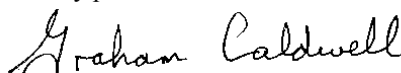


**GRAHAM EDWARD CALDWELL**  
CURRICULUM VITA

I certify that this curriculum vita is a current and accurate statement of my professional record.

August 6, 2012



\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

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**EDUCATION**

**Academic degrees**

1987	Ph.D.	Simon Fraser University <i>Applied Muscle Models in Prediction of Forces at the Elbow</i> Advisor: Arthur E. Chapman, PhD	Kinesiology (Biomechanics)
1980	M.Sc.	University of Waterloo <i>Mechanical Work and Energy Transfers as an Index of Skill</i> Advisor: Robert W. Norman, PhD	Kinesiology (Biomechanics)
1978	B.Sc. (Honours)	University of Waterloo	Kinesiology

**Honours and Awards**

2010-12	<b>Executive Committee</b> , Canadian Society for Biomechanics.
2002	<b>Fellow</b> of the Canadian Society for Biomechanics.
1998	<b>Excellence in Teaching Award</b> , School of Public Health and Health Sciences, University of Massachusetts Amherst
1997-2000	<b>Associate Editor</b> for <i>Medicine and Science in Sports and Exercise</i>
1995, 1997, 2002	<b>Nominated</b> for <i>Excellence in Teaching Award</i> , School of Public Health and Health Sciences, University of Massachusetts Amherst
1988	<b>New Investigator Award</b> , Canadian Society for Biomechanics, Fifth Biannual Conference on Human Locomotion, Ottawa, Canada.
1987	Simon Fraser University <b>Research Stipend</b> (Finishing Doctoral Candidate)
1986	Natural Science & Engineering Research Council (Canada) <b>Post Doctoral Award</b> (position not accepted)
1986	Simon Fraser University <b>President's Research Stipend</b>
1986	Simon Fraser University <b>Graduate Research Fellowship</b>
1982-85	Natural Science & Engineering Research Council (Canada) <b>Post Graduate Scholarship</b>

## **EMPLOYMENT**

### **Full Time**

- 1996- present Associate Professor with tenure, Department of Kinesiology, School of Public Health and Health Sciences; Graduate Faculty, University of Massachusetts Amherst
- 2006- 2011 Associate Professor and Graduate Program Director, Department of Kinesiology, School of Public Health and Health Sciences; Graduate Faculty, University of Massachusetts Amherst
- 2001 Visiting Research Professor, Department of Physical Education, Sports Science and Recreation Management, Loughborough University, Loughborough, England, UK.
- 1993-96 Assistant Professor, Department of Exercise Science, School of Public Health and Health Sciences; Graduate Faculty, University of Massachusetts Amherst
- April, 1993 Awarded promotion to Associate Professor with tenure, Department of Kinesiology, College of Health and Human Performance; University of Maryland - College Park; effective August 15, 1993.
- 1987-93 Assistant Professor, Department of Kinesiology, College of Health and Human Performance; Graduate Faculty (Regular Membership - 1992), University of Maryland - College Park
- 1989 Research Associate, Instituut voor Lichamelijke Opleiding, Katholieke Universiteit Leuven, Belgium (*2 month Summer Appointment*)
- 1981-82 Research Assistant, Department of Kinesiology, Simon Fraser University Biomechanics and Environmental Physiology Laboratories

### **Part Time**

- 1982-85 Teaching Assistant, Department of Kinesiology, Simon Fraser University
- 1979-80 Research Assistant, Department of Kinesiology, University of Waterloo
- 1979-80 Teaching Assistant, Department of Kinesiology, University of Waterloo

## **RESEARCH**

### **Refereed Publications – Journals**

57. Miller, R.M., Umberger, B.R. and **G.E. Caldwell** (2012). Sensitivity of maximum sprinting speed to characteristic parameters of the muscle force-velocity relationship. *Journal of Biomechanics*, 45, 1406–1413. doi: 10.1016/j.jbiomech.2012.02.024.
56. John, D., Miller, R.M., Kozey-Keadle, S.L., **Caldwell, G.E.** and P.S. Freedson (2012). Biomechanical examination of the ‘plateau phenomenon’ in ActiGraph vertical activity counts. *Physiological Measurements*, 33, 219 – 230.
55. Miller, R.M., Umberger, B.R., Hamill, J. and **G.E. Caldwell** (2012). Evaluation of the minimum energy hypothesis and other potential optimality criteria for human running. *Proceedings of the Royal Society of London B*, 279 (1733): 1498-1505. doi: 10.1098/rspb.2011.2015.
54. Hasson, C.J. and **G.E. Caldwell** (2012). Effects of age on mechanical properties of dorsiflexor and plantarflexor muscles. *Annals of Biomedical Engineering*, 40: 1088-1101. doi: 10.1007/s10439-011-0481-4.
53. Miller, R.M., Umberger, B.R. and **G.E. Caldwell** (2012). Limitations to maximum sprinting speed imposed by muscle mechanical properties. *Journal of Biomechanics*, 45(6):1092-1097. doi:10.1016/j.jbiomech.2011.04.040.
52. Miller, R.M., and **G.E. Caldwell** (2011). Practical lessons on running and jumping from computer simulations. *Track & Cross Country Journal*, 1(1), 38-48.
51. Hasson, C.J., Kent-Braun, J.A. and **G.E. Caldwell** (2011). Contractile and non-contractile tissue volume and distribution in ankle muscles of young and older adults. *Journal of Biomechanics*, 44, 2299–2306; doi:10.1016/j.jbiomech.2011.05.031
50. Hasson, C.J., Miller, R.M., and **G.E. Caldwell** (2011). Contractile and elastic ankle joint muscular properties in young and older adults. *PLoS ONE*, 6(1): e15953. doi:10.1371/journal.pone.0015953.
49. Astephen Wilson, J.L., Deluzio, K.J., Dunbar, M.J., **Caldwell, G.E.**, and C.L. Hubley-Kozey (2011). The association between knee joint biomechanics and neuromuscular control and moderate knee osteoarthritis radiographic and pain severity. *Osteoarthritis and Cartilage*. 19(2): 186-93.
48. Yeadon, M.R., King, M.A., Forrester, S.E., **Caldwell, G.E.**, and M.T.G. Pain (2010). The need for muscle co-contraction prior to a landing. *Journal of Biomechanics*, 43, 364-369; doi: 10.1016/j.jbiomech.2009.06.058.
47. Miller, R.M., **Caldwell, G.E.**, van Emmerik, R.E.A., Umberger, B.R., and J. Hamill (2009). Ground reaction forces and lower extremity kinematics when running with suppressed arm swing. *Journal of Biomechanical Engineering*, 131: 124502-1 - 124502-5. doi: 10.1115/1.4000088.
46. Hasson, C.J., **Caldwell, G.E.** and R.E.A. van Emmerik (2009). Scaling of plantarflexor muscle activity and postural time-to-contact in response to upper-body perturbations in young and older adults. *Experimental Brain Research*, 196 (3): 413-427.
45. Miller, R.H., Gillette, J.C., Derrick, T.R., and **G.E. Caldwell** (2009). Muscle forces during running predicted by gradient-based and random search static optimization algorithms. *Computer Methods in Biomechanics and Biomedical Engineering*, 12 (2): 217–225.
44. Hasson, C.J., van Emmerik, R.E.A. and **G.E. Caldwell** (2008). Predicting dynamic postural instability using center of mass time-to-contact information. *Journal of Biomechanics*, 41: 2121–2129.
43. Hasson, C.J., **Caldwell, G.E.** and R.E.A. van Emmerik (2008). Changes in muscle and joint coordination in learning to direct forces. *Human Movement Science*, 27: 590-609. doi:10.1016/j.humov.2008.02.015.
42. Astephen, J.L., Deluzio, K.J., **Caldwell, G.E.**, Dunbar, M.J. and C.L. Hubley-Kozey (2008). Gait and neuromuscular patterns associated with differences in knee osteoarthritis severity levels. *Journal of Biomechanics*, 41: 868-876.

