## BIOGRAPHICAL SKETCH

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| NAME | POSITION TITLE |
|---|---|
| Rudert, M. James | Associate Research Engineer |
| eRA COMMONS USER NAME | |
| RUDERT | |

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

| INSTITUTION AND LOCATION | DEGREE *(if applicable)* | YEAR(s) | FIELD OF STUDY |
|---|---|---|---|
| Pennsylvania State University, University Park, Pennsylvania | B.S. | 1974 | Science |
| University of Pittsburgh, Pittsburgh, Pennsylvania | B.S. | 1982 | Mechanical Engineering |
| University of Pittsburgh, Pittsburgh, Pennsylvania | M.S. | 1988 | Mechanical Engineering |
| University of Iowa, Iowa City, Iowa | Ph.D. | 1994 | Biomedical Engineering |

### A. Positions and Honors.

**Positions and Employment**

| | | |
|---|---|---|
| 1975–1980 | Process Control Engineer | Combustion Engineering, Inc.<br>Gibsonia, PA |
| 1984–1985 | Design Engineer | Medrad (Medical Research and Development) Inc.<br>Pittsburgh, PA |
| 1985–1989 | Research Engineer | University of Pittsburgh<br>Orthopaedic Research Laboratory<br>Pittsburgh, PA |
| 1990–1995 | Staff Engineer/Research Assistant | University of Iowa<br>Department of Orthopaedics & Rehabilitation<br>Orthopaedic Biomechanics Laboratory<br>Iowa City, IA |
| 1996–1997 | Research Assistant Professor of Orthopaedic Surgery | Allegheny University of the Health Sciences<br>Pittsburgh, PA |
| 1997–1998 | Visiting Professor<br>Electrical and Mechanical Engineering | Technikon Northern Transvaal<br>Pretoria, South Africa |
| 1998–2000 | Visiting Associate Professor of Mechanical Engineering | University of Pittsburgh<br>Pittsburgh, PA |
| 2000–Present | Associate Research Engineer | University of Iowa<br>Department of Orthopaedics & Rehabilitation<br>Orthopaedic Biomechanics Laboratory<br>Iowa City, IA |

**Other Experience and Professional Memberships**

American Society of Biomechanics
American Society of Mechanical Engineers

### B. Selected peer-reviewed publications

1. Baratz ME, Rehak DC, Fu FH, Rudert MJ. Peripheral tears of the meniscus. The effect of open versus arthroscopic repair on intraarticular contact stresses in the human knee. Am. J. Sports Med. 1988 Jan–Feb;16(1):1–6.

