

Robson Forensic

Engineers, Architects, Scientists & Fire Investigators

VALENTINA NGAI, PH.D., P.ENG. Biomedical Engineer / Biomechanics and Bioengineering

Investigates and analyzes biomechanical and biomedical injuries; injury causation; and medical equipment, devices and implants.

Assesses Injuries: Applying physics, anatomy and physiology, assesses injuries involving:

- traumatic brain injuries and skull fractures;
- neck, back and spinal cord injuries;
- orthopedic and neurologic injuries;
- vascular ruptures;
- abdominal organs;
- heart, lungs, skin (including burns) and other organs;
- musculo-skeletal injuries including joints (i.e., shoulders, knees, ankles and elbows), soft tissues (i.e., rotator cuff, tendons and ligaments), and fracture patterns (torso, long bone, hand, foot or skull).

Determines Cause: Applying engineering principles, determines:

- the manner in which tissue failed: the type of loading, the direction of loading and magnitude or size of the load that caused the injury;
- if injury patterns are causally related or consistent with the hazardous condition or circumstances claimed;
- whether there was sufficient force in the right direction to cause an injury;
- the presence of pre-existing conditions and how they affect the injury;
- who and/or what action contributed to the injuries;
- what could have been done to prevent the injuries.

Typical Personal Injury Cases Involve:

- motor vehicle collisions;
- slips, trips and falls;
- medical malpractice or device failures;
- occupational and work place injuries;
- sports and recreational injuries.

PROFESSIONAL EXPERIENCE

2010 to present **Robson Forensic, Inc.**
Associate

Provide technical investigations, analysis, reports, and testimony toward the resolution of personal injury litigation involving injury analysis and causation, medical equipment, medical devices, and procedures.

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- 2005 to 2010 **Rush University Medical Center, Chicago, IL**
Research Assistant: Department of Orthopedic Surgery
- Developed a polymer-staining technique for orthopaedic polymers to track wear *in vitro*.
 - Conducted material evaluation through wear simulator studies.
 - Identified specific *in vivo* loading and motion profiles at the knee during walking and the relationship with wear by working with TKR patients and *in vitro* knee simulation.
 - Analyzed the kinematics and kinetics of human motion.
 - Executed biomechanical computation using inverse dynamics and gait data.
- 2007 **University of Illinois at Chicago, Chicago, IL** Jan.-Apr. 2007
Teaching Assistant: Department of Bioengineering
- Prepared lectures and student projects.
 - Supervised laboratory work for a senior/graduate level bioengineering course (Orthopaedic Biomaterials).
- 2003 to 2005 **University of Waterloo, Waterloo, ON** Jan.-Aug. 2005
Research Assistant: Department of Physics and Astronomy
- Quantified protein adhesion onto polymer surfaces using quartz crystal microbalance (QCM).
 - Analyzed protein deposits and examined contact lens surfaces using various imaging methods.
 - Investigated the thermal stability of proteins using spectroscopy and surface plasmon resonance.
- Research Assistant: Department of Mechanical Engineering* May 2002-Dec. 2004
- Developed a simulator apparatus to study friction of the anterior surface of contact lenses.
 - Investigated the frictional effects of material-type, protein deposition and normal load on the lens surface.
 - Utilized different imaging methods to investigate the surfaces of contact lenses.
 - Developed a theoretical lubrication model of the experimental configuration.
- Teaching Assistant: Dept. of Mechanical Engineering* May-Dec. 2003 and May-Sept. 2004
- Prepared and conducted tutorials.
 - Administered and graded projects and examinations (3rd year mechanical engineering course – Kinematics and Dynamics of Machines) with class sizes of approximately 70 to 80 students.

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1999 to **The Greer Galloway Group Inc.**, Belleville, ON

2002 *Assistant Project Manager*

- Performed preliminary and detailed highway designing, transportation planning, traffic analyses.
- Analyzed stormwater and sewer systems and management.
- Conducted environmental studies.
- Was responsible for quality control, cost estimating, project budgeting and technical report preparation.
- Presented highway designs in public meetings and liaised with clients and sub-consultants.