41. Astephen, J.L., Deluzio, K.J., **Caldwell, G.E.** and M.J. Dunbar (2008). Biomechanical changes at the hip, knee and ankle joints during gait are associated with knee osteoarthritis severity. *Journal of Orthopaedic Research*, 26: 332-341.
40. Hasson, C.J., Haddad, J.M., Gagnon, J.L., **Caldwell, G.E.**, Hamill, J. and R.E.A. van Emmerik (2008). Influence of embedding parameters and noise in center of pressure recurrence quantification analysis. *Gait & Posture*, 27: 416-422. NIHMSID: NIHMS42680
39. Chu, J.J. and **G.E. Caldwell** (2004). Stiffness and damping response associated with shock attenuation in downhill running. *Journal of Applied Biomechanics*, 20: 291-308.
38. Lanza, I.R., Towse, T.F., **Caldwell, G.E.**, Wigmore, D.M. and J.A. Kent-Braun (2003). Effects of age on human muscle torque, velocity and power in two muscle groups. *Journal of Applied Physiology*, 95: 2361-2369.
37. Jones, S.L. and **G.E. Caldwell** (2003). Mono- and biarticular muscle activity during jumping in different directions. *Journal of Applied Biomechanics*, 19: 205-222.
36. Knight, C.A. and **G.E. Caldwell** (2000). Muscular and metabolic costs of simulated uphill backpacking: are hiking poles beneficial? *Medicine and Science in Sports and Exercise*, 32: 2093-2101.
35. Heiderscheit, B.C., Hamill, J. and **G.E. Caldwell** (2000). Influence of Q-angle on lower extremity running kinematics. *Journal of Orthopaedic and Sports Physical Therapy*, 30:271-278.
34. Swanson, S.C. and **G.E. Caldwell** (2000). An integrated biomechanical analysis of high speed incline and level treadmill running. *Medicine and Science in Sports and Exercise*, 32: 1146-1155.
33. Derrick, T.R., **Caldwell, G.E.** and J. Hamill (2000). Modeling the stiffness characteristics of the human body while running with various stride lengths. *Journal of Applied Biomechanics*, 16: 36-51.
32. **Caldwell, G.E.** and L. Li (2000). How strongly is muscle activity associated with joint moments? *Motor Control*, 4: 53-59.
31. Li, L. and **G.E. Caldwell** (1999). Coefficient of cross correlation and the time domain correspondence. *Journal of Electromyography and Kinesiology*, 9: 385-389.
30. Li, L., van den Bogert, E.C.H., **Caldwell, G.E.**, van Emmerik, R.E.A., and J. Hamill (1999). Coordination patterns of walking and running at similar speed and stride frequency. *Human Movement Science*, 18:67-85.
29. **Caldwell, G.E.**, Hagberg, J.M., McCole, S.D., and L. Li (1999). Lower extremity joint moments during uphill cycling. *Journal of Applied Biomechanics*, 15: 166-181.
28. Li, L. and **G.E. Caldwell** (1998). Muscular coordination in cycling: effects of surface incline and posture. *Journal of Applied Physiology*, 85: 927-934.
27. **Caldwell, G.E.**, Li, L., McCole, S.D., and J.M. Hagberg (1998). Pedal and crank kinetics in uphill cycling. *Journal of Applied Biomechanics*, 14: 245-259.
26. Derrick, T.R., Hamill, J., and **G.E. Caldwell** (1998). Energy absorption of impacts during running at various stride lengths. *Medicine and Science in Sports and Exercise*, 30: 128-135.
25. Mahar, A.T., Derrick, T.R., Hamill, J., and **G.E. Caldwell** (1997). Impact shock and attenuation during in-line skating. *Medicine and Science in Sports and Exercise*, 29: 1069-1075.
24. Hamill, J., **Caldwell, G.E.** and T.R. Derrick (1997). Reconstructing digital signals using Shannon's sampling theorem. *Journal of Applied Biomechanics*, 13: 226-238.

23. Kamen, G. and **G.E. Caldwell** (1996). Physiology and interpretation of the electromyogram. *Journal of Clinical Neurophysiology*, 13(5): 366-384.
22. Selbie, W.S. and **G.E. Caldwell** (1996). A simulation study of vertical jumping from different starting postures. *Journal of Biomechanics*, 29: 1137-1146.
21. Rosenbaum, D.A., Heugten, C.M. van and **G.E. Caldwell** (1996). From cognition to biomechanics and back: The end-state comfort effect and the middle-is-faster effect. *Acta Psychologica*, 94: 59-85.
20. Siegel, K.L., Kepple, T.M. and **G.E. Caldwell** (1996). Improved agreement of foot segmental power and rate of energy change during gait: inclusion of distal power terms and use of 3D models. *Journal of Biomechanics*, 29: 823-827.
19. **Caldwell, G.E.** and J. Whittall (1995). An energetic comparison of symmetrical and asymmetrical human gait. *Journal of Motor Behavior*, 27:139-154.
18. **Caldwell, G.E.** (1995). Tendon elasticity and relative length: effects on the Hill two-component muscle model. *Journal of Applied Biomechanics*, 11:1-24.
17. Bechtel, R. and **G.E. Caldwell** (1994). Influence of task and angle on torque production and muscle activity at the elbow. *Journal of Electromyography and Kinesiology*, 4:195-204.
16. Jamison, J.C. and **G.E. Caldwell** (1994). Dual degree of freedom tasks: flexion effect on supination / pronation response. *Journal of Electromyography and Kinesiology*, 4:143-152.
15. Jamison, J.C. and **G.E. Caldwell** (1993). Muscle synergies and isometric torque production: influence of supination and pronation level on elbow flexion. *Journal of Neurophysiology*, 70(2):947-960.
14. **Caldwell, G.E.**, Adams, W.B. and M.L. Whetstone (1993). Torque/velocity properties of human knee muscles: peak and angle-specific estimates. *Canadian Journal of Applied Physiology*, 18(3):274-290.
13. **Caldwell, G.E.**, Jamison, J.C. and S. Lee (1993). Amplitude and frequency content of surface EMG during dual-task elbow torque production. *European Journal of Applied Physiology*, 66(4): 349-356.
12. Siegel, K.L., Stanhope, S.J. and **G.E. Caldwell** (1993). Kinematic and kinetic adaptations in the lower limb during gait following a unilateral femoral neuropathy. *Clinical Biomechanics*, 8: 147-155.
11. **Caldwell, G.E.** and L.W. Forrester (1992). Estimates of mechanical work and energy transfers: demonstration of a rigid body power model of the recovery leg in gait. *Medicine and Science in Sports and Exercise*, 24(12): 1396-1412.
10. Whittall, J. and **G.E. Caldwell** (1992). Coordination of symmetrical and asymmetrical human gait: Kinematic patterns. *Journal of Motor Behavior*, 24: 339-353.
9. **Caldwell, G.E.** and M. van Leemputte (1991). Elbow torques and EMG patterns of flexor muscles during different isometric tasks. *Electromyography and Clinical Neurophysiology*, 31: 433-445.
8. **Caldwell, G.E.** and A.E. Chapman (1991). The general distribution problem: a physiological solution which includes antagonism. *Human Movement Science*, 10: 355-392.
7. **Caldwell, G.E.** and A.E. Chapman (1989). Applied muscle modelling: Implementation of muscle-specific models. *Computers in Biology and Medicine*, 19(6): 417-434.
6. Norman, R.W., **Caldwell, G.E.**, and P.V. Komi (1985). Differences in body segment energy utilization between world class and recreational cross country skiers. *International Journal of Sports Biomechanics*, 1(3): 253-262.

5. Chapman, A.E., **Caldwell, G.E.**, and W.S. Selbie (1985). Mechanical output following muscle stretch in forearm supination against inertial loads. *Journal of Applied Physiology*, 59(1): 78-86.
4. Chapman, A.E., Lonergan, R.M., and **G.E. Caldwell** (1984). Kinetic sources of lower limb angular displacement in recovery phase of sprinting. *Medicine and Science in Sports and Exercise*, 16(4): 382-388.
3. Chapman, A.E. and **G.E. Caldwell** (1983a). Factors determining changes in lower limb energy during swing in treadmill running. *Journal of Biomechanics*, 16(1): 69-77.
2. Chapman, A.E. and **G.E. Caldwell** (1983b). Kinetic limitations of maximal sprinting speed. *Journal of Biomechanics*, 16(1): 78-83.
1. Bishop, P.J., Kozey, J., and **G.E. Caldwell** (1982). Performance of eye protectors for squash and racquetball. *Physician in Sportsmedicine*, 10(3): 63-69.

