Andrew J. H. Spence

Contact Information

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Research Program

Understanding the control and biomechanics of movement, through an integrative and multidisciplinary approach that combines biology, engineering, mathematics, and molecular tools (chemogenetics and optogenetics). This is fundamental to biology (how and why do animals move?), medicine (rehabilitation, neuromuscular disease, prosthetics), and technology (bio-inspired robotics). Recent work seeks to use chemogenetics to enhance recovery from spinal cord injury.

Current Position

Associate Professor **Nov 2013 - present**
Department of Bioengineering, Temple University, Philadelphia, USA

Previous Positions

Lecturer (Associate Professor) **Sept 2012 - Nov 2013**
Royal Veterinary College, Structure and Motion Laboratory, Hertfordshire, UK
Awarded tenure in September 2012.

RCUK Research Fellow in Biomechanics **September 2007 - September 2012**
Royal Veterinary College, Structure and Motion Laboratory, Hertfordshire, UK
The RCUK Fellowship is a prestigious 5-year award given to outstanding young investigators that alleviates teaching duties and guarantees a tenured post upon successful completion.

Post-doctoral Research Associate **September 2006 - September 2007**
Royal Veterinary College, Structure and Motion Laboratory, Hertfordshire, UK
Control and biomechanics of locomotion on compliant surfaces, with Alan Wilson.

Post-doctoral Fellow, Poly-PEDAL and Hebets Labs **January 2004 - August 2006**
University of California at Berkeley, Depts. of Integrative Biology and ESPM, Berkeley, CA
Control and neuromechanics of fast legged locomotion, with Bob Full, and sensory neurophysiology in arachnids with Eileen Hebets.

Marine Biological Laboratory, Woods Hole, MA
MBL Summer course in Computational Neuroscience **June 1999 - August 1999**

Education

Cornell University, Ithaca, New York
Doctor of Philosophy, School of Applied and Engineering Physics, August 2003
- Dissertation Topic: "Microfabricated devices for fluidic neuroprosthetics and extracellular recording *in vitro* and *in vivo*."
- Advisors: Michael S. Isaacson, Harold G. Craighead, Ronald R. Hoy

University of California at Berkeley, Berkeley, California
Bachelor of Arts, Physics (Minor: Computer Science), May 1997

Teaching

Temple University, Dept. of Bioengineering, Philadelphia, PA
Professor, Course director, Assessment Committee Member **Nov. 2013 - present**
Design and teach undergraduate courses across levels and formats. Capstone Biomechanics, Capstone Neuroengineering (Lab), Biomechanics Lab, The Bionic Human (GenEd), Principles of Bioengineering, and Intro to Engineering. Inquiry, problem, and research project based teaching model.

Royal Veterinary College, Dept. of Veterinary Basic Sciences, Hertfordshire, UK
Post-Graduate Certificate (1 yr, MS-level) in Higher Education **Fall 2012 - Spring 2013**
Taught *Comparative Animal Locomotion.* **September 2006 - Nov. 2012**

Research

Funding Awarded

May 2018: Craig H. Neilsen Foundation, *Can chemogenetic afferent modulation enhance recovery from spinal cord injury?* Principal Investigator, $266,412.

Nov 2017: Shriner's hospitals for Children, *Chemogenetic afferent modulation to improve recovery from spinal cord injury.* Principal Investigator, $712,890.

Feb 2014: Army Research Office, *NOFALL: Neuromechanics and Optogenetics: Dissecting Fast Legged Locomotion.* Principal Investigator, $390,662.

Feb 2014: Microsoft Research – Industrial/Academic PhD Studentship, *Understanding the moving quadruped: computer vision to advance science, medicine, and veterinary care.* Co-Investigator, $110,000.

Jan 2013: Petplan Charitable Trust (UK), *New methods for non-invasive detection of gait abnormalities: an integrative approach.* Principal Investigator, $9,100.

Sept 2012: Biotechnology and Biosciences Research Council (BBSRC), *Foundations of Neuromechanical Systems Biology.* Principal Investigator, £812,000.

June 2012: Biotechnology and Biosciences Research Council (BBSRC), Research Experience Placement. *Modelling animal gaits to understand stability, make predictions about neural control, and develop new tests for lameness and neuropathy.* Principal Investigator, £2000.

March 2011: Royal Society Research Grant *Closing the loop in running mice: an experimental platform to dissect the neural circuits underlying locomotion.* Principal Investigator, £13,900.

June 2011: Biotechnology and Biosciences Research Council (BBSRC), Research Experience Placement. *Does foot contact timing depend on visual input in mice?.* Principal Investigator, £2000.

Feb 2010: Engineering and Physical Sciences Research Council (EPSRC), Cross Disciplinary Initiative:*Bioinspired Control Architectures for Multilegged Locomotion.* Principal Investigator, £124,879.

Feb 2009: Royal Society International Travel Grant *Scientific and technological frontiers in field arboreal biomechanics.* Principal Investigator, £700.

Sep 2008: BBSrc - Industrial Case PhD Studentship *Assessment of equine locomotor biomechanics during racing using instrumented tags.* Co-Principal Investigator, £80,000.

JOURNAL PUBLICATIONS - *Published*

2018

Book review: **Spence, A.J.** Not just great TV – broad insights from extreme animal performance. *Current Biology Magazine* **22** (20). 22nd October 2018, Pages R1176-1177. Review of the fascinating and frequently hilarious "Feats of Strength: How Evolution Shapes Animal Athletic Abilities." by Simon Lailvaux. http://dx.doi.org/10.1016/j.cub.2018.09.009

J38. Vahedipour, A., Haji-Maghsoudi, O., Wilshin, S., Shamble, P., Robertson, B. D. and **Spence, A. J.** (2018). Uncovering the structure of the mouse gait controller: mice respond to substrate perturbations with adaptations in gait on a continuum between trot and bound. *Journal of Biomechanics*. **78** pp. 77-86. Sept. 10th, 2018. https://doi.org/10.1016/j.jbiomech.2018.07.020.

J37. Simon Wilshin, Paul Shamble, Kyle J. Hovey, Ryan Harris, **Andrew J. Spence**, and S. Tonia Hsieh (2018). Limping following limb loss increases locomotor stability. *Journal of Experimental Biology*. **221**. Sept. 25th, 2018. https://doi.org/10.1242/jeb.174268.

A nice piece on the above work for Inside JEB by Kathryn Knight is here: http://jeb.biologists.org/content/221/18/jeb189936.

J36. Haji Maghsoudi, O., Vahedipour, A., George, S. P., Hallowell, T., Robertson, B., Short, M., Gerstenhaber, J. and **Spence, A.** (2018). Matlab Software to Characterize Electrode Impedances for Neuroscience Applications. *Journal of Neuroscience Methods.* **307**, 1 September 2018, Pages 70-83. https://doi.org/10.1016/j.jneumeth.2018.06.020

J35. Omid Maghsoudi, Annie Vahedipour, Ben Robertson, and **Andrew Spence** (2018). Application of Superpixels to Segment Several Landmarks in Running Rodents. *Journal of Pattern Recognition and Image Analysis (PRIA)*. **28**, 3, pp 468–482, July 2018. https://doi.org/10.1134/S1054661818030082

2017

J34. Omid Maghsoudi, Annie Vahedipour-Tabrizi, Ben Robertson and **Andrew Spence** (2017). Superpixels Based Marker Tracking vs. Hue Thresholding In Rodent Biomechanics Application. *51st Asilomar Conference on Signals, Systems and Computers.* Pacific Grove, California, IEEE. October 29th, 2017. http://dx.doi.org/10.1109/ACSSC.2017.8335168.

