ADAM J. CYR, Ph.D.

PROFESSIONAL BIOGRAPHICAL OUTLINE

BACKGROUND

Dr. Cyr earned a Bachelor of Science degree in Mechanical Engineering from the University of Portland, Portland, Oregon, and continued on to earn a Doctorate of Philosophy in Biomechanics and Neural Engineering from the University of Kansas, Lawrence, Kansas. Dr. Cyr also held a Post-Doctoral Research Engineering position at the University of Denver, Denver, Colorado. During his dissertation, Dr. Cyr studied the motion and forces of human joints and artificial joint implants under activities of daily living, and evaluated the contributions of ligaments, bone, and cartilage to joint constraint under various conditions. Dr. Cyr also worked on a multi-scale computational model of the human knee to accurately predict joint motion, forces, and ligament contribution for daily activities. During his post-doctoral research, Dr. Cyr helped design and construct an advanced high-speed stereo radiography system to study joint mechanics in live subjects, including foot and ankle, knee, hip, and shoulder motions.

Dr. Cyr has experience with three-dimensional motion capture and analysis, static and dynamic radiographic imaging, statistical-shape and mathematical modeling, kinematic and kinetic analysis, experimental and clinical research involving cadaveric specimens and live human subjects. Dr. Cyr has completed and instructed advanced coursework in biomechanics, as well as materials engineering, clinical orthopedics, and kinesiology.

Dr. Cyr's academic background, and his experience with experimental research and modeling of the human body, provides a thorough understanding of human physiology, mechanics, biomechanical failure mechanisms, and interaction of the human anatomy with its environment. Currently, he specializes in biomechanics, injury tolerance, and biomechanical failure mechanisms.

SUMMARY OF EXPERIENCE

- Designed and conducted experimental research to quantify the contribution of ligaments, soft-tissue, and bone to human joint constraint
- Performed analyses of kinematic and kinetic variables used to develop next-generation total knee replacement implant design
- Developed novel mathematical and computational models of the human joint to predict changes to joint morphology and ligament contribution under various loading conditions
- Assisted development of a high-speed stereo radiography system integrated with motion control lab, and performed studies to evaluate joint motion with healthy and injured subjects
- Collaborated with a shoe manufacturer to develop a population-based statistical shape model of the foot and ankle to quantify variation in morphology, and inform future development of athletic shoes to accommodate population variation

AREAS OF EXPERTISE

- Biomechanical Consulting
- Human Injury Tolerance and Failure Mechanisms
- Orthopedic Implant Design
- Knee and Hip Implant Failure
- Accident Reconstruction

- Joint Biomechanics
- Kinematic and Kinetic Analysis
- Experimental and Computational Testing

EDUCATION

- Doctor of Philosophy with honors in Biomechanics and Neural Engineering, University of Kansas, 2014
- Bachelors of Science in Mechanical Engineering, University of Portland, 2008

PROFESSIONAL EXPERIENCE

June 2015 – Present | ARCCA, Incorporated | Senior Biomechanist

- Practices biomechanics to identify and evaluate injury mechanisms and severity
- Utilizes medical records, testing, computer modeling, and knowledge of human injury tolerance to determine whether an injury is consistent with a specific set of actions or exposure to a specific incident environment
- Investigates and reconstructs motor vehicle collisions, incident sites, and equipment failures

2013-2015 | University of Denver | Post-Doctoral Research Engineer

- Assisted development of a state-of-the-art high-speed stereo radiography system
- Design and execution of multiple parallel projects involving the knee, foot/ankle, shoulder, and hip
- Experience with data collection from stereo radiography, optical motion capture, force plates, and EMG
- Established protocols and performed data processing from experimental studies
- Developed a statistical shape model of the human foot for quantifying variation among a population of 3D anatomic geometries
- Assisted in development of a natural knee model, including ligament representation, and performed optimization to predict experimental kinematics and kinetics

2008-2013 | University of Kansas | Graduate Research Assistant

- Member of academic portion of research consortium for testing joint implants, funded by DePuy Synthes
- Designed experimental protocols for simulating physiological knee kinematics
- Designed and executed experiments to quantify ligament contribution to knee joint constraint
- Developed multi-dimensional mathematical model of passive joint constraint
- Worked with a dynamic knee simulator to develop physiological protocols to evaluate intact and implanted cadaveric knee joints

2011-2012 | University of Kansas | Instructor

- Primary instructor for senior and graduate level introductory biomechanics course
- Prepared and presented lectures, assignment, and exams
- Responsible final grades

PUBLICATIONS

Cyr A.J., Shalhoub S.S., Fitzwater F.G., Ferris L.A. Maletsky L.P., "Mapping of Contributions from Collateral Ligaments to Overall Knee Joint Constraint: An Experimental Cadaveric Study", Journal of Biomechanical Engineering, 2015.

Ivester J.C., **Cyr A.J.**, Harris M.D., Kulis M.J., Rullkoetter P.J., Shelburne K.B., "A Reconfigurable High-Speed Stereo-Radiography System for Sub-millimeter Measure of In-vivo Joint Kinematics", Journal of Medical Devices, 2015.

Smoger, L.M., **Cyr, A.J.**, Vierczhalek, A., Fitzpatrick, C.K., Clary, C.W., Maletsky, L.P., Rullkoetter, P.J., Laz, P.J., "Statistical Modeling to Characterize Relationships Between Knee Anatomy and Kinematics", Journal of Orthopaedic Research, 2015.

Cyr A.J., Maletsky L.P., "Technical Note: A Multi-Dimensional Description of Knee Laxity using Radial Basis Functions", Computer Methods in Biomechanics and Biomedical Engineering, 2014.

Cyr A.J., Maletsky L.P., "Unified quantification of variation in passive knee joint constraint", Proceedings of the Institution of Mechanical Engineering, Part H: Journal of Engineering in Medicine, 2014.

Abo-Alhol T.R., Fitzpatrick C.K., Clary C.W., **Cyr A.J.**, Maletsky L.P., Laz P.J., Rullkoetter P.J., "Patellar mechanics during simulated kneeling in the natural and implanted knee", Journal of Biomechanics, 2014.

Fitzpatrick C.K., Clary C.W., **Cyr A.J.**, Maletsky L.P., Rullkoetter P.J., "Mechanics of post-cam engagement during simulated dynamic activity", Journal of Orthopaedic Research, 2013.