1998 to **Stantec Consulting Ltd.**, Winnipeg, MB

1999 *Environmental Technologist*

- Conducted Phase I, II and III environmental sight assessments (ESA).
- Performed background research, project planning and scheduling.
- Supervised sub-surface geotechnical investigations and analyses, excavations and utility coordination.
- Conducted soil and water sampling, environmental risk assessments, effluent/leachate management.
- Prepared technical reports and liaised with clients and sub-consultants.

1994 to **Analytical Services Unit (Queen's University)**, Kingston, ON

1996 *Laboratory Assistant*

June-Aug. 1994-1996

- Prepared soil, water and filtered air samples for contamination analysis (contaminants such as hydrocarbons, phenol, fluoride and various ions) using chromatography and atomic absorption.

PROFESSIONAL CREDENTIALS

Professional Engineer: Ontario, Canada

CrossFit Movement and Mobility Certification

CrossFit Level 1 Trainer

Ballet and Jazz Teaching Certifications (BATD: British Association Teachers of Dance)

Strength Training and Aerobics Instruction Certifications (YMCA)

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EDUCATION

Doctor of Philosophy, Bioengineering, University of Illinois at Chicago (UIC),
Chicago, IL, 2010
Master of Applied Science, Mechanical Engineering, University of Waterloo, Waterloo,
ON, 2005
Bachelor of Applied Science, Civil Engineering, University of Manitoba, Winnipeg,
MB, 1999

PROFESSIONAL MEMBERSHIPS

Professional Engineers of Ontario (PEO)
Orthopaedic Research Society (ORS)
Society of Tribologists and Lubrication Engineers (STLE)
American Society of Biomechanics (ASB)

AWARDS

University of Illinois at Chicago - Women in Science and Engineering Travel Award
(2006, 2010)
University of Illinois at Chicago – Graduate Student Council Travel Award (2009)
FMC Educational Fund Fellowship (2008)
University of Illinois at Chicago – Andriacchi Fellowship (2007)
Society of Tribologists and Lubrication Engineers Scholarship (2006)
University of Waterloo Teaching Assistant Award (2004)
University of Manitoba Faculty of Engineering Entrance Award (1997)

PUBLICATIONS

Refereed Journal Publications:

Ngai V and Wimmer M. (2009) “Kinematic evaluation of cruciate-retaining total knee replacement patients during level walking: A comparison with the displacement-controlled ISO standard.” J, Biomechanics, 42(14), p.2363-2368.

Ngai V, Schwenke T and Wimmer M. (2009) “In vivo kinematics of knee prostheses patients during level walking compared with the ISO-1 force-controlled simulator standard.” Proc. Instn Mech Engrs, Part H: J.Engineering Medicine, 223(H7), p.889-896.

Ngai V, Wimmer M and Kuntz J. (2009) “Rare earth stearates for wear determination of UHMWPE bearings.” Wear, 267, p. 679-682.

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Biomedical Engineer / Biomechanics and Bioengineering

Teichroeb JH, Forrest JA, **Ngai V**, Marin JW, Jones L and Medley J. (2008) “Imaging protein deposits on contact lens materials.” *Optom Vis Sci*, 85(12), p.1151-64.

Teichroeb JH, Forrest JA, **Ngai V** and Jones LW. (2006) “Anomalous thermal denaturing of proteins adsorbed to nanoparticles.” *European Physical Journal E – Soft Matter*, 21(1), p.19-24.

Ngai V, Medley JB, Jones L, Forrest J and Teichroeb J. (2005) “Friction of Contact Lenses: Silicone Hydrogel versus Conventional Hydrogel.” *Tribology and Interface Engineering Series No.48*: Ed.: B.J Briscoe, Elsevier B.V., 371-379. [Written discussion, pg. 872-74]. **Presented at the 31st Leeds-Lyon Symposium on Tribology – Life Cycle Tribology**, Leeds, UK, Sept 7-10, 2004.

Invited Talks:

Ngai V and Wimmer MA. (2008) “Functional Knee Kinematics in Comparison with the ISO Standards.” *10th International Essen Symposium*, March 12-14, Essen, Germany.

Refereed Published Abstracts and Conference Presentations:

Ngai V, Uth T, Kunze J and Wimmer MA. (2011) “Backside Wear of Tibial Polyethylene Components is Affected by Gait”. *57th Annual Meeting of Orthopaedic Research Society*, Jan 13-16, Long Beach, CA, USA.