J33. Simon Wilshin, G. Clark Haynes, Jack Porteous, Daniel Koditschek, Shai Revzen, and **Andrew Spence**. Morphology and the gradient of a symmetric potential predict gait transitions of dogs. (2017) *Biological Cybernetics* 111 (3) 269-277 http://dx.doi.org/10.1007/s00422-017-0721-2.

A nice media piece on the above by UMich: *Building more stable quadruped robots – a dogs point of view.* **Dept. of EECS, University of Michigan.** 28 March, 2017.

J32. Simon Wilshin, Michelle Reeve, G. Clark Haynes, Shai Revzen, Daniel Koditschek, and **Andrew Spence**. Longitudinal quasi-static stability predicts changes in dog gait on rough terrain. *Journal of Experimental Biology* (2017) 220 (10) 1864–1874. http://dx.doi.org/10.1242/jeb.149112

2016

J31. Charles, J.P., O. Cappellari, **A.J. Spence**, J.R. Hutchinson and D.J. Wells. Musculoskeletal Geometry, Muscle Architecture and Functional Specialisations of the Mouse Hindlimb. PLoS ONE (2016) **11** (4): e147669. April 26th, 2016. http://dx.doi.org/10.1371/journal.pone.0147669.

J30. Charles, J.P., O. Cappellari, **A.J. Spence**, D.J. Wells and J.R. Hutchinson. Muscle moment arms and sensitivity analysis of a mouse hindlimb musculoskeletal model. *Journal of Anatomy* (2016) 229 (4) 514-535. http://dx.doi.org/10.1111/joa.12461

J29. Haji Maghsoudi, O., A. V. Tabrizi, B. Robertson, P. Shamble and **A. Spence**. A Rodent Paw

Tracker Using Support Vector Machine. *IEEE Signal Processing in Medicine and Biology Symposium (SPMB)*, (2016). http://ieeexplore.ieee.org/document/7846866/

2015

J28. Maghsoudi, O., A. Vahedipour-Tabrizi, B.D. Robertson, P.D. Shamble, and **A.J. Spence**, A Novel Automatic Method to Track the Body and Paws of Running Mice in High Speed Video, in The IEEE Signal Processing in Medicine and Biology Symposium (2015), IEEE: Philadelphia, PA. http://ieeexplore.ieee.org/document/7405456/

J27. Mamuneas, Diamanto, **Spence, Andrew**, Manica, Andrea, King, Andrew. Bolder stickleback fish make faster decisions, but are not less accurate. *Behavioural Ecology* (2015) **26** (1): 91-96. http://dx.doi.org/10.1093/beheco/aru160.

2013

J26. **A.J. Spence**. Fast horses, robots, and neurotechnologies: Discovering how to go fast on legs. *Science in Parliament* (2013) **70** (3): 23-25. Summer 2013. http://www.vmine.net/scienceinparliament/sip.asp.

J25. **A.J. Spence**, G. Nicholson-Thomas, R. Lampe. Closing the loop in legged neuromechanics: an open-source computer vision controlled treadmill. *Journal of Neuroscience Methods* (2013) **215** (2): 164-169. http://dx.doi.org/10.1016/j.jneumeth.2013.03.009.

2012

J24. **Andrew Spence** and John Hutchinson. A Growing Size Synthesis. *Current Biology* (2012) **22** (9): R309-R314. http://dx.doi.org/10.1016/j.cub.2012.03.017

J23. **Andrew Spence**, Andrew Thurman, Michael Maher, and Alan Wilson. Speed, pacing strategy and aerodynamic drafting in Thoroughbred horse racing. *Biology Letters* (2012) **8** (4): 678-681. http://dx.doi.org/10.1098/rsbl.2011.1120.

J22. Zoe Self, **Andrew Spence**, and Alan Wilson. Racehorse speed supports a power constraint to incline running and a force constraint to decline running. *Journal of Applied Physiology* (2012) **113**: 602-607. http://jap.physiology.org/content/113/4/602.

2011

J21. **A.J. Spence**. Control strategies for legged locomotion: a comparative approach. 7th European Nonlinear Dynamics Conference (ENOC 2011), Rome, Italy. http://w3.uniroma1.it/dsg/enoc2011/proceedings/pdf/spence.pdf.

J20. Greg Byrnes and **A. J. Spence**. Ecological and biomechanical insights into the evolution of gliding in mammals (2011) *Integrative and Comparative Biology* **51**(6): 991-1001. http://dx.doi.org/10.1093/icb/icr069.

J19. Greg Byrnes, Thomas Libby, Norman, T.-L. Lim, and **A.J. Spence**. Gliding saves time but not energy in Malayan Colugos. *Journal of Experimental Biology* **214** (2011) p 2690-2696. http://dx.doi.org/10.1242/jeb.052993

J18. Simon Sponberg, **Andrew J. Spence**, Chris H. Mullens, & Robert J. Full. A single muscle's multifunctional control potential of body dynamics for postural control and running *Phil. Trans. Roy. Soc. B* **366** (2011) no. 1570 p. 1592-1605. http://dx.doi.org/10.1098/rstb.2010.0367

J17. G. Byrnes, N. T-L. Lim, C. Yeong, and **A.J. Spence**. Sex differences in the locomotor behavior and ecology of a gliding mammal (*Galeopterus variegatus*) determined from animal-borne inertial sensors. *Journal of Mammology* **92** no. 2, (2011) p 444-451. http://dx.doi.org/10.1644/10-MAMM-A-048.1

J16. K.J. Parsons, **A.J. Spence**, R. Morgan, J.A. Thompson, and A.M. Wilson. High speed field kinematics of foot contact in elite galloping horses in training. *Equine Veterinary Journal Equine Veterinary Journal* **43** no. 2 (2011) p 216-222. http://dx.doi.org/10.1111/j.2042-3306.2010.00149.x.

2010

J15. **A.J. Spence**, S. Revzen, J. Seipel, C. Mullens, and R.J. Full. Insects running on elastic surfaces. *Journal of Experimental Biology* **213** (2010) p 1907-1920. http://dx.doi.org/10.1242/jeb.042515. **Nominated for Faculty of 1000**.

J14. R.H. Willemart, R.D. Santer, **A.J. Spence**, E.A. Hebets. A sticky situation: Solifugids (Arachnida, Solifugae) use adhesive organs on their pedipalps for prey capture *Journal of Ethology* **29** no. 1 (2010) p 177-180. http://dx.doi.org/10.1007/s10164-010-0222-4.

2009

J14. T. Pfau, **A.J. Spence**, S. Starke, M. Ferrari, A. Wilson. Modern Riding Style Improves Horse Racing Times. *Science* **325** (2009) p 289. http://dx.doi.org/10.1126/science.1174605.

J13. **A.J. Spence**. Scaling in biology. *Current Biology* **19** (2009) R57-R61. http://dx.doi.org/10.1016/j.cub.2008.10.042.

2008

J12. G. Byrnes, N. T-L. Lim, and **A.J. Spence**. Take-off and landing kinetics of free-ranging Malayan colugos (*Galeopterus variegatus*). *Proceedings of the Royal Society B (2008).* http://dx.doi.org/10.1098/rspb.2007.1684.