### Manuscripts in review

- Hasson, C.J., van Emmerik, R.E.A. and **G.E. Caldwell** (*in review*). Age-related changes in muscle properties are related to balance decrements. Submitted to: *Journal of Applied Physiology*, July, 2012.
- Miller, R.M. and **G.E. Caldwell** (*in review*). Antagonism and the metabolic cost of simulated human locomotion. Submitted to: *Computer Methods in Biomechanics and Biomedical Engineering*, April 23, 2012.

### Refereed Publications - In Books

- Hamill, J. and **G.E. Caldwell** (2001). Mechanical load on the body. In: *ACSM's Resource Manual for Guidelines for Exercise Testing and Prescription (4<sup>th</sup> edition)*, J.L. Roitman (ed.), Lippincott Williams & Wilkins, New York, NY, USA, pp 107-112.
- Caldwell, G.E.**, van Emmerik, R.E.A., and J. Hamill (2000). Movement proficiency: incorporating task demands and constraints in assessing human movement. In: *Energetics of Human Activity*, W.A. Sparrow (ed.), Human Kinetics, Champaign, IL, USA, pp 66-95.
- Caldwell, G.E.** and J.E. Clark (1990). Measurement and evaluation of skilled human motion. In: *Advances in Motor Development 3*, J. Clark and J. Humphery (Eds.), AMS Press, Inc., New York, pp 165-200.
- Caldwell, G.E.** and A.E. Chapman (1989). Muscular co-ordination at the elbow. In: *Biomechanics XI-A*, G.D. de Groot *et al.* (Eds.), Free University Press, The Netherlands, pp 167-173.
- Chapman, A.E., **Caldwell, G.E.**, Herring, R.M., Lonergan, R.M. and W.S. Selbie (1987). Mechanical energy and the preferred style of running. In: *Biomechanics X*, B. Jonsson (Ed), Human Kinetics Pub., Champaign, Illinois, USA, pp. 875-879.
- Chapman, A.E. and **G.E. Caldwell** (1985). The use of muscle stretch in inertial loading. In: *Biomechanics IX-A*, D.A. Winter *et al* (Ed), Human Kinetics Pub., Champaign, Illinois, USA, pp. 44-49.
- Komi, P., Norman, R.W., and **G.E. Caldwell** (1982). Horizontal velocity changes of world class skiers using the diagonal technique. In: *Exercise and Sport Biology*, P.V. Komi (Ed.); Champaign, Illinois, Human Kinetics Pub., Vol.12: 166-175.

### Textbook

*Research Methods in Biomechanics*, Robertson, D.G.E., **Caldwell, G.E.**, Hamill, J., Kamen, G., and Whittlesey, S.N. (eds), Human Kinetics, Champaign, IL, USA. Publication date: April 2004.

### **Textbook in progress**

*Research Methods in Biomechanics, Second Edition*, Robertson, D.G.E., **Caldwell, G.E.**, Hamill, J., Kamen, G., and Whittlesey, S.N. (eds), Human Kinetics, Champaign, IL, USA. Publication due in 2012.

### **Textbook Chapters**

Robertson, D.G.E., and **G.E. Caldwell**. "Planar Kinematics". In: *Research Methods in Biomechanics*, Robertson, D.G.E., Caldwell, G.E., Hamill, J., Kamen, G., and Whittlesey, S.N. (eds), Human Kinetics, Champaign, IL, USA, pp 9-34, 2004.

**Caldwell, G.E.**, Robertson, D.G.E., and S.N. Whittlesey. "Forces and Their Measurement", In: *Research Methods in Biomechanics*, Robertson, D.G.E., Caldwell, G.E., Hamill, J., Kamen, G., and Whittlesey, S.N. (eds), Human Kinetics, Champaign, IL, USA, pp 73-102, 2004.

**Caldwell, G.E.** "Muscle Modeling", In: *Research Methods in Biomechanics*, Robertson, D.G.E., Caldwell, G.E., Hamill, J., Kamen, G., and Whittlesey, S.N. (eds), Human Kinetics, Champaign, IL, USA, pp 183-209, 2004.

### **Textbook Chapters in progress**

**Caldwell, G.E.** "Muscle Modeling", Submitted for 2<sup>nd</sup> edition of: *Research Methods in Biomechanics*, Robertson, D.G.E., Caldwell, G.E., Hamill, J., Kamen, G., and Whittlesey, S.N. (eds), Human Kinetics, Champaign, IL, USA, due 2012. \*\*  
\*\*significant new content from 1<sup>st</sup> edition

**Umberger, B.R., and G.E. Caldwell**. "Musculoskeletal Modeling", Submitted for 2<sup>nd</sup> edition of: *Research Methods in Biomechanics*, Robertson, D.G.E., Caldwell, G.E., Hamill, J., Kamen, G., and Whittlesey, S.N. (eds), Human Kinetics, Champaign, IL, USA, due 2012.

**Deluzio, K.J., Harrison, A.J., Coffey, N., and G.E. Caldwell**. "The Analysis of Biomechanical Waveform Data", Submitted for 2<sup>nd</sup> edition of: *Research Methods in Biomechanics*, Robertson, D.G.E., Caldwell, G.E., Hamill, J., Kamen, G., and Whittlesey, S.N. (eds), Human Kinetics, Champaign, IL, USA, due 2012.

### **Research in progress**

**G.E. Caldwell**. Identification of muscle synergies using non-negative matrix factorization.

Rosado, L. and **G.E. Caldwell**. Effect of force location on postural responses to upper-body perturbations.

Miller, R.H. and **G.E. Caldwell**. Computer simulations of human sprinting.

Swanson, S.C. and **G.E. Caldwell**. Biomechanical limits on sprint running performance.

Hasson, C.J., van Emmerik, R.E.A., and **G.E. Caldwell**. Use of two joint muscles in motor learning.

