

**Nicole M. Grosland**  
Dept Biomedical Engineering  
Dept Orthopaedics and Rehabilitation  
Center for Computer Aided Design  
The University of Iowa  
Iowa City, IA 52242  
Ph: (319) 335-6425  
E-mail: nicole-grosland@uiowa.edu

## Education

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| 1998 | PhD, Biomedical Engineering,<br>The University of Iowa, Iowa City, IA (1994-1998)<br>Dissertation Title: “Spinal adaptations in response to interbody fusion systems: a theoretical investigation” (Advisor: Vijay K. Goel) |
| 1994 | BSE, Biomedical Engineering<br>The University of Iowa, Iowa City, IA (1990-1994)  |

## Professional and Academic Employment History

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| 2001 -present | Assistant Professor, Department of Biomedical Engineering and Department of Orthopaedics Rehabilitation, The University of Iowa, Iowa City, IA                   |
| 2000 – 2001   | Assistant Research Scientist, Orthopaedic Biomechanics Laboratory, Department of Orthopaedic Surgery, College of Medicine, The University of Iowa, Iowa City, IA |
| 1998 – 2000   | Post Doctoral Fellow, Department of Orthopaedic Surgery, College of Medicine, The University of Iowa, Iowa City, IA  |
| 1994 -1998    | Research Assistant, Department of Biomedical Engineering, The University of Iowa, Iowa City, IA  |

## Honors and Awards

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### *Received*

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| 2004        | Collegiate Teaching Award, The University of Iowa                        |
| 2004        | December Commencement Address  |
| 1998 – 2000 | NIH Training Grant, Dept. of Orthopaedic Surgery, The University of Iowa |
| 1997        | Co-Author, ASME Student Paper Competition Award                          |
| 1995 - 1998 | Fellow (Whitaker Foundation)   |
| 1992 – 1994 | Tau Beta Pi, The University of Iowa, Iowa City, IA                       |
| 1992 - 1994 | Alpha Eta Mu Beta, The University of Iowa, Iowa City, IA.                |
| 1990 – 1994 | Dean’s List, The University of Iowa, Iowa City, IA.                      |
| 1992        | President’s List, The University of Iowa, Iowa City, IA.                 |

## Teaching

Semester	Course	SH	Enrollment	
2007 (S)	051:158 *Orthopaedic Implants	03	8	
2007 (S)	051:091 Professional Seminar in BME	00	117	
2006 (F)	057:007 Statics	02	96	
2006 (F)	051:091 Professional Seminar in BME	00	121	
2006 (Sp)	051:086 Biomed Eng Sen Design II	04	51	
2006 (Sp)	051:179 F-T Biomed Eng Sen Design II	04	3	
2006 (Sp)	051:191 Seminar in Biomed Engrg	00	77	
2005 (Su)	057:019 Mech. of Def. Bodies	03	20	
2005 (F)	051:050 Biomechanics	03	57	
2005 (F)	051:149 Graduate Biomechanics	03	7	
2005 (F)	051:257 §Applied FE Ortho Biomech	03	11	
2005 (Sp)	051:158 *Orthopaedic Implants	03	39	
2005 (Sp)	051:090 Fresh/Soph Forum	00	69	
2005 (Su)	057:019 Mech. of Def. Bodies	03	20	
2004 (F)	051:050 Biomechanics	03	56	
2004 (F)	051:149 Graduate Biomechanics	03	2	
2004 (Sp)	051:150 Musculoskeletal Biomech	03	31	
2003 (F)	051:050 *Biomechanics	03	65	
2003 (F)	051:149 Graduate Biomechanics	03	5	
2003 (Sp)	051:150 Musculoskeletal Biomech	03	26	Note course name change, originally titled 'Graduate Biomechanics'
2002 (F)	057:019 Mech. of Def. Bodies	03	32	
2002 (Sp)	051:150 *Graduate Biomechanics	03	6	
2002 (Sp)	051:090 Fresh/Soph Forum	00	84	
2001 (F)	057:019 Mech. of Def. Bodies	03	42	
1999 (F)	057:007 Statics	02	65	
1998 (F)	*BME Laboratory	03	12	Course no longer offered

\*Significant changes made to the pre-existing course

§New course

## Student Supervision

### *Doctoral Students*

Nicole Kallemeyn	May 2009 (Expected)	Emphasis on spinal biomechanics and finite element modeling
Srinivas Tadepalli	May 2009 (Expected)	Emphasis on virtual surgical planning coupled with finite element model development
Matthew McCullough	July 2006	“Clinical and biomechanical evaluation of total wrist arthroplasty devices”; Postdoctoral Position at the Mayo Clinic, Rochester, MN
Kiran H. Shivanna	May 2006	“Automating Patient-specific diarthrodial joint contact model development”; Continuing in the lab as a Post Doc

*Masters Students (Thesis option only)*

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Anup Gandhi	May 2009 (expected)	Emphasis on spinal biomechanics
Nicole DeVries	May 2007 (Expected)	“Detailed model of the human hand” - FastTrack Masters Program – has committed to pursuing her PhD under my direction.
Monique Cook	May 2007 (Expected)	“Mechanical signaling of ligamentum flavum hypertrophy in lumbar stenosis”
Ritesh Bafna	May 2007 (Expected)	“Finite element model development techniques and software development” (Co-Advisor Vincent Magnotta)
Esther Gassman	May 2006	“The validation of an automated image segmentation technique for the development of finite element models” FastTrack Masters Program – PhD program at UC Davis; Awarded the NSF Graduate Fellowship and the Tau Beta Pi Fellowship following her BSE degree
Mary Beth Russell	July 2005	“Cartilage Contact Pressure Elevations in Dysplastic Hips: A Model of Chronic Overload “; Medical school at Des Moines University College of Osteopathic Medicine
Jessica Woodworth	July 2005	“Critical Aspects of PIP Motion”; Orthopaedic Sales
Nicole (Vos) Kallemeyn	July 2005	“Articular cartilage mechanics in response to triaxial compression: A poroelastic finite element model”; PhD Program at The University of Iowa
Anith Mathai	May 2005	“Towards physiological modeling in virtual humans”; Research Engineer with the Virtual Soldier Research Program (VSR)
Colleen Roarty	May 2003	“Adaptive meshing for orthopaedic finite element contact problems” - FastTrack Masters Program. Upon graduating, she accepted an internship at the Steadman-Hawkins Foundation in Vail Colorado. Currently at Smith & Nephew, Colorado Springs