J11. **A.J. Spence**, H. Tan and A.M. Wilson. Accuracy of the TurfTrax Racing Data System for determination of speed and position. *Equine Veterinary Journal*, 40, (2008) 680-683. http://dx.doi.org/10.2746/042516408X330338.

2007

J10. **A.J. Spence**, K.B. Neeves, D. Murphy, S. Sponberg, B.R. Land, R.R. Hoy, and M.S. Isaacson, Flexible multielectrodes can resolve multiple muscles in an insect appendage. *Journal of Neuroscience Methods* 159 (2007), 116-124. http://dx.doi.org/10.1016/j.jneumeth.2006.07.002.

2006

J9. **A.J. Spence** and E.A. Hebets, Anatomy and physiology of giant neurons in the antenniform leg of the amblypygid *Phrynus marginemaculatus*. *Journal of Arachnology* 34 (2006), 566-577. Available Online.

2005

J8. L. Spataro, J. Dilgen, S. Retterer, **A.J. Spence**, M. Isaacson, J.N. Turner, W. Shain. Dexamethasone treatment reduces astroglia responses to inserted neuroprosthetic devices in rat neocortex. *Experimental Neurology* 194 (2005), 289-300. http://dx.doi.org/10.1016/j.expneurol.2004.08.037.

2004

J7. C.D. James, **A.J. Spence**, N. Dowell, R.J. Hussein, K. Smith, H.G. Craighead, M.S. Isaacson, W. Shain, J. Turner. Extracellular Recordings from Constructed Neuronal Networks using Planar Microelectrode Arrays. *IEEE Transactions on Biomedical Engineering* 51 (2004), 1640-1648. http://dx.doi.org/10.1109/TBME.2004.827252.

J6. S.T. Retterer, K.L. Smith, C.S. Bjornsson, K.B. Neeves, **A.J. Spence**, J.N. Turner, W. Shain, and M.S. Isaacson. Model neural prostheses with Integrated Microfluidics: A Potential Intervention Strategy for Controlling Reactive Cell and Tissue Responses. *IEEE Transactions on Biomedical Engineering*, 51 (2004), 2063-2073. http://dx.doi.org/10.1109/TBME.2004.834288.

J5. A.P. Russo, S.T. Retterer, **A.J. Spence**, M.S. Isaacson, L.A. Lepak, M.G. Spencer, D.L. Martin, R. MacColl, J.N. Turner. Direct Casting of Polymeric Membranes into Microfluidic Devices. *Separation Science and Technology* 39 (2004), 2515-2530. http://dx.doi.org/10.1081/SS-200026706.

2003

J4. A. Surlykke, J.E. Yack, **A.J. Spence**, I. Hasenfuss. Hearing in hooktip moths (Drepanidae: Lepidoptera). *Journal of Experimental Biology* 206 (2003), 2653-2663. http://dx.doi.org/10.1242/jeb.00469.

J3. **A.J. Spence**, R.R. Hoy, M. S. Isaacson. A micromachined silicon multielectrode for multiunit recording. *Journal of Neuroscience Methods* 126 (2003), 119-126. http://dx.doi.org/10.1016/

S0165-0270(03)00075-X.

J2. D.H. Szarowski, M.D. Andersen, S. Retterer, **A.J. Spence**, M. Isaacson, H.G. Craighead, J.N. Turner, W. Shain. Brain responses to micro-machined silicon devices. *Brain Research* 983 (2003), 23-35. http://dx.doi.org/10.1016/S0006-8993(03)03023-3.

2002

J1. A.P. Russo, D. Apoga, N. Dowell, W. Shain, A. Turner, H. Craighead, **A.J. Spence**, S.T. Retterer, M.S. Isaacson, H.C. Hoch, J.N. Turner. Microfabricated Plastic Devices from Silicon Using Soft Intermediates. *Biomedical Microdevices* 4 (2002), 277-283. Available Online.

Journal Publications - *Submitted or under revision*

S4. Robertson, B., Vahedipour, A., Haji Maghsoudi, O., Valenti, C. D., Shamble, P. and **Spence, A. J**. (2018 (under revision)). A closed loop experimental platform including low-cost multiple camera high speed video for dissecting locomotion neuromechanics in freely moving rodents. *Journal of Neuroscience Methods*.

S3. Haji Maghsoudi, O., Vahedipour, A., Robertson, B. and **Spence, A.** (2018 (submitted)). Support Vector Machine and Neural Network Based Trackers for Rodent Locomotion. *Journal of Medical Imaging, SPIE*.

S2. Haji Maghsoudi, O., Vahedipour, A., Robertson, B. and **Spence, A.** (2018 (submitted)). 3D Based Landmark Tracker Using Superpixels Based Segmentation for Neuroscience and Biomechanics Studies. *Journal of Medical & Biological Engineering & Computing*.

S1. Self, Z.T., **Spence, A.J.**, Wilson, A.M. External Mechanical Work in the Galloping Race Horse. *Biology Letters. Under revision.*

Journal Publications - *Manuscripts in preparation*

Vahedipour, A., Short, M., Gerstenhaber, J., Hallowell, T., Haji Maghsoudi, O., Lemay, M. A. and **Spence, A**. J. (2018 (in preparation)). A versatile system for neuromuscular stimulation and recording in mouse model using a lightweight magnetically coupled headstage. *J. Neurosci. Meth.*

Vahedipour, A., Haji Maghsoudi, O., Robertson, B., Lemay, M. A. and **Spence, A. J**. (2018 (in preparation)). Uncovering the structure of the mouse gait controller with neuromuscular perturbations of freely running mice. *Journal of Neuroscience*.

Robertson, B. D., Smith, G. M., Lemay, M. A. and **Spence, A. J.** (2018 (in preparation)). Selective excitation of large diameter sensory afferents with DREADDs enhances functional recovery post-spinal cord injury. *Journal of Neuroscience*.

Invited Talks and Seminars

I41. "The road to genetic targeting of distinct classes of sensory afferent in rodents, and an application in spinal cord injury." *Applied Physiology and Biology Dept. Brown Bag Seminar Series*, Georgia Institute of Technology, September 19th, 2018.

I40. "Rough terrain, earthquakes, muscle spasms, and the loss of limbs: How poly-pedal animals can adapt their gait to keep moving under difficult circumstances" *Physics of Livings Systems and Soft Matter Seminar*, Georgia Institute of Technology (Georgia Tech), September 18th, 2018.

I39. "Gait, posture, pogo-sticks and newfangled neurogenetics: How do legged animals control their locomotion?" Guest lecture, Graduate course *Current Topics in Neuroengineering*, Drexel University, May 3rd, 2018.

I38. "Gait, posture, pogo-sticks and newfangled neurogenetics: How do legged animals control their locomotion?" **Plenary**. In 2017 IEEE Signal Processing in Medicine and Biology Symposium (SPMB), pp. 1-1. December 2nd, 2017.

I37. "Gait, posture, pogo-sticks and newfangled neurogenetics: How do many-legged animals control their locomotion?" Departmental of Kinesiology "Action Club." Penn State University. October

14th, 2016.

I36. "Modeling gait regulation to understand the control of, and constraints shaping, locomotion." Invited speaker. Frontiers in Applied and Computational Mathematics (FACM) 2016. New Jersey Institute of Technology (NJIT). June 4th 2016.

I35. "Insights into insect-scale running control from experiments in insects, dogs, humans, and robots." Invited workshop speaker and panelist. RSS Robotics: Science and Systems Conference 2015 Rome. 16th July 2015.