Orozco DA, **Ngai V** and Wimmer MA. (2011) “Development of a Multi-Activity Protocol for TKR Wear Assessment”. *57th Annual Meeting of Orthopaedic Research Society*, Jan 13-16, Long Beach, CA, USA.

Wimmer MA, Templeton J, **Ngai V**, Mundermann A and Jacobs JJ. (2011) “Post-operative Knee Flexion Moment drives TKR Kinematics during Walking and is related to Tibial Component Position”. *57th Annual Meeting of Orthopaedic Research Society*, Jan 13-16, Long Beach, CA, USA.

Lundberg H, **Ngai V** and Wimmer MA. (2010) “Comparison of TKR Patient and ISO Standard Axial Force Profiles during Stance.” *56th Annual Meeting of Orthopaedic Research Society*, Mar. 6-9, New Orleans, LA, USA.

Wimmer MA, Kunze J, **Ngai V**, Gallardo L, Laurent MP and Jacobs JJ. (2009) “Lanthanides to Trace Wear Debris of Polymers In Vivo.” *11th Essen Symposium on Biomaterials and Biomechanics: Fundamentals and Clinical Applications*, March 5-7, Essen, Germany.

Wimmer MA, Orozco DA, **Ngai V**, Lundberg HJ, Foucher KC, Laurent MP and Jacobs JJ. (2009) “In Search of the Appropriate Testing Conditions and Input Profile for Knee Wear Simulation.” *2nd Workshop on Biotribology – Bridging Engineering and Medicine & COST 533 Action on Materials for Improved Wear Resistance of Total Artificial Joints*, May 25-27, Guimarães, Portugal.

VALENTINA NGAI, PH.D., P.ENG.

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Ngai V and Wimmer MA. (2009) "Are TKR Knee Kinematics Influenced by Gait Kinetics." *55th Annual Meeting of the Orthopaedic Research Society*, Feb. 22-25, Las Vegas, Nevada, USA.

Lundberg H, Foucher K, **Ngai V**, Rojas I, Swanson A and Wimmer MA (2009) "The Influence of Kinematic Input Variability on Calculated Knee Joint Contact Forces." *55th Annual Meeting of the Orthopaedic Research Society*, Feb. 22-25, Las Vegas, Nevada, USA.

Ngai V, Kunze J and Wimmer MA. (2008) "Validating Rare Earth Stearates for Wear Determination of UHMWPE Bearings." *17th International Conference on Wear of Materials*, Apr.19-23, 2009.

Wimmer MA, **Ngai V**, Orozco D, Jacobs JJ, Laurent MP and Kunze J. (2008) "Rare Earth Tracers to Determine Polyethylene Wear in Total Knee Prostheses." *17th International Conference on Wear of Materials*, Apr.19-23, 2009.

Wimmer MA, **Ngai V**, Swanson A, Paul P, Laurent MP and Jacobs JJ. (2008) "A Comparison Between In Vivo Contact Pathway and Wear Scars of Postmortem Retrieved Components." *16th Congress European Society of Biomechanics*, July 6-9, Lucerne, Switzerland.

Ngai V, Schwenke T and Wimmer MA. (2008) "Knee Kinematics Following Total Joint Arthroplasty versus ISO Standard Profiles." *54th Annual Meeting of the Orthopaedic Research Society*, March 2-5, San Francisco, California, USA.

Orozco DA, Briggs AL, **Ngai V** and Wimmer MA. (2008) "Occurrence of Daily Activity Transitions in an Active TKR Population." *54th Annual Meeting of the Orthopaedic Research Society*, March 2-5, San Francisco, California, USA.

Lundberg HJ, **Ngai V**, Swanson A and Wimmer MA. (2008) "Contribution of Hip and Knee Flexion Angles to the Quadriceps Extension Moment during Stance of Level Walking." *54th Annual Meeting of the Orthopaedic Research Society*, March 2-5, San Francisco, California, USA.

Wimmer MA, Kunze J, Orozco D, **Ngai V**, Laurent MP and Jacobs JJ. (2008) "Rare Earth Tracers to Determine Backside Wear of TKA Polyethylene Inserts." *54th Annual Meeting of the Orthopaedic Research Society*, March 2-5, San Francisco, California, USA.