**Senior Design Projects Supervised**

**2005-06**

Nicole DeVries	Detailed Computer Model of the Human Hand
Amy McQueen	Improvement of the Ponseti AFO brace for the treatment of Idiopathic Clubfoot (Received 2 <sup>nd</sup> Place)
Neena Stephen	Improvement of the Ponseti AFO brace for the treatment of Idiopathic Clubfoot (Received 2 <sup>nd</sup> Place)
Ben Huntley	Wireless Patient Response System for fMRI Imaging (Magnotta)
Andrea Laake	Wireless Patient Response System for fMRI Imaging (Magnotta)

**2004-05**

Esther Gassman	Creating automated FE models of the upper extremity using ANN
Holly Baran	Total wrist arthroplasty redesign
Rochelle Roos	Total wrist arthroplasty redesign
Maggie Poyner	Design of detachable shoes for the Ponseti brace
Josh Tweedy	Design of detachable shoes for the Ponseti brace
Tony Floden	Opening wedge osteotomy jig (Jones/Panarella)
Ryan Kleve	Opening wedge osteotomy jig (Jones/Panarella)
Eric Johnson	Opening wedge osteotomy jig (Jones/Panarella)
Andrea Hayes	Drill attachment modifications to the FLAH (Saltzman)
Elizabeth Kuehl	Drill attachment modifications to the FLAH (Saltzman)
Meagan Shanahan	Changes in EEG during Obstructed Walking (Ladouceur)
Sadaf Kashaf	FE modeling of molar decay of various stages (Khera)
Jessica Lawrence	FE modeling of molar decay of various stages (Khera)

Tom McDonald      FE modeling of molar decay of various stages (Khera)

### 2002-03

Eric Bandstra      PIP External Fixator

### 2001-02

Colleen Roarty      FE Adaptive Meshing Algorithm  
Hannah Lundberg      Controlled motion wrist brace design  
Kara Martin      Controlled motion wrist brace design  
Kathie Trede      Controlled motion wrist brace design

## Scholarship

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### *Refereed and Archival Publications*

1. Brettin B, **Grosland N**, Qian F, Southard K, Stuntz T, Morgan T, Marshall T, Southard T, Bi-Cortical Versus Mono-Cortical Orthodontic Skeletal Anchorage, *Am J Orthod Dentofac Orthop* (in press).
2. Southard TE, Marshall SD, **Grosland NM**. Friction Does Not Increase Anchorage Loss. *Am J Orthod Dentofac Orthop*, 2006 (short communication; in press).
3. Shivanna KH, **Grosland NM**, Russell ME, Pedersen DR, Diarthrodial Joint Contact Models: A finite element analysis of the human hip, *Engineering with Computers* (accepted).
4. Pedersen DR, Shivanna K, Russell ME, **Grosland NM**. Transient cartilage stress elevations in dysplastic hips. *Journal of Orthopaedic Surgery and Research*, 2006 (accepted).
5. Woodworth JA, McCullough M, **Grosland NM**, Adams BD. Impact of Simulated Proximal Interphalangeal Arthrodeses of All Fingers on Hand Function, *Journal of Hand Surgery*, 31(6):940-946 2006.
6. Kallemeyn N, **Grosland NM**, Pedersen DR, Martin JA, Heiner AD, Brown TD, Heterogeneity of shear stress modulation in triaxial compression testing of cartilage, *Iowa Orthopaedic Journal*, ;26:5-16, 2006.
7. Anderson DD, Goldsworthy JK, Shivanna K, **Grosland NM**, Pedersen DR, Thomas TP, Tochigi Y, Marsh JL, Brown TD, Intra-articular contact stress distributions at the ankle throughout stance phase – Patient-specific finite element model analysis as a metric of degeneration propensity, *Biomechanics and Modeling in Mechanobiology*, 5:82-89, 2006.
8. Potratz J, Yang J, Abdel-Malek K, Pitarch E, **Grosland N**. A light weight compliant hand mechanism with high degrees of freedom. *Journal of Biomechanical Engineering* 2005; 127:934-945.
9. Roarty C, **Grosland NM**, Adaptive Meshing for Orthopaedic Finite Element Contact Problems, *Iowa Orthop Journal*, 24: 21-29, 2004.
10. **Grosland NM**, Rogge RD, Adams BD, Influence of Articular geometry on prosthetic wrist stability. *Clinical Orthopaedics and Related Research*: 421: 134-142, 2004.
11. Brown TD, Rudert MJ, **Grosland NM**, New methods of assessing cartilage contact stress after articular fracture. *Clinical Orthopaedics and Related Research*, 423:52-58, 2004.