I34. "The Jockey as a tail: How can a jockey influence horse performance?" Invited workshop speaker and participant. RSS Robotics: Science and Systems Conference 2015 Rome. 16th July 2015.

I33. "Neuromechanics and Neurogenetics: Have the tools to precisely dissect the neural and mechanical contributions to locomotion in intact, freely behaving animals arrived?" Invited talk: AMAM 2015 at MIT. Adaptive Motion of Animals and Machines, MIT. 23rd June 2015.

I32. "Gait, posture, pogo-sticks and newfangled neurogenetics: How do many-legged animals control their locomotion?" Departmental of Biology. James Madison University. 24th April 2015.

I31. "Gait, posture, pogo-sticks and newfangled neurogenetics: How do many-legged animals control their locomotion?" Drexel University College of Medicine: Queen Lane. Drexel University. 17th April 2015.

I30. "Gait, posture, pogo-sticks and newfangled neurogenetics: How do many-legged animals control their locomotion?" Departmental of Ecology and Evolutionary Biology. Brown University. 16th September 2014.

I29. "Insects on rubber, dogs on springs, and newfangled neurogenetics in mice: How do many-legged animals control their locomotion?" Departmental of Mechanical Engineering Seminar. Johns Hopkins University. 4th September 2014.

I28. "Insects on rubber, dogs on springs, and switching the brain with light: the dynamic world of discovering how animals move." Pint of Science Talk, Bourbon Blue Pub. Manuyunk, 19 May 2014.

I27. "Insects on rubber, dogs on springs, and optogenetics in mice: How do many-legged animals control their locomotion?" RCN Neuromechanics Winter Workshop. Princeton University, 30th January 2014.

I26. "Galloping beasts, bounding robots, and molecules that probe the brain with light: The extraordinary science of discovering how animals move." British Science Festival 2013 Young Persons' Programme. 9th September 2013.

I25. "Foundations of Neuromechanical Systems Biology. Combining engineering, biology, and mathematics to understand how animals move." Microsoft Research Cambridge, Cambridge, UK. 6th September 2013.

I24. "Integrative Neuromechanics: Combining biology, engineering, and mathematics to understand how animals move." Centre for Intelligent Sensing Summer School, Queen Mary University of London, London, UK, 12th June 2013.

I23. "Fast horses... and fast robots, insects and neurotechologies: How to go fast on legs." *Invited seminar* for the Parliamentary and Scientific Committee Seminar on *Speed*. National Science and Engineering Week. Portcullis House, Parliament, London, United Kingdom. 21st March 2013.

I22. "Neuromechanics and Optogenetics: Dissecting the neural and musculoskeletal contributions to

locomotor control." *Invited seminar.* Frontiers in Sport and Exercise Science and Medicine Seminar Series, Brunel University, London, 13th March 2013.

I21. "Foundations of Neuromechanical Systems Biology. Combining engineering, biology, and mathematics to understand how we move." Department of Bioengineering Seminar, Temple University, Philadelphia, USA. 26th February 2013.

I20. *Ibid.*. **Kod*Lab** Research Group Meeting Seminar. School of Engineering and Applied Sciences, University of Pennsylvannia, Philadelphia, USA, 25th February 2013.

I19. "Integrative Neuromechanics: Combining biology, engineering, and mathematics to understand how animals move." Shriners Hospitals Pediatric Research Center, Temple University, Philadelphia, USA, 1st June 2012.

I18. "Integrative studies of fast locomotor behavour." *Invited speaker.* Locomotion Systems Science Workshop: National Science Foundation / Army Research Laboratories (USA), Washington DC, USA, 31st May 2012.

I17. "Insects on rubber, dogs on springs, and robots in a field: An integrative approach to discovering how animals move and making better robots." Computer Science Department Invited Seminar, Queen Mary University of London, 21st March 2012.

I16. "Insects on rubber, dogs on springs, and robots in a field: An integrative approach to discovering how animals move and making better robots." Centre for Cognitive Neuroscience and Cognitive Robotics Colloquium, University of Birmingham, Birmingham, UK. 13th March 2012.

I15. "Integrative Neuromechanics: Combining biology, engineering, and mathematics to understand how animals move." Dept. of Biology Seminar, Temple University, 6th February 2012.

I14. "Mathematical approaches to animal locomotion: past, present, and future." Veterinary Epidemiology and Public Health Seminar, Royal Veterinary College, 21st November 2011.

I13. "Control strategies for legged locomotion on soft surfaces: a comparative approach" European Nonlinear Oscillators Conference, 24-29 July 2011, *Invited.*

I12. "Starting an independent research career." University College London Neuroscience Early Career Forum, 23rd May 2011, *Invited Speaker.*

I11. "Insects on rubber and dogs on springs: sensing and perturbing animals to understand the mechanics of legged locomotion." *CFS Seminar*, Dept. of Organismal and Evolutionary Biology, Harvard University, Massachusetts, March 11th, 2011.

I10. *Ibid. Boston Action Club*, Dept. of Kinesiology, Northeastern University, Boston, MA, March 10th, 2011.

I9. *Ibid. Kod*Lab Research Group Meeting*, School of Engineering and Applied Science, University of Pennsylvania, Philadelphia, January 14th, 2011.

I8. *Ibid. Departmental seminar*, Dept. of Biology, Temple University, Philadelphia, January 13th, 2011.

I7. "Equine racing surfaces: How much do they vary, how do they affect hoof impact, and can we measure what the horse will feel?" Racecourse Association Clerks of the Course Seminar, 8th November 2010, London, UK.

I6. "Insects on rubber and dogs on springs: sensing and perturbing animals to understand the mechanics of legged locomotion." *Physics Colloquium*, School of Physics and Astronomy, University

of Southampton, April 30th, 2010.

I5. "Multi-legged running in the real world: how do cockroaches, dogs, and horses handle different surfaces?" *Department of Zoology Tea Talk*, University of Cambridge, January 2010, Cambridge, United Kingdom.

I4. "Multilegged runners in the real world: insects and horses running on hard and soft surfaces" Lauflabor (Locomotion laboratory) Group Seminar, University of Jena, September 14th, 2009, Jena, Germany.

I3. "Applications of Microfabricated Devices to Neuroscience and Neuromechanics." Baskin School of Engineering Invited Seminar, January, 2006. Dept. of Electrical Engineering, University of California at Santa Cruz.

I2. "Customizing Multielectrodes for Nerve Cords." Computation in Biological Systems invited seminar, February 2003, Montana State University, Bozeman, MN.

I1. "Silicon Multielectrodes for In Vivo Multi-neuron Electrophysiology." National Nanofabrication Users' Network Annual Meeting, Stanford University, November, 2002, Palo Alto, CA.

Conference Presentations without Proceedings

7. "How far are we from genetic neuromechanics? Tantalizing prospects and hard challenges using new molecular tools in movement science." Biomechanics and Neural Control of Movement (BANCOM) 2016. Deer Creek Lodge, Ohio. 12th June 2016.

6. **Undergraduate presenter:** Yam, Lindsey, Robertson, B., Vahedipour, A., Smith, G. M. and Spence, A. J. (2015). Viral Constructs for Dissection of the Neuromechanical Basis of Locomotion in Mice. In Northeast Regional Meeting of the Society for Integrative and Comparative Biology NJIT.

5. "Insects running on elastic surfaces: the role of feedforward control." *European Science Foundation – Functional Neurobiology in Minibrains: from Flies to Robots.* Sant Feliu de Guixols, Spain, October 20th, 2010.