2. McKernan DJ, Mutschler TA, Rudert MJ, Klein AH, Victorino G, Harner CD, Fu FH. The characterization of rotator cuff muscle forces and their effect on glenohumeral joint stability: A biomechanical study. Am. J. Sports Med. 1989;17(2). (Winner of the Excellence in Research Award from the American Orthopaedic Society for Sports Medicine.)
3. Flynn J, Rudert MJ, Olson E, Baratz M, Hanley E. The effects of freezing or freeze-drying on the biomechanical properties of the canine intervertebral disc. Spine. 1990 Jun;15(6):567–570.
4. Olson EJ, Hanley EN Jr, Rudert MJ, Baratz ME. Vertebral column allografts for the treatment of segmental spine defects. An experimental investigation in dogs. Spine. 1991 Sep;16(9):1081–1088.
5. Greis PE, Ward WT, Rodosky M, Rudert MJ, Stanitski C. A clinical and comparative biomechanical evaluation of proximal femoral osteotomy fixation in children. Orthopedics. 1993 Mar;16(3):273–279.
6. Caldwell NJ, Hale JE, Rudert MJ, Brown TD. An algorithm for approximate crinkle artifact compensation in pressure-sensitive film recordings. J. Biomech. 1993 Aug;26(8):1001–1009.
7. Hale JE, Rudert MJ, Brown TD. Indentation assessment of biphasic mechanical property deficits in size-dependent osteochondral defect repair. J. Biomech. 1993 Nov;26(11):1319–1325.
8. McKinley TO, Rudert MJ, Koos DC, Brown TD. Incongruity versus instability in the etiology of posttraumatic arthritis. Clin. Orthop. Relat. Res. 2004 Jun;(423):44–51.
9. Brown TD, Rudert MJ, Grosland NM. New methods for assessing cartilage contact stress after articular fracture. Clin. Orthop. Relat. Res. 2004 Jun;(423):52–58.
10. Saltzman CL, Tochigi Y, Rudert MJ, McIff TE, Brown TD. The effect of agility ankle prosthesis misalignment on the peri-ankle ligaments. Clin. Orthop. Relat. Res. 2004 Jul;(424):137–142.
11. Tochigi Y, Amendola A, Rudert MJ, Baer TE, Brown TD, Hillis SL, Saltzman CL. The role of the interosseous talocalcaneal ligament in subtalar joint stability. Foot Ankle Int. 2004 Aug;25(8):588–596.
12. McKinley TO, Rudert MJ, Koos DC, Tochigi Y, Baer TE, Brown TD. Pathomechanical determinants of posttraumatic arthritis. Clin. Orthop. Relat. Res. 2004 Oct;(427 Suppl):S78–88.
13. El-Khoury GY, Alliman KJ, Lundberg HJ, Rudert MJ, Brown TD, Saltzman CL. Cartilage thickness in cadaveric ankles: Measurement with double-contrast multi-detector row CT arthrography versus MR imaging. Radiology. 2004 Dec;233(3):768–773.
14. Tochigi Y, Rudert MJ, Brown TD, McIff TE, Saltzman CL. The effect of accuracy of implantation on range of movement of the Scandinavian Total Ankle Replacement. J. Bone Joint Surg. Br. 2005 May;87(5):736–740.
15. Tochigi Y, Rudert MJ, Amendola A, Brown TD, Saltzman CL. Tensile engagement of the peri-ankle ligaments in stance phase. Foot Ankle Int. 2005;26(12):1067–1073. PMCID2268960.
16. McKinley TO, Rudert MJ, Koos DC, Pedersen DR, Baer TE, Tochigi Y, Brown TD. Contact stress transients during functional loading of ankle stepoff incongruities. J. Biomech. 2006;39:617–626.
17. McKinley TO, Rudert MJ, Koos DC, Pedersen DR, Baer TE, Tochigi Y, Brown TD. Stance-phase aggregate contact stress and contact stress gradient changes resulting from articular surface stepoffs in human cadaveric ankles. Osteoarthritis Cartilage. 2006 Feb;14(2):131–138.
18. McKinley TO, Rudert MJ, Tochigi Y, Pedersen DR, Koos DC, Baer TE, Brown TD. Incongruity-dependent changes of contact stress rates in human cadaveric ankles. J. Orthop. Trauma. 2006 Nov-Dec;20(10):732–738.
19. McKinley TO, Rudert MJ, Tochigi Y, Pedersen DR, Koos DC, Baer TE, Brown TD. Cambios dependientes de incongruencia de grados de estres de contacto en tobillos cadavericos humanos. J. Orthop. Trauma. 2006 Nov–Dec;20(10):747.
20. Tochigi Y, Rudert MJ, Saltzman CL, Amendola A, Brown TD. Contribution of articular surface geometry to ankle stabilization. J. Bone Joint Surg. Am. 2006;88:2704–2713.
21. Anderson DD, Goldsworthy JK, Li W, Rudert MJ, Tochigi Y, Brown TD. Physical validation of a patient-specific contact finite element model of the ankle. J. Biomech. 2007;40(8):1662–1669. PMCID1945165.
22. Heiner AD, Rudert MJ, McKinley TO, Fredericks DC, Bobst JA, Tochigi Y. In vivo measurement of translational stiffness of rabbit knees. J. Biomech. 2007;40(10):2313–2317. PMCID2080615.
23. McKinley TO, Rudert MJ, Tochigi Y, Brown TD. Instability-associated changes in contact stress and contact stress rates near a stepoff incongruity. J. Bone Joint Surg. 2008;90:375–383. PMC2587164.
24. Tochigi Y, Rudert MJ, McKinley TO, Pedersen DR, Brown TD. Correlation of dynamic cartilage contact stress aberrations with severity of instability in ankle incongruity. J. Orthop. Res. 2008;26(9):1186–1193. PMC Journal – In Process.

25. McKinley TO, Rudert MJ, Brown TD. The effect of incongruity and instability on contact stress directional gradients in human cadaveric ankles. Osteoarthritis Cartilage. 2008 Nov;16(11):1363–9. PMC Journal – In Process.

## C. Research Support

**Ongoing Research Support**

Yuki Tochigi (PI) 01/01/09–12/31/09
Orthopaedic Trauma Association
Acute Cartilage Damage Associated with Intraarticular Fractures
The major goal of this project is to build toward a large animal model of intraarticular fracture by establishing strong scientific rationale for the fracture impact technique. A one-year research project that consists of two in-laboratory experimental studies is proposed to characterize acute-phase pathology of cartilage injury in human ankle intraarticular fractures (Aim 1), and to clarify the mechanisms of fracture-associated cartilage injury (Aim 2).
Role: Investigator

5 P50 AR055533 Joseph A. Buckwalter (PI) 09/10/07–08/31/12
US DHHS, National Institutes of Health/NIAMS
New Approaches to Assess and Forestall Osteoarthritis in Injured Joints
The goal of the University of Iowa CORT is to develop new methods of forestalling post-traumatic osteoarthritis (PTOA) through a multi-disciplinary translational approach including biological science, bioengineering, imaging, and clinical research. The central theme is that joint injuries initiate a sequence of biologic events that lead to PTOA and that new treatments of joint injuries will minimize these deleterious events and promote joint healing.
Role: Investigator Project 2: Acute Versus Chronic Mechanical Damage in the Etiology of Post-Traumatic OA, Biomechanics & Imaging Core, and Tissue & Experimental Modeling Core.