12. Adams BD, **Grosland NM**, Murphy DM, McCullough MB: Impact of Impaired Wrist Motion on Hand and Upper Extremity Performance. *Journal of Hand Surgery*, 28: 898-903, 2003.
13. **Grosland, N. M.**, and Brown, T. D.: A Voxel-Based Formulation for Contact Finite Element Analysis. *Computer Methods in Biomechanics and Biomedical Engineering*, 5(1): 21-32, 2002.
14. Dooris AP, Goel VK, **Grosland NM**, Gilbertson LG, Wilder DG, Load-sharing between anterior and posterior elements in a lumbar motion segment implanted with an artificial disc, *Spine*. 15;26(6): E122-9, 2001.
15. Konz RJ; Goel VK; Grobler LJ; **Grosland NM**; Spratt KF; Scifert JL; Sairyo K. The Pathomechanism of Spondylolytic Spondylolisthesis in Immature Primate Lumbar Spines: In Vitro & Finite Element Assessments, *Spine*, 15;26(4): E38-E49, 2001.
16. Goel VK, Konz RJ, Chang HT, **Grosland NM**, Grobler LJ, Chesmel KD. Hinged-Dynamic Posterior Device Permits Greater Loads on the Graft and Similar Stability as Compared with Its Equivalent Rigid Device: A Three-Dimensional Finite Element Assessment. *Journal of Prosthetics and Orthotics*; 13:17-20, 2001.
17. Puttlitz CM, Goel, VK, Clark CR, Traynelis VC, Scifert JL, **Grosland NM**, Biomechanical rationale for the pathology of rheumatoid arthritis in the craniovertebral junction, *Spine*, 1;25(13):1607-16, 2000.
18. Hitchon PW, Goel VK, Rogge T, **Grosland NM**, Sairyo K, Torner J, Biomechanical studies of a dynamized anterior thoracolumbar implant, *Spine*, 1;25(3):306-9, 2000.
19. Scifert J, Goel VK, **Grosland NM**, Grobler, Spratt K, Chesmel KD, Stability Analysis of an Enhanced Load Sharing Posterior Fixation Device and its Equivalent Conventional Device in a Calf Spine Model, *Spine*, 1;24(21):2206-13, 1999.
20. Hitchon PW, Goel VK, Rogge T, **Grosland NM**, Torner J, Biomechanical Studies on Two Anterior thoracolumbar implants in cadaveric spines, *Spine*, Feb. 1, 1999.
21. Sairyo K., Scifert J., Goel VK, **Grosland N**, Grobler LJ. Neurocentral synchondrosis fracture in immature spines associated with pedicle screw type fixation devices. *Journal of Spinal Disorders*. 11(2):142-5, 1998.
22. Goel VK, **Grosland NM**, Scifert J, Biomechanics of the Lumbar Disc, *J. Musculoskeletal Research*, 1997.
23. Goel VK, **Grosland NM**, Todd DT, Grobler LJ, Pope MH, Application of Finite Element Models to Predict Clinically Relevant Biomechanics of the Lumbar Spine, *Seminars in Spine Surgery*, 1997.
24. **Grosland NM.**, Kim JK, Park JB, Reinforcement of Bone Cement Around Prosthesis by Pre-Coated Wire Coil: A Finite Element Model Study; *J. Biomed-Mater-Engrn.*, 5:29-36, 1995.

*Manuscripts in Review*

1. **Grosland NM**, Gassman EE, Kallemeyn NA, Shivanna KH, Magnotta VA, , Validation of Orthopaedic Related Image Segmentation Techniques. *Computers in Biology and Medicine*, 2006 (in review).
2. Gassman EE, Powell SM, Kallemeyn NA, Shivann KH, Magnotta VA, **Grosland NM**, Automated Bony Region Identification Using Artificial Neural Networks: Reliability and Validation Measurements. *Computerized Medical Imaging and Graphics*, 2006 (in review).

*Manuscripts in Preparation for Near-term Submission*

1. Kallemeyn NA, **Grosland NM**, Magnotta VA, Martin J, Pedersen DR, Arthroscopic lens distortion correction during triaxial compression of cartilage, (in preparation).

2. McCullough M, **Grosland NM**, Adams BD, Kinematic Analysis of the Upper Extremity in Patients Receiving the Universal 2 Total Wrist Arthroplasty Device (in preparation).
3. McCullough M, Adams BD, **Grosland NM**, A theoretical approach to the evolution of total wrist arthroplasty (in preparation).
4. Anderson M, Adams BD, McCullough MBA, **Grosland NM**. Wrist circumduction after proximal row carpectomy (in preparation).
5. **Grosland NM** and Goel VK, Vertebral Endplate Morphology Predicted via Wolff's Law, *J Tissue Mechanics and Injury*.

#### *Chapters in Books*

1. Grosland NM, Goel VK, Lakes RS, Techniques and applications of adaptive bone remodeling concepts. In: Biomechanical Systems, Techniques, and Applications: Musculoskeletal Models and Techniques, Volume III (Ed. CT Leondes), CRC Press, 2001. *This chapter was taken from the appendices of my doctoral dissertation.*
2. Goel VK, Montgomery RE, Grosland NM, Pope MH, Kumar S, Ergonomic Factors in the Workplace Contribute to Disc Degeneration, 1997.

