Canadian Arthritis Network
International Partnership Initiative

International Research & Training Program
LABORATORY/CLINIC PROFILE

Contact information of the principal investigator

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Please indicate if you are member or affiliate of one or more of the following International Partnership Initiative organizations:

☐ AO Foundation – Biotechnology Advisory Board, Switzerland
☐ Arthritis Foundation, USA
☐ Arthritis Research Campaign, UK
X☐ Canadian Arthritis Network, Canada
☐ Japan Society for the Promotion of Science, Japan
☐ Nuffield Foundation Oliver Bird Rheumatism Program, UK

International Research & Training Program Opportunity

Please indicate which of the following international opportunities would be available at your laboratory/clinic.

X ☐ Training Elective Rotation

X ☐ Research Mini-sabbatical

☐ Industry Training Rotation

The International Research & Training Program will be available for trainee elective rotations and investigator mini-sabbaticals that commence on or before March 31, 2009. If you have any preferences regarding the dates when you can host an international trainee or investigator, please indicate this below.

Visit Length (please indicate start and end dates if known):	None

Please provide ten key words and a brief description of the research currently being conducted in your laboratory/clinic, including descriptions of any specialized equipment, methods or technologies employed at your facility.

10 key words

1. Biomechanics
2. Computer Assisted Orthopaedic Surgery
3. Joint kinematics
4. In-vitro testing
5.
6.
7.
8.
9.
10.

Brief description (up to ½ page)

Our research focuses on **bioengineering**, with special interest in **orthopaedic biomechanics**. The Bioengineering Research Laboratory of the Hand and Upper Limb Centre of St. Joseph's Health Centre, is a teaching hospital of the University of Western Ontario. This facility is a hub of biomechanics research of this nature for the Department of Mechanical and Materials Engineering, and the Department of Surgery. We supervises a variety of projects that are conducted by a team comprised of an (engineering) undergraduate or graduate student with a surgical resident or medical student.

This research encompasses the application of engineering-based studies to address clinical problems such as implant design, fracture fixation and ligament repair. These experimental studies range from the employment of basic bench-top approaches to the use of advanced testing systems that permit the simulation of joint function. The **kinematic analysis** of joint motion is an important component of these studies. In addition, **implant development** is a major thrust of this research. In collaboration with industrial partners, new implant systems have been developed and these are now commercially available.

More recently, we have developed **intra-operative measurement systems** as a component of computer-assisted surgery. Specifically, a load cell has been developed to assist the surgical team in establishing proper load balance during replacement of the knee with implants. Furthermore, an alignment system has been designed to more precisely locate the position of the center of the

hip joint, to ensure that this can be reconstructed during replacement with implants. Similar techniques are being developed for the shoulder and elbow.

Key publications (maximum 5 publications)

1) El-Hawary R, Roth SE, Harwood JC, Johnson JA, King GJW, Chess DG: Ligamentous Balancing in Total Knee Arthroplasty: An In Vitro Load Cell Analysis. *Clinical Biomechanics*, 2006. (In press)

2) Furukawa K. Pichora J, Steinmann S, Faber KJ, Johnson JA, King GJW: The Efficacy of Interference Screw and Double Docking Methods using Palmaris Longus and Graft Jacket for Medial Collateral Ligament Reconstruction of the Elbow. *Journal of Shoulder and Elbow Surgery*, 2006 (In press)

3) Bicknell RT, Liew ASL, Danter MR, Patterson SD, King GJW, Chess DG, Johnson JA: The Influence of Implant Articular Thickness and Glenohumeral Conformity on Stability of an All Metal Glenoid Component. *Journal of Shoulder and Elbow Surgery*, 2007 (In press)

4) Beingessner D, Dunning CE, Stacpoole R, Johnson JA, King GJW. The Effect of Coronoid Fractures on Elbow Kinematics and Stability. Clinical Biomechanics, Feb;22(2):183-190, 2007.

5) Kedgley, AE, MacKenzie GA, Ferreira LM, Drosdowech DS, King GJW, Faber KJ, Johnson JA: The Effect of Muscle Loading on the Kinematics of In-Vitro Glenohumeral Abduction. *Clinical Biomechanics*, 2007. (In Press)