Weighted Average Material Model for X100 Steel**

S. Verbit, L.N. Pussegoda, D. Redekop

### **On the Development of a Compressible Pseudo-Strain Energy Density Function for Hyper-elastic Materials**

H. Ghaemi, K. Behdinan

### **Experimental Evaluation of an Energy-Based Approach for Predicting Local Ratcheting in Particulate Metal Matrix Composites**

G.M. Owolabi, M.N.K. Singh

### **Effet de l'Absorption d'Eau sur le Comportement Mécanique en Cisaillement d'un Composite (Tissus de Verre/Résine Époxyde)**

A. Naceri, A. Vautrin

## **SS - Solids & Structures**

Session 1 (May 31, 14:00-15:40), Chair: G. McClure

### **Comparison of Gear Standards for Bending Failure**

D. Martinez Leal, J.J. Cabello Eras, R.G. Espinosa, D. Redekop

### **Comparison of Gear Standards for Surface Durability**

D. Martinez Leal, J.J. Cabello Eras, R.G. Espinosa, D. Redekop

### **Stress Concentration Analysis of Tubular DT Joints**

T.A. Oumarou, E. Evgin, D. Redekop

### **Practical Convergence-Divergence Checks for Stress Analysis with Finite Elements**

G.B. Sinclair, Y. Lu and J.A. Smouse

### **Effect of Lumbar Posture on Trunk Active-Passive Load Sharing and Stability in Static Lifting**

N. Arjmand, A. Shirazi-Adl

Session 2 (May 31, 16:00-17:40), Chair: G.B. Sinclair

### **Micromechanical modeling of fiber reinforced elasto-viscoplastic polymer matrix composites and structures**

L. Adam, R. Assaker, I. Doghri, O. Pierard

### **Validation of a New, Locking-Free Beam Finite Element**

E. Byskov, F. Westarp, J. Christoffersen

### **A Comparative Analysis of two Posteriori Error Estimators for the Finite Element Method**

A.H. ElSheikh, S.E. Chidiac, S. Smith

### **Raideurs Équivalentes des Vis et des Boulons**

F. Alkatan, P. Stéphan, J. Guillot

### **Raideurs Équivalentes des Pièces dans un Assemblage Boulonné**

F. Alkatan, P. Stéphan, J. Guillot

Session 3 (June 1, 10:30-12:10), Chair: P. Hubert

### **Buckling of a Torus-Cylinder Structure Using the FEM**

X.H. Wang, L. Xu, D. Redekop

### **Ultimate Load Carrying Capacity of Timber Shear Walls using FEA**

L. Wu, D. Redekop, M.E. Mohareb

**Thermal Distortion Modelling on CMM structures**

T.O. Ekinici, J.R.R. Mayer, G. Cloutier

**A General 3D L-Section Beam Finite Element for Elastoplastic Large Deformation Analysis**

P.S. Lee, G. McClure

**Application of Receptance Coupling to Synovial Joint**

P.G. Park, S.S. Park

Session 4 (June 2, 10:30-12:10), Chair: W.L. Cleghorn

**Elastic-Brittle-Plastic Analysis of Underground Openings in Hoek-Brown Rock**

S.K. Sharan

**Buckling of Web-Post in Castellated Beams**

K. Weicker, D. Redekop, M.E. Mohareb

**Validation du Modèle DDM Multicouches Homogénéisé pour le Carton Ondulé à Travers un Test de Flexion à Trois Points**

Nabil Talbi, Rezak AYAD, Z. Aboura, S. Allaoui

**A Novel TKP Design with Lower Predicted Contact Pressure**

M.T. Manzari, A. Hashemi

**A New Approach to Predict Face Dimpling Load for Honeycomb Core Laminated Sandwich Panels**

M J. Jamali, I. Rajabi

Session 5 (June 2, 15:00-16:40), Chair: S.K. Sharan

**Free Vibration of Thin Plates with Finite Nodal Method**

Y. Yao, M. Packirisamy, R.B. Bhat

**Perfectly Matched Layer versus Hybrid Modeling of Guided, PSV Waves in Plates**

A. Mahmoud, N. Popplewell, A. Shah

**Applications of Stress-Based Finite Element Method on Euler-Bernoulli beams**

Y.L. Kuo, W.L. Cleghorn, K. Behdinan

**Dynamic Modeling of a Viscoelastic Sandwich**

A. Oulmane, E. Farah, A. Ross

**Shape Factors for Cylindrical Intakes Located in Transversely Isotropic Porous Media**

R. Foroutan, A.P.S. Selvadurai

Session 6 (June 2, 17:00-18:40), Chair: A. Shirazi-Adl

**On the Removal of Stress Singularities from Bonded Bimaterial Interfaces**

G.B. Sinclair, A.J. Birnbaum, J. Jiang

**A Combined Approach for Anisotropic Materials Analysis**

G. Bandé, J.A. Nemes

**Compensating Stiffness in a Peripherally Heated Rotating Thin Disk**

J. Poirier, P. Radziszewski

**Post-Elastic Dynamic Analysis of a Transmission Tower**

X.H. Zhang, G. McClure, P. Guilbault, T. Holmas

**Numerical Study of Elliptic Cracks in Cylinders with a Thickness Transition**

A. Saffih, S. Hariri

## **TEP - Thermo-Electric Phenomena**

Session 1 (June 2, 17:00-18:40), Chair: R.J. Hill