#### *Conference and Symposium Publications/Presentations*

1. Shivanna KH, Magnotta VA, Grosland NM, Towards Automating Patient-Specific Finite Element Model Development, NA-MIC AHM Salt Lake City, UT Jan 10-12, 2007.
2. Shivanna KH, Adams BD, Magnotta VA, **Grosland NM**. Automating patient-specific finite element model development, 9<sup>th</sup> MICCAI Conference, Copenhagen, Oct 1-6, 2006 (full length paper).
3. Frey-Law L, Rahmatalla S, Wilder D, **Grosland N**, et al. Arm and shoulder muscle activity are greater with steering wheel vs. seat mounted controls. In:1st American Conference on Human Vibration, 2006.
4. Wilder D, Rahmatalla S, Contratto M, Xia T, Frey-Law L, Kopp G, **Grosland N**. Head-trunk motion increase with arm-rest controls. In:1st American Conference on Human Vibration, 2006.
5. Rahmatalla S, Xia T, Contratto M, Wilder D, Frey-Law L, Kopp G, **Grosland N**. 3D Displacement, Velocity, and Acceleration of Seated Operators in a Whole Body Vibration Environment using Optical Motion Capture Systems. In:International Symposium on the 3D Analysis of Human Movement. Valenciennes, France, 2006.
6. Gassman EE, Powell SM, Magnotta VA, **Grosland NM**. Automating the identification of bony structures using artificial neural networks. In:52nd Annual Meeting of the Orthopaedic Research Society. Chicago, IL, 2006.
7. Pedersen DR, Shivanna K, Russell ME, **Grosland NM**. Cartilage contact pressure elevations in dysplastic hips. In:52nd Annual Meeting of the Orthopaedic Research Society. Chicago, IL, 2006.
8. Goldsworthy JK, Anderson DD, Shivanna K, **Grosland, NM**, et al. Patient-specific modeling of degeneration propensity following intra-articular fracture of the ankle. In:52nd Annual Meeting of the Orthopaedic Research Society. Chicago, IL, 2006.
9. Pedersen DR, Russell ME, Shivanna KH, **Grosland NM**. Cartilage contact pressure elevations in dysplastic hips after ganz osteotomy. In:52nd Annual Meeting of the Orthopaedic Research Society. Chicago, IL, 2006.
10. Kallemeyn NA, **Grosland NM**, Pedersen DR, Martin JA, Heiner AD, Brown TD. A poroelastic finite element analysis of cartilage in dynamic triaxial compression. In:52nd Annual Meeting of the Orthopaedic Research Society. Chicago, IL, 2006.

11. Khera SC, **Grosland NM**, McDonald T, Kashef S, Lawrence J. Stresses Due to Different Cavity Preparation Depths and Base Placement. In:35th Annual Meeting of the Academy of Operative Dentistry. Chicago, IL, 2006.
12. Goldsworthy JK, Anderson DD, Shivanna K, **Grosland NM**, Pedersen DR, Brown TD. Chronic stress exposure following intra-articular ankle fractures. In:Congress of the International Society of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics. Cleveland, Ohio, 2005.
13. Russell ME, Shivanna KH, **Grosland NM**, Pedersen DR. Chronic overexposure of human articular cartilage in dysplastic hips. In:ASB/ISB Conference. Cleveland, OH, 2005.
14. Shivanna K, Pedersen DR, **Grosland NM**. Finite element mesh generation of synovial joints. In: University of Iowa College of Engineering 3rd Annual Research Open House. Iowa City, IA, 2005.
15. Woodworth JA, McCullough MB, **Grosland NM**, Adams BD. Impact of Restricted PIP Joints and MCP Joint Motion in the Human Hand. In:XXth Congress of the International Society of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics. Cleveland, Ohio, 2005.
16. Pedersen DR, Martin JA, Kallemeyn NA, **Grosland NM**. Cinematic measurement of cartilage plugs in unconfined compression. In:XXth Congress of the International Society of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics. Cleveland, Ohio, 2005.
17. Kallemeyn NA, **Grosland NM**, Pedersen DR, Martin JA, Heiner AD, Brown TD. A finite element analysis of cartilage in cyclic triaxial compression. In:ASB/ISB Conference. Cleveland, OH, 2005.
18. Pedersen DR, Martin JA, Kallemeyn NA, **Grosland NM**. Cinematic measurement of cartilage plugs in unconfined compression. In:ASB/ISB Conference. Cleveland, OH, 2005.
19. Baer T, Rudert MJ, Pedersen DR, Kallemeyn NA, **Grosland NM**, Brown TD. Calibration and monitoring of piezoresistive contact stress sensor arrays using a roller device to generate a travelling pressure wave. In:ASB/ISB Conference. Cleveland, OH, 2005.
20. Baer TE, Pedersen DR, Rudert MJ, Vos NA, **Grosland NM**, Brown TD. Traveling-wave calibration of sheet array sensors for intra-articular pressure measurements. In:The 51st Annual Meeting of the Orthopaedic Research Society. Washington DC, 2005.
21. Pedersen DR, Shivanna KH, Russell ME, **Grosland NM**. Transient cartilage stress elevations in dysplastic hips. In:The 51st Annual Meeting of the Orthopaedic Research Society. Washington DC, 2005.
22. Woodworth JA, McCullough M, **Grosland NM**, Adams BD. Impact of restricted PIP joints on MCP joint motion in the human hand. In:The 51st Annual Meeting of the Orthopaedic Research Society. Washington DC, 2005.
23. Kallemeyn NA, **Grosland NM**, Pedersen DR, Martin JA, Heiner AD, Brown TD. Heterogeneity of shear stress modulation in triaxial compression of cartilage. In:9th World Congress of the Osteoarthritis Research Society International. Chicago, IL, 2004.
24. Vos NA, **Grosland NM**, Pedersen DR, Martin JA, Heiner AD, Brown TD. Heterogeneity of shear stress modulation in triaxial compression of cartilage (Best poster). In:ASB Upper Midwest Student Regional Meeting. Minneapolis, MN, 2004.
25. Pedersen DR, Shivanna KH, Russell ME, **Grosland NM**. Cyclic cartilage stress elevations in dysplastic hips. In:9th World Congress of the Osteoarthritis Research Society International. Chicago, IL, 2004.
26. Baer TE, Pedersen DR, Rudert MJ, Vos NA, **Grosland NM**, Brown TD. Travelling-wave calibration of intra-articular sheet array pressure sensors. In:OARSI. Chicago, IL, 2004.
27. Vos NA, **Grosland NM**, Pedersen DR, Martin JA, Heiner AD, Brown TD. Heterogeneity of shear stress modulation in triaxial compression of cartilage. In:OARSI. Chicago, IL, 2004.