4. "Is virtual leg stiffness a task variable for running that generalizes across posture and leg number?" Society for Experimental Biology Annual Meeting, May 2010, special session *Function and Control of Elastic Systems.* Prague, Czech Republic.

3. "Insects running on elastic surfaces: The role of feedforward control" Society for Experimental Biology Annual Meeting, June 2009, Glasgow, Scotland.

2. "Speed, strategy, drag and drafting in Thoroughbred horse racing" Society for Experimental Biology Annual Meeting, June 2009, Glasgow, Scotland.

1. "Preliminary neuroethological studies of the whip spider *Phrynus marginemaculatus* (Arachnida, Amblypigi)." International Congress of Arachnology, July 2004, Ghent, Belgium.

Conference Proceedings

C34. Omid Haji Maghsoudi, Annie Vahedipour, Tommy Hallowell, Shaun George, Benjamin Robertson, and **Andrew Spence** (2018). Electrical Characterization of Nerve Cuffs or Electrodes for Neuroscience Applications. Biomedical Engineering Society (BMES), Atlanta, Georgia. 17-20th October, 2018.

C33. Omid Haji Maghsoudi, Annie Vahedipour, Benjamin Robertson, and **Andrew Spence** (2018). Segmentation and Tracking of Multiple Landmarks on Body of Running Rodents for Neuroscience and Biomechanics Applications. Biomedical Engineering Society (BMES), Atlanta, Georgia. 17-20th October, 2018.

C32. **Selected for Dynamic Poster:** Vahedipour, A., Shamble, P., Haji Maghsoudi, O., Short, M., Robertson, B. and **Spence, A.** (2017). Uncovering the structure of the mouse gait controller with mechanical and neural perturbations. In Society for Neuroscience, vol. 410.11 / DP10/NN31. Washington, DC.

C31. Robertson, B. D., Smith, G. M., Lemay, M. A. and **Spence, A. J.** (2017). Selective excitation of large diameter sensory afferents with DREADDs enhances functional recovery post-spinal cord injury. In Society for Neuroscience, vol. 501.10/JJ8. Washington, DC.

C30. Haji Maghsoudi, O., Vahedipour, A., Robertson, B. and **Spence, A.** (2017). Superpixels based landmarks tracking for biomechanics applications. In Society for Neuroscience, vol. 93.21 / VV12. Washington, DC.

C29. Haji Maghsoudi, O., Vahedipour, A., Robertson, B. and **Spence, A.** (2017). 3D modeling of running rodents based on direct linear transform. In 2017 IEEE Signal Processing in Medicine and Biology Symposium (SPMB), pp. 1-4. Philadelphia.

C28. Haji Maghsoudi, O., Hallowell, T., Vahedipour, A., George, S. P., Robertson, B., Short, M., Gerstenhaber, J. and **Spence, A.** (2017). Impedance characterization of bipolar implantable nerve cuffs for neuroscience applications. In 2017 IEEE Signal Processing in Medicine and Biology Symposium (SPMB), pp. 1-3.

C27. Robertson, B. D., Valenti, C. D., Vahedipour-Tabrizi, A., Maghsoudi, O., Shamble, P. and **Spence, A. J.** (2016). A computer vision controlled treadmill with high speed 3D motion capture and behaviorally triggered perturbation for use in rodents. In 40th Annual Meeting of the American Society of Biomechanics. North Carolina State University

C26. Robertson, B. D., Lemay, M. A., Smith, G. M. and **Spence, A. J.** (2016). Viral expression of excitatory DREADDs in dorsal root ganglia induces reflex hyperexcitability. In Society for Neuroscience, vol. 335.02 / PP14. San Diego, CA.

C25. Haji Maghsoudi, O., Vahedipour, A., Robertson, B., Shamble, P. and **Spence, A.** (2016). A Rodent Paw Tracker Using Support Vector Machine. In Signal Processing in Medicine and Biology Symposium (SPMB), 2016 IEEE, pp. 1-3.

C24. Wilshin, S., Starr, J., Haynes, G. C., Koditschek, D. and **Spence, A.** (2015). Using a physical model to investigate dog walking behavior on rough terrain. In Society for Integrative and Comparative Biology (SICB), vol. 77.4. Palm Beach, Florida.

C23. Vahedipour, A., Valenti, C. D., Robertson, B. D., Haji Maghsoudi, O. and **Spence, A. J.** (2015). The Quakemill: A computer vision based actuated treadmill for rapid, precisely controlled mechanical perturbations of freely running animals. In Society for Neuroscience, vol. 519.03/T12. Chicago, IL.

C22. **Spence, A. J.** (2015). Neuromechanics and neurogenetics: Old questions and new tools targeted at the control of legged locomotion. In Society for Neuroscience, vol. 341.25/X12. Chicago, IL.

C21. Haji Maghsoudi, O., Vahedipour, A., Robertson, B., Shamble, P. and **Spence, A.** (2015). A novel automatic method to track the body and paws of running mice in high speed video. In 2015 IEEE Signal Processing in Medicine and Biology Symposium (SPMB), pp. 1-2.

C20. Charles, J., Cappellari, O., **Spence, A.**, Wells, D. and Hutchinson, J. (2015). Developing, Testing and Optimising a Mouse Hindlimb Musculoskeletal Model. The FASEB Journal 29.

C19. Capellari, O., Wells, K. E., Wilshin, S. D., Charles, J., Hutchinson, J. R., **Spence, A. J.** and Wells, D. J. (2015). An optogenetic approach to understanding fine control of fast locomotion. In

Society for Neuroscience. Washington, DC.

C18. Byrnes, G., **Spence, A.J.,** Martino, B., Hilt, M., Wilson, A.M. (2014) The effects of gap distance and substrate compliance on the biomechanics of jumping in gray squirrels (*Sciurus carolinensis*). *Integrative and Comparative Biology* 54:e247.

C17. Reeve, M.A.; Wilshin, S.; **Spence, A.J.** (2014) Dog gait on rough terrain: When does static stability matter? *Integrative and Comparative Biology* 54:e337.

C16. Reeve, M.A.; Wilshin, S.; Haynes, G. C.; Revzen, S.; **Spence, A.J**. (2012) Dog gait on rough terrain confirms prediction of a stability inspired dynamical systems model of quadrupedal leg control. *Society of Experimental Biology Annual Conference 2012, Salzburg, Austria.*

C15. Liedtke, A.M., Moore, S., Witte, T., **Spence, A.J.** (2012) How do animals with limited distal limb musculature use sensory feedback during locomotion? *Integrative and Comparative Biology* 52: P111.

C14. Self, Z.t., **Spence, A.J.**, Wilson, A.M. (2012) Jump racing: do horses slow down due to a force limit? *Integrative and Comparative Biology* 52: P161.

C13. Wilshin, S.D.; Haynes, G.C.; Reeve, M., Revzen, S. **Spence, Andrew J**. (2012) How is dog gait affected by natural rough terrain? *Integrative and Comparative Biology* 52: P198.

C12. Wilshin, S.D., Haynes, G.C., Porteous, J., **Spence, A. J.** (2012) Describing gait transitions and the role of symmetry in control. *Integrative and Comparative Biology* 52: P198.

C11. S. Wilshin, C.N. Kelleher, G. Byrnes, J. Seipel, **A.J. Spence** (2011) Dogs on springs: do trotting dogs adjust their virtual leg stiffness on compliant surfaces? *Integrative and Comparative Biology* 51: E152-E152.