## Conference Presentations (110+)

### Proceedings

- Miller, R.H., Umberger, B.R., and **G.E. Caldwell** (2011). Optimality criteria for human running investigated by forward dynamics simulations. *Portuguese Journal of Sport Sciences*, 11 (Supplement 2), Biomechanics in Sports 29, pp 813-816. Presentation at the 29th Annual Meeting of *International Society for Biomechanics in Sports*, Porto, Portugal, June 27-July 1.
- Miller, R.H., Umberger, B.R., and **G.E. Caldwell** (2010). Effects of history dependence on the mechanics and energetics of the hill muscle model. *Medicine and Science in Sports and Exercise*, 42: 5 (Supplement), Presentation at *57th Annual Meeting and 1st World Congress of Exercise is Medicine*, American College of Sports Medicine, Baltimore, Maryland, June 1 - 5.
- Hasson C.J., **Caldwell, G.E.**, Van Emmerik, R.E.A., and C. Gariépy (2007). Postural corrections in response to increasing upper-body perturbations. *Motor Control*, 11 (Supplement), S165. Abstract of presentation at the *6th Progress in Motor Control Conference*, Brazil, August 2007.
- Hasson, C.J., van Emmerik, R.E.A., **Caldwell, G.E.**, McDermott, W.J. and J. Hamill (2007). Recurrence Quantification Analysis of upright stance with postural and respiratory challenges. *Motor Control*, 11 (Supplement), S155. Abstract of presentation at the *6th Progress in Motor Control Conference*, Brazil, August 2007.
- Hasson, C.J., van Emmerik, R.E.A. and **G.E. Caldwell** (2006). Changes in pedal force directing ability with real-time visual feedback. In: Proceedings of the *XIVth Biennial Conference of the Canadian Society for Biomechanics*, Callahan, J. et al. (eds), Waterloo, Canada, August, pp. xx, 2006.
- Swanson, S.C. and **G.E. Caldwell**. Kinetic limitations of maximal sprinting speed revisited (2005). In: Proceedings of the *XXth International Congress of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics*, CD-ROM, Davis, B.L. & van den Bogert, A.J. (eds.), Cleveland, USA, August, 2005.
- Hasson, C.J., Gagnon, J.L., van Emmerik, R.E.A. and **G.E. Caldwell** (2005). A musculoskeletal model of postural control at the ankle. In: Proceedings of the *XXth International Congress of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics*, CD-ROM, Davis, B.L. & van den Bogert, A.J. (eds.), Cleveland, USA, August, 2005.
- Caldwell, G.E.** (2004). Cycling biomechanics – where do we go from here? In: Proceedings of the *XIIIth Biennial Conference of the Canadian Society for Biomechanics*, Kozey, C.A. et al. (eds), Halifax, Canada, August, pp. 64, 2004.
- Caldwell, G.E.**, Eck, K.A., King, M.A. and M.R. Yeadon (2004). Effects of muscle model Po values on simulated jumping performance. In: Proceedings of the *XIIIth Biennial Conference of the Canadian Society for Biomechanics*, Kozey, C.A. et al. (eds), Halifax, Canada, August, pp. 186, 2004.
- Chu, J.J., McKeown, K.A. **Caldwell, G.E.** and J. Hamill (2004). Principal component analysis reveals lower extremity changes during a 10 Km run. In: Proceedings of the *XIIIth Biennial Conference of the Canadian Society for Biomechanics*, Kozey, C.A. et al. (eds), Halifax, Canada, August, pp. 44, 2004.
- Hasson, C.J., Merrell, R.E., van Emmerik, R.E.A. and **G.E. Caldwell** (2004). Changes in mono- and biarticular muscle activation patterns while learning to direct pedal forces. In: Proceedings of the *XIIIth Biennial Conference of the Canadian Society for Biomechanics*, Kozey, C.A. et al. (eds), Halifax, Canada, August, pp. 175, 2004.
- Hubley-Kozey, C.L., Deluzio, K.J., Kozey, J.W., Chu, J.J., **Caldwell, G.E.** and W.D. Stanish (2002). Pattern recognition techniques can detect EMG differences between moderate knee osteoarthritis patients and healthy controls during walking. In: *The 4th World Congress of Biomechanics* Proceedings CD-ROM, Nigg, B.M. & Herzog, W. (eds.), Calgary, Canada, filename “Normal480.pdf”.
- Deluzio, K.J., Landry, C.S.N., Chu, J.J., Hubley-Kozey, C.L., Kozey, J.W., **Caldwell, G.E.** and W.D. Stanish (2002). Knee joint kinematics and kinetics in patients with moderate osteoarthritis. In: *The 4th World Congress of Biomechanics* Proceedings CD-ROM, Nigg, B.M. & Herzog, W. (eds.), Calgary, Canada, filename “Normal924.pdf”.



Kozey, J.W., Offman, S.L., Deluzio, K.J., Hubble-Kozey, C.L., Chu, J.J., **Caldwell, G.E.** and W.D. Stanish (2002). Lower limb energetics of normal and moderate oa subjects. In: The *4th World Congress of Biomechanics* Proceedings CD-ROM, Nigg, B.M. & Herzog, W. (eds.), Calgary, Canada, filename "Normal868.pdf".

Lanza, I.R., Towse, T.F., Bartholomew, D. **Caldwell, G.E.** and J.A. Kent-Braun (2002). Muscle torque, velocity and power: effects of age. In: Proceedings of the 49<sup>th</sup> American College of Sports Medicine Meeting, *Medicine and Science in Sports and Exercise*, 34 (5): S98.

McDermott, W.J., Chu, J.J., Hamill, J., **Caldwell, G.E.** and R.E.A. van Emmerik (2001). The influence of step-related mechanical constraints on the coordination between locomotory and breathing rhythms. In: Proceedings of the *XVIIIth International Congress of Biomechanics*, Muller, R., Gerber, H. & Stacoff, A.. (eds.), Zurich, Switzerland, pp.83.

Chu, J.J., Hamill, J., and **G.E. Caldwell** (2001). Quantifying stiffness during downhill running. In: Proceedings of the *XVIIIth International Congress of Biomechanics*, Muller, R., Gerber, H. & Stacoff, A.. (eds.), Zurich, Switzerland, pp.278.

Chu, J.J., Deluzio, K.J., and **G.E. Caldwell** (2001). Principal component analysis of accelerometer data reveals differences in running styles. In: Proceedings of the *XVIIIth International Congress of Biomechanics*, Muller, R., Gerber, H. & Stacoff, A.. (eds.), Zurich, Switzerland, pp.279.

Chu, J.J. and **G.E. Caldwell** (2000). Modeling tibial accelerations in running. In: *Archives of Physiology and Biochemistry*, 108 (1/2): Proceedings of the *XIth Congress of the Canadian Society for Biomechanics*, Dansereau, J. & Prince, F. (eds), Montreal, Canada, pp. 137.

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**Caldwell, G.E.** (1999). The importance of goals and constraints in performance. In: Proceedings of the *XVIIIth International Congress of Biomechanics*, Herzog, W. & Jinha, A.. (eds.), Calgary, Canada, pp.148.

Chu, J.J., Peters, B.T., Hamill, J. and **G.E. Caldwell** (1999). Shock attenuation during downhill running. In: Proceedings of the *XVIIth International Congress of Biomechanics*, Herzog, W. & Jinha, A.. (eds.), Calgary, Canada, pp.438.

Swanson, S.C., Frappier, J. and **G.E. Caldwell** (1999). Muscular coordination during incline running with an elastic loading device. In: Proceedings of the *XVIIIth International Congress of Biomechanics*, Herzog, W. & Jinha, A.. (eds.), Calgary, Canada, pp. 230.

Li, L. and **G.E. Caldwell** (1998). Identification of phase shifting using cross correlation. In: Proceedings of the *Third North American Congress on Biomechanics*, S. McGill, M. Gross & A. Patla (eds), Waterloo, Ontario, Canada, pp. 433-434.

W.S. Selbie and **G.E. Caldwell** (1998). Common features of simulated jumping. In: Proceedings of the *Third North American Congress on Biomechanics*, S. McGill, M. Gross & A. Patla (eds), Waterloo, Ontario, Canada, pp. 461-462.

Knight, C.A., Merrell, R.E. and **G.E. Caldwell** (1998). Kinematic effects of hiking pole use in simulated uphill backpacking. In: Proceedings of the *Third North American Congress on Biomechanics*, S. McGill, M. Gross & A. Patla (eds), Waterloo, Ontario, Canada, pp. 135-136.

Swanson, S.C., Frappier, J.P. and **G.E. Caldwell** (1998). Muscular coordination during incline and level treadmill running. In: Proceedings of the *Third North American Congress on Biomechanics*, S. McGill, M. Gross & A. Patla (eds), Waterloo, Ontario, Canada, pp. 343-344.

**Caldwell, G.E.**, Robertson, D.G.E., Li, L., and J.M. Hagberg (1997). Lower extremity power and work in level and uphill cycling. In: Proceedings of the *XVIth International Congress of Biomechanics*, Miyashita, M et al. (eds.), Tokyo, Japan, pp. 226.

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**Caldwell, G.E.**, Hagberg, J.M., McCole, S.D. and L. Li (1996). Lower extremity joint moments during uphill cycling. In: Proceedings of the *Ninth Biannual Conference of the Canadian Society for Biomechanics*, Hoffer, J.A. et al. (eds), Burnaby, Canada, pp. 182-183.

Li, L., and **G.E. Caldwell** (1996). Muscular coordination of cycling: effect of change in grade and posture. In: Proceedings of the *Ninth Biannual Conference of the Canadian Society for Biomechanics*, Hoffer, J.A. et al. (eds), Burnaby, Canada, pp. 366-367.

Swanson, S.C., Derrick, T.R., Knight, C.A., Frappier, J. and **G.E. Caldwell** (1996). Joint moments and powers in level and incline treadmill running. In: Proceedings of the *Ninth Biannual Conference of the Canadian Society for Biomechanics*, Hoffer, J.A. et al. (eds), Burnaby, Canada, pp. 210-211.

Derrick, T.R., Hamill, J. and **G.E. Caldwell** (1996). Energy absorption during running at various stride frequencies. In: Proceedings of the *Ninth Biannual Conference of the Canadian Society for Biomechanics*, Hoffer, J.A. et al. (eds), Burnaby, Canada, pp. 136-137.

Mahar, A.T., Derrick, T.R., Hamill, J. and **G.E. Caldwell** (1995). Kinematic analysis of segmental shock attenuation at varying stride frequencies. In: Proceedings of the *XVth International Congress of Biomechanics*, Hakkinen, K., et al. (eds), Jyvaskyla, Finland, pp. 584-585.