28. Anderson DD, **Grosland NM**, Brown TD. Investigating chronic aberrant stress exposure following intra-articular fracture as a predictor of post-traumatic osteoarthritis. In:OARSI. Chicago, IL, 2004.
29. Baer T, Pedersen DR, Rudert MJ, Vos NA, **Grosland NM**, Brown TD. Calibrating and monitoring sheet array pressure sensors for intra-articular load measurement. In:5th Combined Meeting of the Orthopaedic Research Societies of the U.S.A., Canada, Japan and Europe. Banff, Alberta, Canada, 2004.
30. Baer T, Pedersen DR, Rudert MJ, Vos NA, **Grosland NM**, Brown TD. A novel device for calibrating sheet array pressure sensors and for monitoring their performance. In:American Society of Biomechanics. Portland Oregon, 2004.
31. Anderson DD, **Grosland NM**, Brown TD. Investigating chronic stress exposure following intra-articular fracture using a finite element model of the ankle. In:5th Combined Meeting of the Orthopaedic Research Societies of the U.S.A., Canada, Japan and Europe. Banff, Alberta, Canada, 2004.
32. Anderson DD, **Grosland NM**, Brown TD. Investigating chronic stress exposure following intra-articular fracture using a finite element model of the ankle. In:American Society of Biomechanics. Portland, Or, 2004.
33. McCullough M, **Grosland NM**, Adams BD. Finite element analysis of the Universal 2 total wrist prosthesis. In:5th Triennial International Hand and Wrist Biomechanics Symposium. Syracuse, New York, 2004.
34. Heiner AD, Brown TD, **Grosland NM**. Apparent Modulus of Fused vs Unfused Femoral Impaction Grafts. In:American Society of Biomechanics. Toledo, OH, 2003.
35. McCullough M, Murphy D, Adams BD, **Grosland NM**. Impact of Impaired Wrist Motion on Hand and Upper Extremity Performance. In:American Society of Biomechanics. Toledo, OH, 2003.
36. **Grosland NM**, Rogge RD, Adams BD. Influence of Articular Geometry on Prosthetic Wrist Stability. In:The 49th Annual Meeting of the Orthopaedic Research Society. New Orleans, La, 2003.
37. Roarty CM, **Grosland NM**. Adaptive Finite Element Analysis for Orthopaedic Contact Problems. In:American Society of Biomechanics. Toledo, OH, 2003.
38. Roarty C, **Grosland NM**. Adaptive Meshing for Orthopaedic Finite Element Contact Problems. In:11th Annual Symposium of Computational Methods in Orthopaedic Biomechanics. New Orleans, 2003.
39. **Grosland NM**, Rogge RD, Adams BD. Influence of Articular Geometry on Prosthetic Wrist Stability. In:American Society of Biomechanics. Toledo, OH, 2003.
40. McCullough M, Murphy D, Adams BD, **Grosland NM**. Impact of Impaired Wrist Motion on Hand and Upper Extremity Performance. In:The 49th Annual Meeting of the Orthopaedic Research Society. New Orleans, La, 2003.
41. Adams BD, **Grosland NM**. Impact of Impaired Wrist Motion on Hand and Upper Extremity Performance. In:57th Annual Meeting ASSH. Phoenix, Az, 2002.
42. Dai Y, Pedersen DR, **Grosland NM**, Brown TD. Interactive three-dimensional computational reconstruction of intra-articular fractures. In:10th Annual Symposium of Computational Methods in Orthopaedic Biomechanics. Dallas, Tx, 2002.
43. **Grosland NM**, Pedersen DR, Brown TD. An Anatomical Voxel-Based FE Contact Analysis Formulation. In:American Society of Biomechanics. San Diego, CA, 2001.
44. **Grosland NM**, Rogge RD, Brown TD, Adams BD. Rotational Dislocation Propensity of an Unconstrained Total Wrist Implant. In:American Society of Biomechanics. San Diego, CA, 2001.