C10. **Spence, A.J.**, Seipel, J., Revzen, S., Mullens, C., Yeats, K. and Full, R.J. (2009) Insects running on elastic surfaces: The role of feedforward control. *Annual Meeting of the Society-for-Experimental-Biology*, Glasgow, Scotland. pp S137-S137.

C9. **Spence, A.J.**, Thurman, A., Maher, M. and Wilson, A.M. (2009) Speed, strategy, drag and drafting in thoroughbred horse racing. *Annual Meeting of the Society-for-Experimental-Biology*, Glasgow, Scotland. pp S127-S127.

C8. **Spence, A.J.** and Wilson, A.M. (2008) What limits running speed in race horses. *Comparative Biochemistry and Physiology Part A, Molecular & Integrative Physiology.* 48.

C7. **A.J. Spence**, K. Parsons, M. Ferrari, T. Pfau, A. Wilson, and A. Thurman, Effects of substrate properties on equine locomotion. *Comparative Biochemistry and Physiology a-Molecular & Integrative Physiology* 146 (2007), S109-S109.

C6. **A.J. Spence**, S. Revzen, K. Yeats, C. Mullens, and R. Full, Insects running on compliant surfaces. *Comparative Biochemistry and Physiology a-Molecular & Integrative Physiology* 146 (2007), S121-S121.

C5. G. Byrnes, **A.J. Spence** and N. Lim. Locomotor biomechanics of a free-ranging gliding mammal *Cynocephalus variegatus. Comparative Biochemistry and Physiology a-Molecular & Integrative Physiology* 146 (2007), S143-S144.

C4. S. Sponberg, **A. Spence**, and R.J. Full, Testing neural control models for antenna-based tactile navigation in cockroaches. *Society for Integrative and Comparative Biology* 45 (2005), 1076-1076.

C3. S. Revzen, J. Bishop-Moser, **A.J. Spence**, and R.J. Full, Testing Control Models In Rapid

Running Insects Using Lateral Ground Translation. *Society for Integrative and Comparative Biology* 2007. Phoenix, Arizona

C2. M. Bowtell, **A. Spence**, A. Wilson, D. Kerwin, G. Irwin and I. Bezodis. Limitation to maximal speed human sprinting - Insights from bend running and fatigue. *Comparative Biochemistry and Physiology a-Molecular & Integrative Physiology* 146 (2007), S109-S109.

C1. S. Sponberg, C. Mullens, R. Full and **A. Spence**. Effective fields for muscles in the neuromechanical control of running and station-keeping cockroaches. *Comparative Biochemistry and Physiology a-Molecular & Integrative Physiology* 146 (2007), S112-S113.

Book Reviews

Current Biology Magazine / Elsevier / Yale University Press (2018). "Feats of Strength: How Evolution Shapes Animal Athletic Abilities." S. Lailvaux. October 22nd, 2018. http://dx.doi.org/10.1016/j.cub.2018.09.009

Invention Disclosure

Annie Vahedipour, Jonathan Gerstenharber, Andrew Spence, Michel Lemay "Magnetically Coupled Light Weight Neural Interface Device", Temple University, RC2017-062.

Professional Experience

Nion Corporation, Spherical aberration corrector project, Kirkland, WA
Consultant **May 1997 - August 2001**
Developed software for automatic diagnosis of aberrations from STEM images.

Media Coverage

Versatile wolf spiders limp or switch steps after limb loss. Kathryn Knight, Inside JEB. http://jeb.biologists.org/content/221/18/jeb189936.

Beagles and Bioengineering: Where the paws hit the road. College of Engineering Newsletter, Fall 2017.

Dr. Spence Featured on NPR. Temple Bioengineering Newsletter. 23 November 2017.

Tell Me Something I Don't Know – Episode 26 "Urinetown" – Freakonomics Podcast Philadelphia. **Show Contestant and Winner**. 9 May 2017.

Science for Real. Temple Now – Undergraduate Research Program. Highlights Lyanna Kessler Optogenetics Project. 9 May 2017.

Building more stable quadruped robots – a dogs point of view. **Dept. of EECS, University of Michigan.** 28 March, 2017.

Integrative Animal Locomotion Research. Temple Bioengineering Newsletter. 1 June 2015.

Illuminating Technology. **The Philadelphia Inquirer**. 14 September 2014.

See How They Run. The Daily Telegraph *Seven* Magazine. 18 November 2012.

Cell Podcast: Interview for Editorial in Size Special Issue. **Cell Podcast**. 10 May 2012.

Horse racing: Scientists say secret of success is the pack. **DiscoveryNews – AFP**. 7 March 2012.

How to predict a winner. **The Royal Society**. 7 March 2012.

How to win a horse race. **COSMOS**. Achim Eberhart, 7 March 2012.

Welcome to Robotville, Population: 20. **New Scientist Culturelab**. Celeste Biever, 1 Dec. 2011.

Robots set up home at Science Museum. **BBC News**. Rory Cellan-Jones, 5 Dec. 2011.

Gliding is quick but hard work. **Nature Newsblog**. George Wigmore, July 28th, 2011.

In Picture: Tracking Flying Lemurs. **BBC Nature**. July 28th, 2011.

Why do flying lemurs glide?. **Discover Magazine – Not Exactly Rocket Science**. Ed Yong, July 28th, 2011.

Flying Mammal Pays Price For Glides. **Scientific American – 60 Second Science**. Christopher Intagliata, July 28th, 2011.

ScienceShot: Tree Gliders Are Energy Wasters. **Science – Science Now**. Yasmin Ogale, July 28th, 2011.

Camel spiders are sticky killers. **BBC Earth News**. Matt Walker, July 8th, 2010.

"Cyber-roach" forces rethink on animal movement. **Wired.co.uk**. Duncan Geere, May 14th, 2010.

Interview and jockey feature broadcast during The Breeder's Cup. **ESPN**. Nov 8th, 2009.

Faster Horses? Study Credits Jockeys. **The New York Times**. Joe Drape, July 16th, 2009.

Secrets of Jockeying: Why Horses Go Fast. **Time.com**. Jeffrey Kluger, July 21st, 2009.

The Physics of Flesh. **Discover Magazine Blogs**, The Loom (Carl Zimmer). January 26th, 2009.

Commentary on *Acrobatic geckos steer with their tails* for **New Scientist**, March 17th, 2008.

Hang gliders. **Science** Random Samples, February 29th, 2008; 319(5867).

High-tech backpack helps reveal lemur's flying secret. Roger Highfield, **The Daily Telegraph**, February 6th, 2008.

Teaching

Formal Education

Royal Veterinary College, Dept. of Veterinary Basic Sciences, Hertfordshire, UK
Post-Graduate Certificate (1 yr, MS-level) in Higher Education **Fall 2012 - Spring 2013**

Ongoing Education

Cornell University, Dept. of Neurobiology and Behavior
Crawfly Summer Workshop on Neuroscience Education **June 2014**

Temple University – Nov. 2013 - present

Courses taught

BIOE4441/5441 Capstone Biomechanics (Spring 2015, 2016, 2017, 2018) – Sole course designer

BIOE4431/5431 Capstone Neuroengineering (Fall 2015, 2016, 2017) – Sole course designer

BIOE4101 Biomechanics Laboratory (Fall 2015, 2016) – Sole course designer

MEE/BIOE0944 The Bionic Human (Spring 2017, Fall 2017) – GenEd: Course director for multiple sections per semester

BIOE2001 Principles of Bioengineering (Fall 2014)

ENGR1901 Introduction to Engineering (Spring 2016)

Student Evaluations

Average student feedback score 4.4/5. Higher better, 5=Strongly agree, 4=Agree. 53% of all responses were classed "Upper", meaning >50% of students answered the question with 5/5.