5 R01 AR053899 Thomas D. Brown (PI) 09/07/07–08/31/11
US DHHS, National Institutes of Health
Local Biomechanics of Median Nerve Insult in Carpal Tunnel
The long-term goal of the study is to establish an objective mechanistic framework for linking CTS with quantifiable biomechanical influence factors. An interdisciplinary approach will be adopted, integrating research team member expertise in the areas of biomechanical stress analysis, hand surgery, and musculoskeletal magnetic resonance imaging (MRI).
Role: Investigator

5 R01 AR053344 Jeffrey A. Weiss (PI) 07/01/07–06/30/12
US DHHS, National Institutes of Health
Biomechanics of the Dysplastic Hip
The overall hypothesis of this study is that acetabular dysplasia causes alterations in hip joint biomechanics, which predispose the joint to cartilage degeneration. Subject-specific, three-dimensional finite element modeling techniques will be developed and validated to study hip joint biomechanics. Then, using three patient populations (normal, traditional dysplastic and retroverted dysplastic), patient-specific finite element models will be used to determine stresses in and around the hip joint during simulated walking, stair-climbing and descending stairs. The primary focus of the University of Iowa subcontract will be development and validation of a sensor for transient contact stress measurement in the hip, based on the TekScan technology.
Role: Investigator

5 R01 AR53553 Thomas D. Brown (PI) 09/25/06–08/31/10
US DHHS, National Institutes of Health/NIAMS
Implant/Construct Interactions in the Biomechanics of Total Hip Dislocation
The major goal of this project is to study the interaction between implant design parameters, surgical placement, and capsule integrity/repair on the dislocation propensity of total hip constructs. The work involves three-dimensional nonlinear FEA, validated cadaverically in a multi-axial servohydraulic hip simulator.
Role: Investigator

**Completed Research Support**

Yuki Tochigi (PI) 02/01/07–12/31/08
University of Iowa OVPR Biological Sciences Funding Program (BSFP)
Development of an Animal Model of Human Intra-Articular Fracture
The purpose of this project was to develop a novel animal model of intraarticular fracture that allows *in-vivo* pilot studies of new treatment strategies for human post-traumatic osteoarthritis. The goal was to establish definitive methodology to realistically replicate the pathophysiology of human intraarticular fractures in animal joints.
Role: Investigator

Annunziato Amendola (PI) 01/01/07–12/31/08
Arthrosurface, Inc.
The Effects of Osteochondral Defects and Focal Resurfacing on Joint Contact Mechanics
The proposed research aimed to clarify the pathomechanics of focal osteochondral defect in the ankle and to assess the ability of resurfacing to restore functional joint contact mechanics.
Role: Investigator

5 P50 AR048939 Joseph A. Buckwalter (PI) 09/16/02–08/31/08
US DHHS, National Institutes of Health/NIAMS
Pathogenesis—Prevention of Post-Traumatic OA
The University of Iowa Specialized Center of Research (SCOR) in Osteoarthritis (OA) supported and coordinated a multidisciplinary group of experienced investigators in clinical, bioengineering, cell and molecular biology research to advance understanding of the pathogenesis of post-traumatic OA, and develop innovative approaches for preventing and treating this disease. The Biomechanics Core provideed technical support for SCOR Projects 1–4, and operated from the University of Iowa's Orthopaedic Biomechanics Laboratory.
Role: Investigator

M. James Rudert (PI) 06/15/06–08/15/06
Smith & Nephew, Inc.
Investigation of Dislocation Kinematics of Smith and Nephew Oxinium THA Components
The UI Orthopaedic Biomechanics Lab assisted Smith and Nephew in an investigation of possible dislocation damage of Oxinium THA components. The components were implanted in Sawbones® hip joint models that had been augmented with a hip capsule analog. The THA/sawbones/capsule construct was mounted in our hip motion simulator in order to explore clinically plausible joint movements under which the dislocation and damage might occur.
Role: Principal Investigator

Yuki Tochigi (PI) 04/01/05–03/31/06
Chiba University Orthopaedic Alumni
The Role of the Articular Surfaces in Ankle Stability
This project studied the mechanism via which ankle stabilization by articular surface resistance is developed, using a newly developed computer model of ankle surface geometry. The goal was to determine the contribution of articular surface geometry to passive ankle stability, and to determine the effect of individual geometric differences on the level of that contribution.
Role:Co-Investigator

R49 CCR721745 Todd O. McKinley (PI) 09/30/02–09/29/06
US DHHS/CDC
Unstable Joints: Stress Anomaly and OA
The goal of this project was to determine the means by which injuries that cause a joint to become unstable lead to arthritis. This involved characterizing how injured joints that are rendered unstable react as indexed by changes in the biochemistry of the cartilage, in the microscopic appearance of cartilage, and by changes on x-ray.
Role: Investigator