45. **Grosland NM**, Rogge RD, Adams BD, Brown TD. Rotational Dislocation Resistance of a Dual-Curvature-Radius Total Wrist Implant. In:47th Meeting, Orthopaedic Research Society. San Francisco, CA, 2001.
46. **Grosland NM**, Pedersen DR, Brown TD. Automating Voxel-Based Contact Finite Element Models. In:9th Annual Symposium of Computation Methods in Orthopaedic Biomechanics. San Francisco, CA, 2001.
47. Dooris AP, Goel VK, **Grosland NM**, et al. Biomechanics of a Lumbar Spine Stabilized with an Interbody Bone Graft. In:Orthopedic Research Society. Orlando, FL, 2000.
48. Heatherly RD, **Grosland NM**, Goel VK, Adams BD. Biomechanics of Distal Radius Fracture Instability. In:World Congress on Medical Physics and Biomedical Engineering. Chicago, 2000.
49. Dooris AP, Goel VK, **Grosland NM**. Surgical Variables Affect Load Sharing Between an Implanted Artificial Disc and Facets in a Lumbar. In:46th Meeting, Orthopaedic Research Society. Orlando, Florida, 2000.
50. Dooris AP, Goel VK, **Grosland NM**, et al. Biomechanics of a Lumbar Spine Segment Stabilized with Morselized Bone Interbody Graft. In:46th Meeting, Orthopaedic Research Society. Orlando, Florida, 2000.
51. Dooris AP, **Grosland NM**, Grobler LJ, Goel VK. Placement of an artificial disc with the disc space alters loads on the posterior elements - A quantification using the finite element technique. In:27th International Society for the Study of the Lumbar Spine (ISSLS). Adelaide, Australia, 2000.
52. Hitchon PW, Rogge TN, Goel VK, **Grosland NM**, et al. A Biomechanical Comparison of Three Anterior Stabilization Devices. In:North American Spine Society. Chicago, IL, 1999.
53. Scifert JL, Goel VK, **Grosland NM**, Puttlitz CM, Totoribe K, Traynelis VC. Load Sharing and Stress Shielding in the Cervical Spine Following Anterior Bone Graft and Plating. In:27th Annual Meeting of the Cervical Spine Research Society. Seattle, Washington, 1999.
54. **Grosland NM**, Goel VK, Grobler LJ. Interbody Stability as the Result of Endplate Engagement/Annular Tension. In:26th International Society for the Study of the Lumbar Spine (ISSLS). Kona, Hawaii, 1999.
55. Goel VK, **Grosland NM**, Grobler LJ. Bone Adaptation Following Interbody Spacer-Cage Implantation in the Spine. In:ASME Summer Bioengineering Conference. Big Sky, Montana, 1999.
56. Puttlitz CM, Goel VK, **Grosland NM**, Scifert JL, Clark CR. Biomechanics Aspects of Early Rheumatoid Arthritis Involvement of the Upper Cervical Spine: A Finite Element Investigation. In:ASME Summer Bioengineering Conference. Big Sky, Montana, 1999.
57. Scifert JL, Goel VK, **Grosland NM**, Puttlitz CM, Totoribe K, Traynelis VC. Finite Element Investigation of Anterior Plate and Bone Graft Load Sharing in the Cervical Spine. In:ASME Summer Bioengineering Conference. Big Sky, Montana, 1999.
58. Rogge TN, Hitchon PW, Goel VK, **Grosland NM**, et al. A Biomechanical Comparison of Three Anterior Stabilization Devices. In:ASME Summer Bioengineering Conference. Big Sky, Montana, 1999.
59. Dooris AP, Goel VK, Todd DT, **Grosland NM**, Wilder DG. Load Sharing in a Lumbar Motion Segment Implanted with an Artificial Disc Under Combined Sagittal Plane Loading. In:ASME Summer Bioengineering Conference. Big Sky, Montana, 1999.
60. Goel VK, **Grosland NM**, Grobler LJ. Morphologic Vertebral Endplate Thickness Predicted via FEM. In:45th Meeting, Orthopaedic Research Society. Anaheim, Ca, 1999.
61. Goel VK, Konz RJ, Chang HT, **Grosland NM**, Grobler LJ, Chesmel KD. Hinged-Dynamic Posterior Device Permits Greater Loads on the Graft and Similar Stability as Compared to the Alternative Rigid Device. In:45th Meeting, Orthopaedic Research Society. Anaheim, Ca, 1999.

62. Puttlitz CM, Goel VK, Clark CR, Traynelis VC, Scifert JL, **Grosland NM**. Relationship of upper cervical rheumatoid arthritis diagnostic criteria to ligament involvement. In:45th Annual Meeting of the Orthopaedic Research Society. Anaheim, CA, 1999.
63. Scifert JL, Goel VK, **Grosland NM**, Puttlitz CM, Totoribe K, Traynelis VC. Finite element investigation of anterior plate and bone graft load sharing in the cervical spine. In:45th Annual Meeting of the Orthopaedic Research Society. Anaheim, CA, 1999.
64. Scifert JL, Goel VK, **Grosland NM**, Puttlitz CM, Totoribe K, Traynelis VC. Anterior plate and bone graft load sharing in the cervical spine: a finite element investigation. In:23rd Annual Meeting of the American Society of Biomechanics. Pittsburgh, PA, 1999.
65. Dooris AP, **Grosland NM**, Goel VK, et al. Load-displacement characteristics of an implanted nuclear pouch in the lumbar spine. In:ASME Biomed. Eng. Conference. Nashville, Tennessee, 1999.
66. Scifert JL, Goel VK, **Grosland NM**, Puttlitz CM, Totoribe K, Traynelis VC. Finite Element Investigation of Anterior Plate and Bone Graft Load Sharing in the Cervical Spine, Assessments. In:7th Annual Symposium on Computational Methods in Orthopaedic Biomechanics. University of California, Irvine, 1999.
67. Konz RJ, Goel VK, Grobler LJ, **Grosland NM**, et al. The Pathomechanism of Spondylolytic Spondylolisthesis in Pediatric Lumbar Spines: In Vitro & Finite Element Assessments. In:7th Annual Symposium on Computational Methods in Orthopaedic Biomechanics. University of California, Irvine, 1999.
68. Konz RJ, Goel VK, Grobler LJ, **Grosland NM**, et al. The Pathomechanism of Spondylolytic Spondylolisthesis in Immature Primate Lumbar Spines: In Vitro & Finite Element Assessments. In:ASME International Mechanical Congress and Exposition. Anaheim, Ca, 1998.
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70. **Grosland NM**, Goel VK, Grobler LJ. Vertebral Endplate Morphology Predicted via Wolff's Law. In:ASME International Mechanical Congress and Exposition. Anaheim, Ca, 1998.
71. **Grosland NM**, Goel VK, Grobler LJ, Griffith SL. Biomechanical Basis for Bone Growth Around an Interbody Fusion Cage. In:44th Meeting, Orthopaedic Research Society. New Orleans, LA, 1998.
72. Puttlitz CM, Goel VK, Clark CR, Traynelis VC, Scifert JL, **Grosland NM**. Biomechanical rationale for the pathology of rheumatoid arthritis in the craniovertebral junction. In:26th Annual Meeting of the Cervical Spine Research Society. Atlanta, GA, 1998.
73. Goel VK, Konz RJ, Chang HT, **Grosland NM**, Grobler LJ, Chesmel KD. Load Sharing Comparison of a Rigid vs. a Hinged Device in the Stabilized Lumbar Motion Segment. In:25th International Society for the Study of the Lumbar Spine (ISSLS). Brussels, Belgium, 1998.
74. Goel VK, Konz RJ, Chang HT, **Grosland NM**, Grobler LJ, Chesmel KD. Load Sharing Comparison of a Hinged vs. A Rigid Screw Device in the Stabilized Lumbar Motion Segment: A Finite Element Study. In:44th Meeting, Orthopaedic Research Society. New Orleans, 1998.
75. Scifert JL, Goel VK, Grobler LJ, Sairy K, **Grosland NM**, et al. Comparative Stability Provided by an Enhanced Load Sharing Posterior Fixation Device and an Equivalent Conventional Device. In: 44th Meeting, Orthopaedic Research Society. New Orleans, LA, 1998.
76. **Grosland NM**, Goel VK, Grobler LJ, Griffith SL. The Effects of Anterior Lumbar Interbody Stabilization on Motion And Adaptive Remodeling. In:12th Annual Conference of the North American Spine Society. New York City, New York, 1997.
77. **Grosland NM**, Goel VK, Grobler LJ, Griffith SL. Effects of an Anterior Interbody Fusion Device on Bone Density Distributions in the Lumbar Spine. In:ASME International Mechanical Congress and Exposition. Dallas, Texas, 1997.