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Derrick, T.R., **Caldwell, G.E.** and J. Hamill (1995). The effects of simulated MUAP shape, rate and variability on the power spectrum. In: Proceedings of the *XVth International Congress of Biomechanics*, Hakkinen, K., et al. (eds), Jyvaskyla, Finland, pp. 212-213.

Mahar, A.T., Derrick, T.R., Hamill, J. and **G.E. Caldwell** (1995). Evaluation of in-line skating for rehabilitation: impact shock considerations. Abstracts from the North American Clinical Gait Lab Conference, Waterloo, Ontario, Canada, *Gait and Posture* 3:109.

**Caldwell, G.E.**, McCole, S.D. and J.M. Hagberg (1994). Pedal force profiles during uphill cycling. In: Proceedings of the *Eighth Biannual Conference of the Canadian Society for Biomechanics*, Herzog, W. & Nigg, B.M. (eds), Calgary, Canada, pp. 58-59.

Siegel, K.L., Kepple, T.M. and **G.E. Caldwell** (1994). Segmental power and energy calculations at the foot during the stance phase of gait. In: *Proceedings of the Eighth Biannual Conference of the Canadian Society for Biomechanics*, Herzog, W. & Nigg, B.M. (eds), Calgary, Canada, pp. 20-21.

Selbie, W.S. and **G.E. Caldwell** (1993). Simulation of human jumping - task alteration. In: Proceedings of the *XIth International Symposium of Biomechanics in Sports*, Hamill, J. et al (eds), Amherst, MA, pp. 41-46.

Li, L. and **G.E. Caldwell** (1993). Effect of inertial loading on muscle activity in cycling. In: Proceedings of the *XIth International Symposium of Biomechanics in Sports*, Hamill, J. et al (eds), Amherst, MA, pp. 120-125.

**Caldwell, G.E.**, Lee, S. and J.C. Jamison (1992). The influence of torque production task on EMG frequency content. In: Proceedings of the *Second North American Congress on Biomechanics*, Draganich, L.F., R.P. Wells & J.E. Bechtold (eds), Chicago, IL, pp. 187-188.

**Caldwell, G.E.** and L.W. Forrester (1991). Mechanical work and the time course of energy transfer in the swing phase of gait. In: Proceedings of *American Society of Biomechanics 15th Annual Meeting*, Vaughn, C.L. & P.E. Martin (eds), Tempe, AZ, pp. 40-41.

Jamison, J.C. and **G.E. Caldwell** (1991). Torque and muscle activity in various isometric elbow tasks. In: Proceedings of *American Society of Biomechanics 15th Annual Meeting*, Vaughn, C.L. & P.E. Martin (eds), Tempe, AZ, pp. 174-175.

**Caldwell, G.E.**, Forrester, L.W., Phillips, S.J. and J.E. Clark (1989). Segmental energy contributions in walking and running. Abstracts from the International Society of Biomechanics Meeting, Los Angeles, CA, *Journal of Biomechanics*, 22(10): 994.

**Caldwell, G.E.** (1989). The influence of antagonism on solutions to the general distribution problem. In: Proceedings of *American Society of Biomechanics 12th Annual Meeting*, Urbana-Champaign, IL, pp. 71-72.

**Caldwell, G.E.** and A.E. Chapman (1988). Prediction of individual muscle forces including antagonism. In: *Human Locomotion V*, Proceedings of the *Fifth Biannual Conference of the Canadian Society for Biomechanics*, pp. 46-47.

Chapman, A.E. and **G.E. Caldwell** (1982). Interlimb exchanges of energy in sprinting. In: *Human Locomotion II*, Proceedings of the *Second Biannual Conference of the Canadian Society for Biomechanics*, pp. 96-97.

Chapman, A.E. and **G.E. Caldwell** (1982). Energetic limitations of sprinting speed. In: *Human Locomotion II*, Proceedings of the *Second Biannual Conference of the Canadian Society for Biomechanics*, pp. 104-105.

Chapman, A.E. and **G.E. Caldwell** (1982). Sources of lower limb energy in sprinting. In: *Human Locomotion II*, Proceedings of the *Second Biannual Conference of the Canadian Society for Biomechanics*, pp. 26-27.

Wells, R.P. and **G.E. Caldwell** (1982). Effect of body markers and image size on cine film digitization noise. In: *Human Locomotion II*, Proceedings of the *Second Biannual Conference of the Canadian Society for Biomechanics*, pp. 90-91.

## **Presentations**

Miller, RH, and **Caldwell, GE** (2012). Antagonism and the metabolic cost of simulated human locomotion. *Biennial Conference of the Canadian Society for Biomechanics*, Burnaby, BC, Canada, June 9-12.

Miller, RH, Umberger, BR, Kent-Braun, JA and **Caldwell, GE** (2011). Virtual aging of the muscular system and its effects on running biomechanics. *American Society of Biomechanics Annual Conference*, Long Beach, CA, August 10-13.

Hasson, CJ, van Emmerik, REA, and **Caldwell, GE** (2010). A musculoskeletal model of postural control: Simulated aging of muscle mechanical properties. *American Society of Biomechanics Annual Conference*, Providence, RI, August 18-21.

Laboda, MD, Gidley, AD, Hasson, CJ, **Caldwell, GE**, and Umberger, BR (2010). Subject-specific versus group-mean and generic musculoskeletal models for predicting isometric ankle dorsiflexion torque. *American Society of Biomechanics Annual Conference*, Providence, RI, August 18-21.

Miller, RH, Umberger, BR and **Caldwell, GE** (2010). Theoretical analysis of limitations to maximum sprinting speed imposed by muscle mechanical properties. *American Society of Biomechanics Annual Conference*, Providence, RI, August 18-21.

Miller, RH and **Caldwell, GE** (2010). The effect of antagonism on the calculation of muscle model parameters. *Biennial Conference of the Canadian Society for Biomechanics*, Kingston, Ontario, Canada, June 9-12.

Hasson, CJ, Miller, RH, Foulis, S., Kent-Braun, JA and **Caldwell, GE** (2009). Application of musculoskeletal models to aging: obtaining subject-specific measures of muscle volume using MRI. *American Society of Biomechanics Annual Conference*, Penn State University, August 26-29.

Miller, RH, Umberger, BR and **Caldwell, GE** (2009). Muscle forces in the lower limb predicted by static and dynamic optimization. *American Society of Biomechanics Annual Conference*, Penn State University, August 26-29.

Hasson, CJ, van Emmerik, REA, and **Caldwell, GE** (2009). Structural changes in muscle activity patterns while learning to direct pedal forces. *North American Society for the Psychology of Sport and Physical Activity Annual Conference*, Austin, Texas, June 11-13.

Miller, RH, Umberger, BR, Hamill, J and **Caldwell, GE** (2009). Dynamic optimization of maximum-effort human sprinting. *ASME 2009 Summer Bioengineering Conference*, June 17-21, Lake Tahoe, California, USA.

Miller, RH, **Caldwell, GE**, and JA Kent-Braun (2008). Fatigue in a Hill-based muscle model of human tibialis anterior. *American Physiological Society Meeting: The Integrative Biology of Exercise-V*, Hilton Head, South Carolina, September 24 to 27.

Astephen, JL, Deluzio, KJ, **Caldwell, GE**, Dunbar, MJ and CL Hubley-Kozey (2008). Biomechanical mechanisms of knee osteoarthritis. *North American Congress on Biomechanics*, Ann Arbor, Michigan, USA, August 5 to 9.

Miller, RH, **Caldwell, GE**, van Emmerik, REA, Hamill, J, Umberger, BR. (2008) Does restraining arm motion alter ground reaction forces during running? *North American Congress on Biomechanics*, Ann Arbor, Michigan, USA, August 5 to 9.

Miller, RH, Hasson, CJ, **Caldwell, GE**. (2008) Subject specific force-length parameters of the ankle plantarflexors in young adults. *North American Congress on Biomechanics*, Ann Arbor, Michigan, USA, August 5 to 9.

Hasson, CJ, Miller, RH, **Caldwell, GE**. (2008) Determination of subject specific mechanical properties of individual ankle joint muscles. *North American Congress on Biomechanics*, Ann Arbor, Michigan, USA, August 5 to 9.