### **Modeling Electrowetting-based Droplet Actuation in Microchannel**

A. Dolatabadi, K. Mohseni, P. Wood-Adams

### **A New Thermal Storage System for the Management of Both Solar and Electric Energy**

Z.A. Hammou, M. Lacroix

### **Electroactive Polymers: Properties, Applications, Challenges**

A.M. Vinogradov

### **Prediction and Control of Protective Banks in Electric Arc Furnaces by Inverse Heat Transfer**

O. Tadrari, M. Lacroix

### **Electrokinetic Transport in Polymer Gels with Spherical Charged Inclusions**

R.J. Hill

## **T - Turbulence**

Session 1 (May 31, 10:30-12:10), Chair: B.A. Fleck

### **Use of Energy Scale Budget to Quantify Effect of Initial Conditions on Decaying Grid Turbulence**

P. Lavoie, R.A. Antonia, L. Djenidi

### **Statistics of Passive Scalar in a Turbulent Jet**

A. Benaissa, J. Lemay

### **Scalar Concentration Reduction in a Contaminant Cloud**

T.P. Schopfloch, C.J. Smith, P.J. Sullivan

### **Effect of Initial Conditions in the Near and Far Fields of a Co-Flowing Jet**

M. Uddin, A. Pollard

### **Turbulent Jet Inside an Enclosure**

K. Ness, B.A. Fleck, D.J. Wilson, A. Benaissa

Session 2 (May 31, 14:00-15:40), Chair: A. Benaissa

### **An Anisotropic Turbulence/Wave Theory of Atmospheric Stratification and a Multifractal Model**

S. Lovejoy, D. Schertzer

### **Lien entre les Phénomènes de Dislocation et l'Écoulement Secondaire pour l'Écoulement d'Interaction Couche de Mélange - Sillage**

C. Braud, D. Heitz, G. Arroyo, J. Delville, J.P. Bonnet

### **Wave Turbulence Decomposition**

K. Siddiqui, M. Loewen

### **Scaling and Reynolds Number Effects on Plume Entrainment and Trajectory**

K. Shahzad, B.A. Fleck, D.J. Wilson

### **Jet Source Turbulence for Small Scale Experiments**

K. Shahzad, B.A. Fleck, D.J. Wilson

Session 3 (May 31, 16:00-17:40), Chair: K. Siddiqui

### **Experiments on Turbulent Channel Flow Subject to System Rotation**

Y. Maciel, G. Yan, G. Dumas

### **Investigation of the 3D Inlet Flow Characteristics in a Rotating Channel Setup**

S. Julien, F. Torriano, G. Dumas, Y. Maciel

**Effect of Surface Roughness on the Higher-Order Moments in a Turbulent Boundary Layer**

O.G. Akinlade, D.J. Bergstrom

**Conditional Quadrant Analysis of the Reynolds Stress in Open Channel Flow**

V. Roussinova, N. Biswas, R. Balachandar

**Covariance of Passive Scalars Emitted from Concentrated Sources in Turbulent Channel Flow**

Etienne Costa-Patry, L. Mydlarski

Session 4 (June 1, 10:30-12:10), Chair: L. Mydlarski

**Computational Study of Turbulent Flow Around a Sphere Using Finite Volume Blocked-off Treatment**

M.M. Abou Al-Sood, M. Birouk

**A Turbulence Model for Dividing and Combining Open Channel Flows**

M.Satish, F. Ma, N. El-Jabi

**A New Wall Function Formulation Based on Power Laws for Pipe Flows Including Roughness Effects**

O. G. Akinlade, D. J. Bergstrom

**Visualization of Coherent Eddies in Turbulent Channel Flows by Direct Numerical Simulation**

S.K. Das

**Effects of Radial Position and Reynolds Number on Differential Diffusion in a Turbulent Jet**

T. Lavertu, S. Gaskin, L. Mydlarski

## **US - Uncertain Systems**

Session 1 (June 2, 15:00-16:40), Chair: A. Sarkar

### **On The Use Of Fuzzy Arithmetic For Automotive Crash Simuations In The Presence Of Uncertainty**

M. Hanss, K. Willner

### **Design Assessment of Mechanical Structures Based on Fuzzy Dynamic Analysis**

D. Moens, H. De Gerssem, D. Vandepitte

### **On a Generalized Buckling Problem with Fuzzy-Valued Material and Support Parameters**

U. Gauger, S. Turrin, M. Hanss, L. Gaul

### **Uncertainty Modelling using Fuzzy Arithmetic based on Dimension-Adaptive Sparse Grids**

A. Klimke

Session 2 (June 2, 17:00-18:40), Chair: M. Hanss

### **Random Matrix Eigenvalue Problems in Probabilistic Structural Mechanics**

S. Adhikari

### **Multi-Modal Probability Structure of a LCO with Random Excitation – Application to an Airfoil**

D. Poirel, S.J. Price

### **La maintenance Prédictive d'une Machine Hydraulique en Utilisant le Filtre de Kalman**

Y. Chinniah, R. Burton, S. Habibi, E. Sampson

### **Etude Probabiliste d'un Système Mécanique à Paramètres Incertains par une Technique Basée sur la Méthode de Transformation**

S. Kadry, R. Younès

### **Comparison of FEM and Experimental Shell Vibration Results**

X.J. Hu, R. Singhal, D. Redekop

## **KL - Keynote Lectures**