78. Todd DT, Goel VK, **Grosland NM**, et al. A Comprehensive Investigation of the Biomechanics of an Artificial Intervertebral Disc. In:ASME International Mechanical Congress and Exposition. Dallas, Texas, 1997.
79. Todd DT, Goel VK, **Grosland NM**, Wilder DG, Pope MH. Contact Finite Element Model of an Artificial Intervertebral Disc. In:21st Annual Meeting of the American Society of Biomechanics. Clemson, South Carolina, 1997.
80. **Grosland NM**, Goel VK, Grobler LJ, Griffith SL. Adaptive Internal Bone Remodeling of the Vertebral Body Following an Anterior Interbody Fusion: A Computer Simulation. In:24th International Society for the Study of the Lumbar Spine (ISSLS). Singapore, 1997.
81. Goel VK, **Grosland NM**, Grobler LJ, Griffith SL. Kinematic Evaluation of A Spinal Segment Adjacent to an Anterior Interbody Fusion Segment Using the Finite Element Approach. In:24th Meeting, International Society for the Study of the Lumbar Spine (ISSLS). Singapore, 1997.
82. Goel VK, Ramirez SA, **Grosland NM**. Contributions of Various Load Types To Adaptation Alterations of Cancellous Bone of the Vertebral Body. In:ASME Annual Summer Meeting. Oregon, 1997.
83. **Grosland NM**, Goel VK, Griffith SL. Effects of an Anterior Interbody Fusion Cage on the Motion at the Adjacent Segment. In:43rd Meeting, Orthopaedic Research Society. San Francisco, CA, 1997.
84. Goel VK, Hitchon PW, **Grosland NM**, Rogge TN, Sairyo K, Serhan HA. Comparative Kinematics of a Collapsible and Rigid Anterior Devices. In:43rd Meeting, Orthopaedic Research Society. San Francisco, CA, 1997.
85. Hitchon PW, Goel VK, Rogge TN, **Grosland NM**, Sairyo K. Biomechanical Analysis of Two Commonly used Anterior Spinal Devices. In:Annual Meeting of the American Association of Neurological Surgeons. Denver, CO, 1997.
86. Hitchon PW, Rogge TN, **Grosland NM**, Sairyo K, Goel VK. Biomechanical Studies on a Spinal Dynamized Anterior Locking System. In:Annual Meeting of the American Association of Neurological Surgeons. Denver, CO, 1997.
87. Hitchon PW, Goel VK, Rogge TN, **Grosland NM**, Sairyo K, Most E. Biomechanical Analysis of Two Commonly used Anterior Spinal Devices. In:Annual Meeting of the American Association of Neurological Surgeons. Newport Beach, CA, 1997.
88. Hitchon PW, Rogge TN, **Grosland NM**, et al. Biomechanical Studies on a spinal dynamized anterior locking system. In:Annual Meeting of the American Association of Neurological Surgeons. Newport Beach, CA, 1997.
89. Hitchon PW, Goel VK, Rogge TN, **Grosland NM**, Sairyo K, Most E. Biomechanical Studies on a Spinal Dynamized Anterior Locking System. In:Spine Across the Sea, NASS & JSRS, 1997.
90. Goel VK, Ramirez SA, **Grosland NM**. Finite Element Analysis to Determine Contributions of Various Load Types to Adaptation Alterations of Cancellous Bone of the Vertebral Body. In:5th Meeting, Pan American Congress of Applied Mechanics (PACAMV). San Juan, Puerto Rico, 1997.
91. Gilbertson LG, Goel VK, Wilder DG, **Grosland NM**, et al. Biomechanical Evaluation of a new Lumbar Disc Implant: In-vitro Simulations of Disc Surgery, Implantation, and Post-op Mobilization, Approach. In:23rd Meeting, International Society for the Study of the Lumbar Spine (ISSLS). Burlington, VT, 1996.
92. **Grosland NM**, Kim JK, Park LB. Reinforcement of Bone Cement Around Prostheses by Pre-Coated Wire Coil: Comparison of the Finite Element Model and Mechanical Tests. In:8th Meeting, International Conference on Biomedical Engineering. Singapore, 1994.
93. Patel PP, **Grosland NM**, Goel VK. Finite Element Analysis of the Glenoid Component: Effect of Four Metal Keel Geometries. In: ASME Winter Annual Meeting. Chicago Ill, 1994.