Rosado, L, Hasson, CJ, van Emmerik, REA, **Caldwell, GE**. (2008). Age related changes in postural muscle responses with increasing perturbations to the upper back. *North American Congress on Biomechanics*, Ann Arbor, Michigan, USA, August 5 to 9.

Garipey, C., Hasson, C.J., van Emmerik, R.E.A., and **G.E. Caldwell**. (2008). Age-related decrease in degrees of freedom in postural control during quiet stance. *European Society of Biomechanics Meeting*, Lucerne, Switzerland, July.

Hasson, C.J., **Caldwell, G.E.**, and R.E.A. van Emmerik (2008). Adaptations in Mono- and Bi-articular Muscle Coordination with Motor Learning. *NIBIB Workshop*, Bethesda, MD, USA, June.

Hasson CJ, Van Emmerik REA, **Caldwell GE**. (2008). Age related adaptability of postural control as assessed by recurrence quantification analysis. *North American Society for the Psychology of Sport and Physical Activity Annual Conference*, Niagara Falls, Ontario, June 5-7.

Hasson CJ, **Caldwell GE**, Van Emmerik REA. (2008). Using time-to-contact to predict stepping behavior after postural perturbations in older adults. *North American Society for the Psychology of Sport and Physical Activity Annual Conference*, Niagara Falls, Ontario, June 5-7.

Miller, RH, Umberger, B, **Caldwell, GE**. (2008). Optimal control solutions for a simple model of human jumping. *ASME 2008 Summer Bioengineering Conference (SBC2008)*, Marco Island, Florida, USA, June 25-29.

Astephen, J.L., Deluzio, K.J., **Caldwell, G.E.**, Hubley-Kozey, C.L. and M.J. Dunbar (2007). Gait and neuromuscular changes associated with knee OA severity. Presentation at the *XXIst International Congress of Biomechanics*, Taipei, Taiwan, July, 2007.

Astephen, J.L., Deluzio, K.J., **Caldwell, G.E.**, Hubley-Kozey, C.L. and M.J. Dunbar (2007). Kinematic, kinetic and neuromuscular gait changes of the lower extremity with moderate knee osteoarthritis. Presentation at the *XXIst International Congress of Biomechanics*, Taipei, Taiwan, July, 2007.

Miller, R.H., **Caldwell, G.E.** and T.R. Derrick (2007). Determining vertical ground reaction forces without a force platform using a mass-spring-damper model. Presentation at the *American Society of Biomechanics*, Stanford University, Aug. 23-25, 2007.

Hasson, C.J., Gariépy, C., **Caldwell, G.E.**, Van Emmerik, R.E.A., and W.J. McDermott (2007). Critical time-to-contact after postural perturbations. Presentation at the *American Society of Biomechanics*, Stanford University, Aug. 23-25, 2007.

Umberger, B.R. and **G.E. Caldwell** (2007). Simulating the independent effects of muscle fiber type composition on vertical jumping performance. Presentation at the *ASME 2007 Summer Bioengineering Conference*, Keystone Resort & Conference Center, Keystone, Colorado, USA, June 20-24, 2007.

Hasson, C.J., van Emmerik, R.E.A. and **G.E. Caldwell** (2006). Alterations in mono- and bi-articular muscle activity patterns after learning to direct pedal forces. Presentation at the *Conference of the American Society for Biomechanics*, Blacksburg, Virginia, September, 2006.

Hasson, C.J., van Emmerik, R.E.A. and **G.E. Caldwell** (2006). Changes in pedal and joint kinetics after learning to direct pedal forces. Presentation at the *Conference of the American Society for Biomechanics*, Blacksburg, Virginia, September, 2006.

Hasson, C.J., Swanson, S.C. and **G.E. Caldwell** (2004). Three-dimensional joint kinematics and ground reaction forces during repeated single-leg vertical jumps in female high school athletes. Presentation at the *National Strength and Conditioning Association Annual Meeting*, Minneapolis, July, 2004.

O'Connor, K.M., **Caldwell, G.E.** and J. Hamill (2003). Estimation of extrinsic foot muscle forces using a musculoskeletal model. Presentation at the *Conference of the American Society for Biomechanics*, Toledo, Ohio, September, 2003.

Swanson, S.C. and **G.E. Caldwell** (1999). Muscular coordination during incline and level treadmill running: trained vs untrained responses. Presentation at the *Vth IOC Congress on Sport Sciences*, Sydney, Australia, November, 1999.

**Caldwell, G.E.** (1999). The importance of goals and constraints in performance. Invited presentation at the *XVIIth International Congress of Biomechanics*, Calgary, Canada, August, 1999.

Li, L., Heiderscheit, B., Hamill, J. and **G.E. Caldwell** (1998). Knee stiffness measurement during stance phase of level running. Presentation at the American Physical Therapy Association Annual Meeting, Boston, Massachusetts, February, 1998.

Li, L., Van Emmerik, R., Van Wegen, E., Haddad, J. and **G.E. Caldwell** (1998). Variability assessment in walking and running within the gait transition region. Presentation at the 3<sup>rd</sup> Annual Gait and Clinical Movement Analysis Meeting, San Diego, California, April, 1998.

Li, L. and **G.E. Caldwell** (1997). The effect of cycling cadences on the coordination of mono- and bi-articular muscles. Presentation at the 16<sup>th</sup> Southern Biomedical Engineering Conference, Biloxi, Mississippi, April, 1997.

**Caldwell, G.E.** (1996). Impact shock attenuation in in-line skating. Presentation in the Symposium *Physiology and biomechanics of in-line skating*, at the Meeting of the New England chapter of the American College of Sports Medicine, Boxborough, Massachusetts, November, 1996.

Li, L. and **G.E. Caldwell** (1996). Muscle activity patterns in the lower extremity during in-line skating. Presentation in the Symposium *Physiology and biomechanics of in-line skating*, at the Meeting of the New England chapter of the American College of Sports Medicine, Boxborough, Massachusetts, November, 1996.

Heil, D., and **G.E. Caldwell** (1996). Theoretical hip and knee extensor torques as a function of preferred hip angle and crank angle in cyclists. Presentation at the Meeting of the American College of Sports Medicine, Cincinnati, Ohio, June, 1996.

Li, L., and **G.E. Caldwell** (1996). The relationship of pennation angle to the index of architecture in muscle. Presentation at the Meeting of the American College of Sports Medicine, Cincinnati, Ohio, June, 1996.

**Caldwell, G.E.** (1995). Proficiency in human gait. Presentation in the Symposium *Biomechanical approaches to the analysis of gait*, at the Meeting of the New England chapter of the American College of Sports Medicine, Boxborough, Massachusetts, November, 1995.

Li, L., Swanson, S.C., **Caldwell, G.E.** and J. Hamill (1995). Measurement of lower extremity stiffness during the stance phase of level and downhill walking. Presentation at the Meeting of the New England chapter of the American College of Sports Medicine, Boxborough, Massachusetts, November, 1995.

Derrick, T.R., Hamill, J. and **G.E. Caldwell** (1995). The application of windowing functions to biomechanical data sets. Presentation at the Meeting of the American College of Sports Medicine, Minneapolis, Minnesota, June, 1995.

Siegel, K.L., Kepple, T.M. and **G.E. Caldwell** (1994). Comparison of two- and three-dimensional models used to calculate foot segmental power and energy during the stance phase of gait. Presentation at the Conference of the American Society of Biomechanics, Columbus, Ohio, October, 1994.

Forrester, L.W., Phillips, S.J., **Caldwell, G.E.** and J.E. Clark (1994). Developing gait patterns and lower limb coordination: a study of intralimb relative phasing. Presentation at the Conference of the North American Society for the Psychology of Sport and Physical Activity, Tampa, FL, June, 1994.

Forrester, L.W., Phillips, S.J., **Caldwell, G.E.** and J.E. Clark (1993). Continuity in the developmental transition from walking to running. Presentation at the Conference of the North American Society for the Psychology of Sport and Physical Activity, Minnesota, June, 1993.

Siegel, K.L., Stanhope, S.J. and **G.E. Caldwell** (1993). Stance phase gait adaptations of the lower limbs in unilateral quadriceps femoris weakness. Presentation at the Eighth East Coast Clinical Gait Conference, Rochester, Minnesota, May, 1993.