Course Name	Capstone Neuroengineering						Capstone Biomechanics							
Course Code	BIO4431_5431						BIOE4441_5441							
Semester	Fall 2017		Fall 2016		Fall 2015		Spring 2018		Spring 2017		Spring 2016		Spring 2015	
Enrollment	16		15		21		15		17		13		13	
Completed Evaluations	15		10		21		14		11		13		12	
Questions	Mean	Level	Mean	Level	Mean	Level	Mean	Level	Mean	Level	Mean	Level	Mean	Level
1. I came well prepared for class.	3.8	M	4.1	M	4	M	4.4	M	4.6	U	4.2	M	4.2	M
2. Instructor explained objectives	4.7	U	4.2	M	4.3	M	4.7	U	4.9	U	4.7	U	4.5	U
3. Instructor well organized	4.5	U	3.6	M	4.4	M	4.8	U	4.7	U	4.8	U	4.5	U
4. Instructor conscientious office hrs	4.7	U	4.3	M	4.6	U	4.7	U	4.7	U	4.8	U	4.8	U
5. Classroom atmosphere, free to ask	4.9	U	4.4	M	4.8	U	4.7	U	4.8	U	5	U	5	U
6. Instructor provided useful feedback	4.3	U	4	M	4.5	U	4.7	U	4.6	U	4.8	U	4.3	M
7. Instructor grades fairly	4.7	U	4.2	M	4.5	U	4.9	U	4.9	U	4.9	U	4.2	M
8. Instructor taught this course well.	4.6	U	4.3	M	4.4	U	4.6	U	4.8	U	4.8	U	4.5	U
9. Content matches objectives	4.6	U	4.4	M	4.4	U	4.8	U	4.8	U	4.9	U	4.3	M
10. Increased ability to analyze	4.7	U	4.1	M	4.5	M	4.8	U	4.7	U	4.7	U	4.3	M
11. I learned a great deal	4.7	U	4.3	M	4.4	M	4.8	U	4.8	U	4.8	U	4.3	M
Average	**4.6**		**4.2**		**4.4**		**4.7**		**4.8**		**4.8**		**4.4**	

Score max = 5 = Strongly Agree; Rankings of U denotes that >50% of students gave 5

Course Name	BIOE Lab 3: Biomechanics Lab				Honors Bionic Human				Principles of Bioeng.		Hnrs Intro Eng	
Course Code	BIOE4101				MEE/BIOE0944				BIOE2001		ENGR1901	
Semester	Fall 2016		Fall 2015		Fall 2017		Spring 2017		Fall 2014		Spring 2016	
Enrollment	38		14		21		22		20		38	
Completed Evaluations	34		13		18		20		15			
Questions	Mean	Level	Mean	Level	Mean	Level	Mean	Level	Mean	Level	Mean	Level
1. I came well prepared for class.	4.1	M	4	M	3.9	M	3	L	4.5	M	4.3	M
2. Instructor explained objectives	4.4	M	4.2	M	4.1	M	3.8	M	4.5	M	4.4	U
3. Instructor well organized	4.3	M	4.5	U	4	M	4	M	4.3	M	4.5	U
4. Instructor conscientious office hrs	4.4	M	4.5	U	4.5	U	4.2	M	4.1	M	4.5	U
5. Classroom atmosphere, free to ask			4.8	U	4.9	U	4.7	U	4.6	U	4.4	U
6. Instructor provided useful feedback	4.2	M	3.8	M	4.2	M	4.4	U	4	M	4.3	U
7. Instructor grades fairly	4.3	M	4.1	M	4.4	M	4.2	M	3.9	M	4.5	U
8. Instructor taught this course well.	4.4	M	4.5	U	4.1	M	4.1	M	4.4	U	4.4	U
9. Content matches objectives	4.4	M	4.5	M	4.1	M	3.7	M	4.4	M	4.4	M
10. Increased ability to analyze	4.4	M	4.5	M	4.2	M	3	L	4.3	M	4.2	M
11. I learned a great deal	4.3	M	4.5	U	4.2	M	3.3	M	4.6	U	4.4	M
Average	**4.3**		**4.4**		**4.2**		**3.9**		**4.3**		**4.4**	

Score max = 5 = Strongly Agree; Rankings of U denotes that >50% of students gave 5

Royal Veterinary College, London UK – 2006 - Nov. 2013

COURSES TAUGHT Comparative Animal Locomotion (AY 2009, 2010, 2011, 2012, 2013) – Module leader

Mentoring

Temple University – Nov. 2013 - present

POSTDOCTORAL FELLOWS

Dr. Benjamin D. Robertson **Sept 2014 – Aug 2017**
Current position: Biomedical Engineer at Edgewise Therapeutics, Boulder Co.

Grant writing
Dr. Robertson contributing significantly to the writing of several grants, including two large ($500k+) foundation grants that were funded and an NIH R01 grant that received priority score 33% on first submission.

Journal Publications
2 papers published, 7 papers submitted, under revision, or in preparation. 7 conference presentations/proceedings.

Dr. Paul Shamble **May 2015 – May 2016**
Current Position: John Harvard Distinguished Science Fellow, Harvard University

Grant writing
NSF Preproposal Jan 2016.

Journal Publications
3 papers submitted or under revision. 3 conference presentations/proceedings.

VISITING POSTDOCTORAL FELLOWS

Dr. Simon Wilshin **Jun 2010 – current**
Current Position: Postdoctoral Fellow, Royal Veterinary College, London, UK

Dr. Wilshin was a postdoc with me in my prior faculty position at the Royal Veterinary College, and now visits Temple. We have a continuing very productive collaboration that includes Prof. Daniel Koditschek at Penn (SEAS) and Prof. Shai Revzen at Michigan (EECS).

Grant writing
Supported and co-wrote multiple proposals from 2011 onward.

Journal Publications
2 papers published, 1 submitted or under revision. 2 conference presentations/proceedings.

Dr. Ornella Capellari **Jan 2013 – current**
Current Position: Postdoctoral Fellow, Royal Veterinary College, London, UK

Dr. Capellari was a co-supervised postdoc with me in my prior faculty position at the Royal Veterinary College, and now visits Temple. Funded by my now completed UK award ?Foundations of Neuromechanical Systems Biology? (3 years, $1.2m), we continue to collaborate on publications stemming from that work.

Journal Publications
2 papers published, 1 in preparation. 2 conference presentations/proceedings.

PH.D. STUDENTS

Annie Vahedipour **Graduated Spring 2018**
Dissertation Title: Uncovering the structure of the mouse gait controller using mechanical and neuromuscular perturbation of freely running mice.

Current position
Postdoctorate fellow at **Yale University** with Dr. Nigel Bamford. June 2018 onward.

Grant writing
Awarded a First Summer Research Initiative Grant ($4k).

Journal Publications
2 papers published, 5 in preparation. 7 conference presentations/proceedings.