**Areas of Research Interest**

Orthopaedic Biomechanics (particularly of the spine and upper extremity)  
Total joint replacements  
Finite element model development

**Grants*****Active***

2006-2010 National Institutes of Health, NIBIB  
Integrating Automating Patient-Specific Model Development into the NA-MIC Toolkit  
\$1,541,173 Total Direct Cost  
\$413,538 First Year Total Direct Cost (Principal Investigator)

2005-2007 National Institutes of Health Grant EB001501  
Automating Patient-Specific Model Development  
\$200,000 Total Direct Costs (Principal Investigator)

2006-2007 University of Iowa Biological Sciences Funding Program (BSFP)  
Improving 3D Volumetric FE meshing algorithms for anatomic applications  
\$30,000 Total Direct Costs (Principal Investigator)

2006-2009 Medtronic  
Mechanical Signaling of Ligamentum Flavum Hypertrophy in Lumbar Stenosis  
\$177,448 Total Direct Costs (Investigator)

1999-2009 Kinetikos Medical Inc.  
Universal Total Wrist Implant (UTW)  
\$63,323 Total Direct Costs (Investigator)

***Completed Research Support***

2005-2006 Caterpillar  
Human Response to Select Vibratory Conditions: Limb Motion and Muscle Activity  
\$50,000 Total Direct Costs (Investigator)

2003-2004 Iowa Research Experience for Undergraduates (IREU)  
The University of Iowa  
\$3,000 Total Costs (Principal Investigator)

2003-2003 TACOM  
Digital Human and Virtual Reality for Future Combat Systems  
\$2,500,000 Annual Total Costs (Investigator)

2002-2007 National Institutes of Health Grant AR048939  
Pathogenesis- Prevention of Post-Traumatic OA (SCOR)  
\$3,750,000 Total Direct Costs  
\$750,000 First Year Direct Costs (Investigator)

2002-2005 Center for Disease Control Grant R49CCR 721745  
Unstable Joints: Cartilage Stress Anomaly and OA

	\$611,222 Total Direct Costs \$203,310 First Year Direct Costs (Investigator)
2001-2003	The University of Iowa College of Medicine Research Award Adaptive Meshing for Orthopaedic Finite Element Contact Problems \$20,000 Total Costs (Principal Investigator)
2001-2002	Kinetikos Medical Inc. Universal 2 Total Wrist Implant \$14,000 Total Direct Costs (Principal Investigator)
2000-2003	National Institutes of Health Grant AR046863 Revision THA Impaction Grafts: Effects of Bone Fusion \$150,000 Total Direct Costs \$50,000 First Year Direct Costs (Investigator)
2000-2005	National Institutes of Health Grant AR46601 Nonlinear Computational Biomechanics of the Hip \$1,951,374 Total Direct Costs \$367,550 First Year Direct Costs (Investigator)

## Selected Service Activities

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### Departmental

BMESS Faculty Advisor	2006 - present
AEMB Faculty Advisor	2006 - present
Undergraduate Program Committee (member)	2006 - present
Senior Design Sequence Subcommittee (Chair)	2006 - present
Bea Park Scholarship Committee (Chair)	2005
Ad Hoc Strategic Planning Committee (member)	2002 - present
Graduate Program Committee (member/secretary)	2002 - 2006
Graduate Program Subcommittee (member/secretary)	2002 - 2006
Doctoral Student Admissions Committee (member)	2001 - present
Graduate Program Enhancement Committee	2001 - 2002
ABET, Course Portfolio Committee	2001 - 2002

### Collegiate

Undergraduate Admissions Committee	2007 - present
Workplace learning, BME representative	2007
Judge, College of Engineering Research Week	2005, 2006
Explore Engineering @ Iowa, "Biomechanics of Artificial Joints"	2006
Faculty advisor for the Homecoming Float/Corn Monument	2002 - present
Chi Epsilon FE review; Mechanics of Deformable Bodies	2002
Student/Parent Orientation Participant	2001 - present
Men in Engineering Dinner, Faculty Representative	2002, 2004
ACE Academy Participant	2002, 2003
SWE invited speaker and Panelist; High School visitation	2002, 2003
Iowa Biosciences Advantage Mentor/Host	2003
Judge for Mechanical Engineering Design Projects	2003
WISE faculty representative, mentoring program	2002
Presentation, Fort Dodge Senior High School Students (Lab tour)	2001, 2003

SSTP (Secondary Student Training Program), Mentor 1998, 1999, 2000

### University

MSTP Faculty Member 2006 - present  
WISE, Scholarship and Awards Committee Member 2005 - present  
WISE Advisory Board 2004 - present

### Community, State, National and International

#### *Referee*

Clinical Orthopaedics and Related Research  
Computer Aided Design  
Computer Methods and Programs in Biomedicine  
Integrated Computer Aided Engineering  
Journal of Biomechanics  
Journal of Biomechanical Engineering  
Journal of Orthopaedic Research

#### *Professional Society*

Member

Biomedical Engineering Society (BMES) 2006 - present  
Society of Automotive Engineers 2005 - present  
American Society for Engineering Education 2002 - present  
American Society for Biomechanics 2002 - present  
Orthopaedic Research Society 2002 - present

#### Session Co-Chair

Co-Chair, American Association of Anatomists (AAA) Annual Meeting,  
Symposium titled "\$6 Billion (Hu)Man", San Francisco, April 1-5 2006

#### Session Moderator

14<sup>th</sup> Annual Symposium on Computational Methods in Orthopaedic  
Biomechanics, PreORS; Session I: Tissue/Implant Complex, Chicago, IL,  
March 18, 2006 2006

#### *Advisory Board Membership*

Medical Advisory Board, Brown Medical Industries 2006 - present