Van Leemputte, M., Andries, R., **Caldwell, G.E.** and E. Willems (1992). Static elbow flexion torque after stretch with different activation patterns. Presentation at the Conference of the European Society of Biomechanics, Rome, Italy, June, 1992.

Van Leemputte, M. and **G.E. Caldwell** (1990). The effect of non-synergistic elbow flexor activity on the estimation of elbow flexion torque. Presentation at the Conference of the American Society for Biomechanics, Miami, Florida, November, 1990.

Forrester, L.W., Clark, J.E. and **G.E. Caldwell** (1990). Developmental changes in locomotor coordination: the role of mechanical energy transfers. Presentation at the Conference of the North American Society for the Psychology of Sport and Physical Activity, Houston, Texas, June, 1990.

Whitall, J. and **G.E. Caldwell** (1989). The coordination patterns in symmetrical and asymmetrical gaits: Running vs galloping. Presentation at the Motor Development Research Consortium, Greensboro, North Carolina, October, 1989.

Whitall, J. and **G.E. Caldwell** (1989). Co-ordination patterns in symmetrical and asymmetrical gait. Presentation at the Conference of the North American Society for the Psychology of Sport and Physical Activity, Kent State University, Ohio, June, 1989.

Truly, T.L., Clark, J.E., Phillips, S.J. and **G.E. Caldwell** (1989). Getting the system started: Intralimb coordination for gait initiation in newly walking infants. Presentation at the Conference of the North American Society for the Psychology of Sport and Physical Activity, Kent State University, Ohio, June, 1989.

Clarke, L.C., Clark, J.E., Phillips, S.J. and **G.E. Caldwell** (1989). Intralimb coordination in walking: Does the lower extremity act as a coupled non-linear limit-cycle oscillator? Presentation at the Conference of the North American Society for the Psychology of Sport and Physical Activity, Kent State University, Ohio, June, 1989.

Norman, R.W., Komi, P.V., Stalhammar, H. and **G.E. Caldwell** (1983). Mechanical and estimated metabolic work rates of world class cross country skiers. Presentation at the Canadian Association of Sports Sciences Conference, Waterloo, Ontario, November, 1983.

Goodman, D., Kobayashi, R., **Caldwell, G.E.** and N. Levy (1983). Simultaneity reconsidered: an examination of the boundary effects. Presentation at the Conference of the North American Society for the Psychology of Sport and Physical Activity, May, 1983.

Chapman, A.E., **Caldwell, G.E.** and R. Lonergan (1982). Moment contributions to kinematics of sprinting. Presentation at Canadian Association of Sport Sciences Conference, Victoria, B.C., October, 1982.

Chapman, A.E., R. Lonergan and **G.E. Caldwell** (1982). Power changes with fatigue in sprinting. Presentation at Canadian Association of Sport Sciences Conference, Victoria, B.C., October, 1982.

Scheier, A., Norman, R.W. and **G.E. Caldwell** (1981). A biomechanical assessment of the accuracy of some CANSI statements on cross-country skiing technique. Presentation at the Canadian Association of Sports Sciences Conference, Halifax, Nova Scotia, November, 1981.

**Caldwell, G.E.**, Norman, R.W. and P. Komi (1981). Differences between world class and recreational cross-country skiers in body segment utilization. Presentation at VIIIth International Congress of Biomechanics, Nagoya, Japan, July, 1981.

**Caldwell, G.E.**, Norman, R.W. and P. Komi (1980). Mechanical cost and energy transfers of world class and recreational skiers. Presentation at Canadian Association of Sport Sciences Conference, Toronto, Ontario, November, 1980.

**Caldwell, G.E.**, Norman, R.W. and P. Komi (1979). Mechanical work rate and energy transfers of world class skiers. Presentation at the Canadian Association of Sports Sciences Conference, Vancouver, British Columbia, November, 1979.

Norman, R.W., Winter, D.A., Pierrynowski, M.R. and **G.E. Caldwell** (1978). Partitioning of mechanical work output. Presentation at the Canadian Association of Sports Sciences Conference, Ottawa, Ontario, November, 1978.

### **Invited Presentations**

**Caldwell, G.E.** and S.C. Swanson (2007). Limitations to maximal sprinting speed. 2007 Frappier Acceleration Facilities Conference, Dallas, Texas, April 26, 2007.

**Caldwell, G.E.** (2005). Musculoskeletal models should account for anatomical and mechanical heterogeneity. 2005 Workshop on Investigation of Human Muscle Function *In Vivo*, Vanderbilt University, Nashville, Tennessee, October, 2005.

**Caldwell, G.E.** (2001). Simulation of human jumping. Department of Physical Education, Sports Science and Recreation Management, Loughborough University, Loughborough, England, UK, March 21, 2001.

**Caldwell, G.E.** (1999). The importance of movement goals and task constraints in the interpretation of biomechanical data. Departments of Kinesiology and Physical Therapy, Dalhousie University, Halifax, Nova Scotia, November 12, 1999.

**Caldwell, G.E.** and J.J. Chu (1999). Three-dimensional motion analysis. Workshop for the Departments of Kinesiology and Physical Therapy, Dalhousie University, Halifax, Nova Scotia, November 11-14, 1999.

**Caldwell, G.E.** (1998). Biomechanics of in-line skating: a between-skate comparison. Rollerblade, Inc., Eden Prairie, Minnesota, December 3, 1998.

**Caldwell, G.E.** (1998). Biomechanical studies of in-line skating. Rollerblade, Inc., Eden Prairie, Minnesota, December 3, 1998.

**Caldwell, G.E.** (1996). Kinetic adaptations during uphill cycling. Neuromuscular Research Center, Boston University, Boston, Massachusetts, December 5, 1996.

**Caldwell, G.E.** (1993). Modelling and experimental approaches to the muscle load sharing problem. Department of Kinesiology, University of Wisconsin, Madison, Wisconsin, April, 1993.

**Caldwell, G.E.** (1993). Muscle load sharing: Modelling and experimental approaches. Department of Exercise Science, University of Massachusetts, Amherst, Massachusetts, April, 1993.

**Caldwell, G.E.** (1991). Task-specific torque and muscle activity at the human elbow. School of Kinesiology, Simon Fraser University, Vancouver, British Columbia, January, 1991.

**Caldwell, G.E.** (1989). The use of mechanical energy and phase plots in the analysis of human gait. School of Kinesiology, Simon Fraser University, Vancouver, British Columbia, June, 1989.

**Caldwell, G.E.** (1986). Biomechanics of running. Coquitlam Marathon Clinic, Coquitlam, British Columbia, March, 1986.

**Caldwell, G.E.** and T. van Rijn (1985). Biomechanics of running and running injuries. Simon Fraser University (Downtown Campus) Workshop, Vancouver, British Columbia, October, 1985.



## Grants & Contracts

Cybex, Inc., Research Equipment Grant,

*The biomechanical effectiveness of Arc and elliptical exercise trainers,*

Co-Principal Investigators **G.E. Caldwell**, B.R. Umberger, and P.S. Freedson. \$128,456, October, 2010, funded.

Canadian Institutes of Health Research, Team Grant: Physical Activity, Mobility and Health LOI

*Preventing mobility and physical activity impairments: a longitudinal, multifactorial investigation of knee osteoarthritis progression*, Principal Investigator C.L. Kozey, Collaborator **G.E. Caldwell**, Funding Period July 1, 2009 – June 30, 2010, \$10,000, funded.

National Institutes of Health, F31 EB005073-01A2

*Roles of mono- and biarticular muscles in motor learning.* Ruth L. Kirschstein National Research Service Award (NRSA).

Principal investigator: C.J. Hasson, Sponsor: **G.E. Caldwell**. Funding Period May 15, 2007 – May 15, 2009, \$50,822, funded.

National Institutes of Health, R03 AG026281-01A1

*Muscular Properties and Balance Control in Older Adults*, Principal Investigator **G.E. Caldwell**, Co-investigators, R.E.A. van Emmerik, J. Buonaccorsi. Funding Period July 15, 2006 - June 30, 2008, \$88,000 / \$133,405 (Direct / Total Costs), funded.