Ngai V and Wimmer MA. (2007) "Variability in secondary motions of the knee following total joint replacement." *2007 Annual Conference of the American Society of Biomechanics*, August 22-25, Palo Alto, California, USA.

Lundberg H, Swanson A, **Ngai V** and Wimmer MA. (2007) "Effect of the knee joint contact path on the quadriceps extension moment during gait." *2007 Annual Conference of the American Society of Biomechanics*, August 22-25, Palo Alto, California, USA.

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Swanson AJ, **Ngai V**, Inoue N and Wimmer MA. (2007) "Analysis of the tibio-femoral contact point in total knee replacement using a marker based motion analysis system." *ASME 2007 Summer Bioengineering Conference*, June 20-24, Keystone, Colorado, USA.

Ngai V, Kunze J and Wimmer MA. (2007) "A rare earth tracer for accurate wear determination of polyethylene." *16th International Conference on Wear of Materials*, April 15-19, Montreal QC, Canada.

Wimmer MA, **Ngai V** and Kunze J. (2006) "Europium as a candidate staining material to determine polyethylene wear." *Proceedings of ASME IMECE 2006. ASME International Mechanical Engineering Congress & Exposition*: November 5-10, Chicago, Illinois, USA.

Ngai V, Schwenke T, Andriacchi TP and Wimmer MA. (2006) "Kinematics of total knee replacement (TKR) patients versus knee simulator input data." *5th World Congress of Biomechanics*: July 30-Aug 4, Munich, Germany.

Teichroeb JH, Forrest JA and **Ngai V**. (2006) "Thermal Stability, and Curvature Dependence of Bovine Serum Albumin on Gold Nanoparticles Using Localized Surface Plasmon Resonance." *2006 American Physical Society March Meeting*: March 13-17, Baltimore, MD, USA.

Ngai V, Medley JB and Jones L. (2004) "Friction of Contact Lenses: Silicone and Conventional Hydrogels." *World Biomaterials Congress*: May 17-21, Sydney, Australia.

Ngai V, Medley JB, Jones L, Forrest J and Teichroeb J. (2004) "Measurement of Friction Associated with Lotrafalcon and Hema Hydrogel Contact Lenses." *International Conference on the Lacrimal Gland, Tear Film, Ocular Surface and Dry Eye Syndromes: Basic Science and Clinical Relevance*: November 17-20, Fajardo, Puerto Rico

Teichroeb JH, Martin J, Forrest JA, Jones LW, **Ngai V**, Medley J. (2004) "SEM and AFM Imaging of Contact Lens Spoilation." *International Conference on the Lacrimal Gland, Tear Film, Ocular Surface and Dry Eye Syndromes: Basic Science and Clinical Relevance*: November 17-20, Fajardo, Puerto Rico

Ngai V, Medley JB, Jones L, Forrest J and Teichroeb J. (2004) "Influence of In-Vitro Protein Deposition on Friction of Hydrogel Contact Lens Materials." *Society for Biomaterials-30th Annual Meeting & Exposition*: April 27-30, Memphis, Tennessee, USA

Ngai V, Medley JB, Jones L, Forrest J and Teichroeb J. (2005) "Friction Simulation of the Anterior Surface of Hydrogel Contact Lenses." *Canadian Biomaterials Society-24th Annual Meeting*: May 26-28, Waterloo, Ontario, Canada

Teichroeb J, **Ngai V**, Forrest J and Jones L. (2005) "Thermal Stability of Lysozyme Adsorbed onto Gold Nanoparticles." *Canadian Biomaterials Society-24th Annual Meeting*: May 26-28, Waterloo, Ontario, Canada

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EXTRA-CURRICULAR ACTIVITIES

Competitive Women's Ultimate Team (Chicago, IL): "Nemesis" (competed in UPA National Championships 2006, 2008, 2009, 2010)

Illinois 80 mile River to River Relay 2008 (La Rue Pine Hilles, IL)

Kettle Moraine Fall Colour Festival 10 mile run/10 mile bike 2005

Competitive Ultimate Team (Waterloo, ON): "Liquid" (competed in Canadian Championships 2004, 2005)

St. John Ambulance Marathon 2003 (Waterloo, ON)

Certified scuba diver for open water through PADI

EXPERT NOT RETAINED