National Institutes of Health, R01 AG21094

*Skeletal Muscle Fatigue in Older Adults*, Principal Investigator J.A. Kent-Braun, Co-investigators, J. Buonaccorsi, **G.E. Caldwell**, Funding Period July 1, 2002 – June 30, 2007, \$1,000,000 / \$1,419,348 (Direct / Total Costs), funded.

Canadian Orthopaedic Foundation,

*Knee osteoarthritis and impact loading*, Principal Investigator Kevin DeLuzio, Co-Investigators W.H. Stanish, J. Kozey, **G.E. Caldwell**, J. Chu, \$9100\*, April, 2000, funded.

\*Winner of the Staler Award, funding increased to \$15,000.

SkyDex, Inc., Research Grant,

*Material Impact Testing: Footwear Components and Running Shoes,*

Principal Investigator **G.E. Caldwell**, \$2000, January, 2000, funded.

University of Massachusetts Faculty Research Grant,

*The role of bi-articular muscles in motor learning,*

Principal Investigator **G.E. Caldwell**, \$15,000, October, 1999, funded.

Rollerblade, Inc., Research Grant,

*Muscle activity during in-line skating: effectiveness of flexible-blade skates,*

Principal Investigator **G.E. Caldwell**, \$19,335, March, 1999, funded.

NordicTrack, Inc., Research Grant,

*Muscle activity during recumbent cycling: traditional vs. elliptical trainers,*

Principal Investigator **G.E. Caldwell**, \$6,500, April, 1998, funded.

NordicTrack, Inc., Research Grant,

*Upper body muscle activity during E-motion and Ellipse participation,*

Principal Investigator **G.E. Caldwell**, \$2,000, December, 1997, funded.

Rollerblade, Inc., Research Grant,

*Biomechanics of in-line skating: effectiveness of energy-return skates,*

Principal Investigator **G.E. Caldwell**, \$39,048, November, 1996, funded.

Rollerblade, Inc., Research Grant,

*Muscular activity patterns during in-line skating,*  
Principal Investigator **G.E. Caldwell**, \$23,300, November, 1995, funded.

Acceleration Products, Inc., Research Grant,  
*Neuro-muscular adaptations during incline sprint training,*  
Co-investigators **G.E. Caldwell** and Steve Swanson, \$17,847, September, 1995, funded.

University of Massachusetts Faculty Research Grant,  
*Force production and muscular coordination in uphill cycling,*  
Principal Investigator **G.E. Caldwell**, \$5000, October, 1993, funded.

Cycling Research Association,  
*The effective frontal area and mass of cyclists of different size,*  
Co-investigators **G.E. Caldwell** and J.M. Hagberg, \$1740, May 15, 1991, funded.

United States Olympic Committee, Sports Medicine and Sports Science Committee, Sports Science Grant,  
*Effects of hill climbing technique during cycling on physiology, biomechanics and performance,*  
Co-investigators J.M. Hagberg and **G.E. Caldwell**, \$16,000, June, 1990, funded.

University of Maryland at Baltimore, Physical Therapy Alumni Association Grant,  
*An examination of patterns of inhomogeneous stimulation of the human gluteus maximus,*  
Co-investigators J.D. Laking and **G.E. Caldwell**, \$2595, May, 1990, funded.

University of Maryland Biomedical Equipment Grant,  
*The study of neuromuscular function through electromyography,*  
Co-investigators **G.E. Caldwell**, S.J. Phillips, B.D. Hatfield and D.L. Kelley,  
\$5750, April, 1989, funded.

University of Maryland Biomedical Grant,  
*The study of mechanical properties of human muscles,*  
Principal Investigator **G.E. Caldwell**, \$7600, April, 1988, funded.

University of Maryland Graduate Research Board Summer Research Grant,  
*Prediction of individual muscle forces in human movement,*  
Principal Investigator **G.E. Caldwell**, \$4800, November, 1987, funded.

## TEACHING

### **University of Massachusetts (1993 to present)**

#### Undergraduate

#### *Semesters*

Biomechanics (Kinesiology <sup>†</sup> 430 [old 305])	Fall	1993, 1994, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004	Spring	1994, 1995, 1997, 1998, 1999, 2000, 2002, 2003, 2004, 2005
Neuromechanics of Human Movement (Kinesiology 297G)	Spring	2009*, 2012	Fall	2009*, 2010, 2011
Human Anatomy (Kinesiology 304)	Fall	1995	Spring	1996

#### Graduate

#### *Semesters*

Mechanical Analysis of Human Motion (Kinesiology 530)	Fall	2005*, 2006, 2008*		
Muscle Mechanics and Models (Kinesiology 535 [old 597G])	Fall	2000, 2010	Spring	1994, 1995, 1996, 1997, 1998, 1999, 2000, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2012
Biomechanics Laboratory (Kinesiology 730)	Spring	2006*		
Advanced Biomechanics Laboratory (Kinesiology 735 [old 797G])	Fall	1994, 1995, 1996, 1997, 1998, 1999, 2001, 2003, 2005, 2007, 2009		
Advanced Muscle Modeling (Kinesiology 697G)	Spring	1998		
Musculoskeletal Modeling (Kinesiology 797C)	Fall	2002, 2004		
Doctoral Seminar (Kinesiology 891 / 895)	Fall	2001	Spring	1995, 1998, 2010

\* *co-taught*

<sup>†</sup>Kinesiology *courses formerly named* Exercise Science (*Department name change in 2006*)

## **University of Maryland - College Park (1987 to 1993)**

### Undergraduate

Biomechanics of Human Motion (KNES 300)

### *Semesters*

Fall 1987, 1988, 1989, 1991, 1992  
Spring 1988

Mechanical Properties of Human Tissues  
(KNES 498G)

Spring 1989, 1990, 1993

### Graduate

Current Biomechanics Literature  
(KNES 670)

Spring 1988, 1989, 1990, 1991, 1992, 1993

Biomechanics Laboratory Techniques  
(KNES 770)

Fall 1988, 1989, 1990, 1991, 1992, 1993

Muscle Mechanics and Modelling  
(KNES 689J)

Spring 1991

## **Course Development**

### **University of Maryland Instructional Improvement Grant,**

*The study of muscular properties through computer models*, \$1900, April, 1988, funded.

Funds used to purchase software tools for programming an interactive computer model that permits students to simulate experiments on mammalian muscle tissue. This computer model was used in both KNES 498G and KNES 689J, and an updated version is currently in use in Kinesiology 535.

### **University of Massachusetts Faculty Grant for Teaching,**

*Biomechanics laboratory teaching software*, \$1500, March, 1999, funded.

Funds used to purchase biomechanics teaching software and development of specific laboratories for Exercise Science 305 (now Kinesiology 430).

## Advising

### **PhD:**

- (In progress) Jeff Chu
- (In progress) Steve Swanson
- (2011) Ross Miller *Optimal control of human running.*  
^ Young Scientist Pre-Doctoral Award winner, American Society of Biomechanics, 2010
- (2009) Christopher J. Hasson *Muscular properties and balance control in older adults.*
- (1999) Li Li *The influence of the inertial properties of the human body: cycling at different pedaling speeds.*

### **Master's:**

- (In progress) Devon Frayne
- (In progress) Luis Rosado
- (2004) Katherine Eck *Sensitivity of simulation models of jumping to muscular parameters*
- (2000) Stephanie Jones *A comparison of the function of mono- and biarticular muscles in directional countermovement jumps.*
- (2000) Jeff Chu *Shock attenuation in downhill running.*
- (1999) Cathleen Aron *Muscle activity patterns and 3-dimensional kinematics of in-line skating and running.*
- (1998) Chris Knight *Muscular and metabolic costs of simulated uphill backpacking: Are hiking poles beneficial?*
- (1998) Steven Swanson *Coordination during incline and level treadmill running.*
- (1996) Andrew Mahar *Impact shock and attenuation in in-line skating.*
- (1995) Melinda Whetstone *Force enhancement: the effect of the initial torque level on the impulse of an isovelocity concentric contraction.*
- (1993) Karen Siegel *Segmental power and energy calculations at the foot during gait.*
- (1993) Jon Laking *An examination of patterns of inhomogeneous stimulation of the human gluteus maximus.*
- (1992) Chris Jamison *Single degree of freedom vs dual degree of freedom isometric tasks: Effects on EMG and torque measures.*