Invited talks

IBM Research, Precision Diagnostics – Visiting Speaker, Zurich, Switzerland, February 22, 2017 Abstract

Selected talks Dynamic Poster Presenter, The Society of Neuroscience (SFN) – 47th Annual Conference, Washington, DC, November 13, 2017
Title: Uncovering the structure of the mouse gait controller with mechanical and neural perturbations. Highlight: selected as one of the 135 dynamic poster presenters

Selected Speaker, **HHMI Janelia Research Campus** – Junior Scientist Workshop and Neural Circuits and Behavior, Ashburn, VA, October 3 - 8, 2016
Title: Uncovering the structure of the mouse gait controller with mechanical and neural perturbations Highlight: selected as one of the 20 participants out of 250 applicants

Poster Presenter, The Society of Neuroscience (SFN) – 45th Annual Conference, Chicago, IL, October 20, 2015 Abstract Title: The Quakemill: A computer vision based actuated treadmill for rapid, precisely controlled mechanical perturbations of freely running animals

Omid Haji Maghsoudi **Defense scheduled for 11/26/2018**

Dissertation title: Computer vision methods for automated rodent tracking during locomotion validated in spinal cord injury and aging studies.

Proposal approved August 8/27/2018. Currently in final round interview for computer vision for breast cancer risk analysis postdoc at Penn Medical School.

Grant writing
Awarded a Summer Research Grant ($2k).

Journal Publications
2 papers published, 6 submitted, under revision or in preparation. 9 conference presentations/proceedings.

Jaclyn Eisdorfer **September 2017 - present**
Jaclyn is completing her first year in my lab, having come from and undergraduate degree at UCSB.

Grant writing
First Summer Research Initiative Grant – Summer 2018 (Temple internal - $4000)

Jaclyn, in her first 9 months at Temple, managed to write and win funding for her summer research in 2018. She needed only high level guidance on writing this grant, and largely independently wrote this successful proposal.

George Moukarzel **September 2017 - present**
George is a Temple Presidential Fellowship winner.

TECHNICIANS

Thomas Hallowell **Jan 2018 – October 2018**
Neurotechnician on Shriner's grant.

Current Position: Technician in Traumatic Brain Injury, Children's Hospital of Pennsylvania (CHOP).

M.S. Thesis Advisor

1. Nick Caccese – "Fabrication of a Low Cost, Easily Programmable Neural Stimulator for a Research Environment" Temple Bioengineering, 2016-present

Graduate Committee Member

12. Nicole Mazouchova, Ph.D., Temple University Biology, 2014-present.
11. Josie Van Loozen, Ph.D., Drexel University Neuroscience, 2016 ? present
10. Justin Braveboy-Wagner, Ph.D., Temple University Bioengineering, 2015-present
9. Michelle Reeve, Ph.D., Royal Veterinary College UK, 2013-present.
8. Anna Leidtke, Ph.D., Royal Veterinary College UK, 2012-present
7. Francesca Marchionne, Ph.D., Temple University Bioengineering, 2014-2017. Graduated 2017.
6. Janne Pfeiffenberger, Ph.D., Temple University Biology, 2014-2017. Graduated 2017.
5. Yu Sun, M.S., Temple University Bioengineering, Graduated 2017.
4. Elliot Franz, M.S., Temple University ECE, Graduated 2014.
3. Subashini Lakshaman, M.S., Temple University Bioengineering, Graduated 2015.
2. Devon Middleton, Ph.D., Temple University Mechanical Engineering, Graduated 2014.
1. Diamanto Mamuneas, Ph.D., Royal Veterinary College Comparative Bioveterinary Sciences, Graduated 2014

Graduate Preliminary Exam Committee Member

5. Louisiane Perrin, Ph.D., Temple University Bioengineering, 2017
4. Alexander Dumont, Ph.D., Temple University Bioengineering, 2017
3. Justin Braveboy-Wagner, Ph.D., Temple University Bioengineering, 2015
2. Sarah Vakili, Ph.D., Temple University Neuroscience, 2017 ? present
1. Mahdi Aliizadeh, Ph.D., Temple University Bioengineering, 2014

Masters Student Project Advisor

4. Edward Dalton (2018) – "Mixed effects models of rodent responses to sudden substrate perturbations."
3. Thomas Hallowell (2017) – "Optical and electrical nerve cuffs and a novel magnetic headstage for neural interfacing in rodent models."
2. Manuel Portilla-Jimenez (2017-2018) – "Optogenetic perturbations of walking flies to dissect the handling of neuromechanical noise."
1. Shaun George (2016-2017) – "Impedance characterization of nerve cuff electrodes"

Senior Design Team Advisor

6. Electrical Stimulation Shin Sleeve: STIM Sleeve. Fall 2017 – Spring 2018
   Vienna Blow, Devrissa Knowles, Rachel Makar, Stacey Plasencia
5. Uniaxial force plate for the locomotive mechanics of lab rats and their neural feedback response. Fall 2016 – Spring 2017
   Mayank Parmar, Lubaina Shakir Brandon Segal, Bryanna Wands
4. LOCOMOTION: Mouse Perturbation Arena. Fall 2016 – Spring 2017
   M. Ayub, L. Chen, J. Durelli, W. Marshall
3. Optogenetic Locomotion: Open Source Computer Vision Feedback Controlled Treadmill. Fall 2015 – Spring 2016
   T. Beck, N. Caccese, A. LeKang, M. Mat
2. Project Perturbation: Closing the Loop in Running Mice. Fall 2015 – Spring 2016
   Jerid Grelecki, Miles Vendetti-Houser and Vaughn Wiernicki
1. Data Acquisition for Locomotive Mechanics of Lab Mice. Spring 2015 ? Fall 2015
   K. Alexander, G. Kapoor, J. Rodriguez, G. Saloum

High School Research Students Advisor

1. Prosthetics Subgroup – Cat Prostheses – January 2018 – present
   Science Leadership Academy – Beeber
   Abdulomar Tucker, Khafren Smith, and Stephanie Devlin

Undergraduate Research Assistants

* = Undergraduate journal article co-author. †= Undergraduate poster or oral presentation

Temple University

Department of Bioengineering

32. Thao Vo (2018 – present): Computer vision and gene therapy for spinal cord injury in rats.
31. Samantha Zaremba (2018 – present): Computer vision and gene therapy for spinal cord injury in rats.
30. Khai Nguyen (2018 – present): Computer vision and gene therapy for spinal cord injury in rats.
29. Lucia Kennedy (2018 – present): Computer vision and gene therapy for spinal cord injury in rats.
28. Garrett Benner (2018 – present): Robotics.
27. *†Matthew Short (2015 – present): Optoelectrical cuff fabrication and spinal cord injury biomechanics. Won intramural summer BESIP internship at NIH in summer 2017 – one of 16 chosen out of 300 national applicants. Returning to work intramurally at NIH post-graduation in 2018. Presented at Temple Bioenginering Summer Research Symposium in 2015 and 2016.
26. Morgan Rollins (2018 – present): Won $2000 Temple Internal CARAS Grant for summer 2018 research "Towards a better myoelectric prosthetic hand"
25. Haley Smith (2015 – 2017): Student in my Neuroengineering Class, subsequently won internship at BackYardBrains working on a mosquito courtship song experiment, gave a TED talk with BYB head Greg Gage. Now graduate student at Villanova University.
24. †Lindsey Yam (2014 – 2016) Gave Oral presentation at Regional Conference: SICB Northeast 2015 – "Viral Constructs for Dissection of the Neuromechanical Basis of Locomotion in Mice." Also presented at Temple Bioenginering Summer Research Symposium 2015.
23. *Christian Valenti (2014 – 2015): Robotic treadmill fabrication and programming.
22. †Brian Amin (2016 – present): Robotic treadmill software in ROS and mechatronics. Presented at Temple Bioengineering Summer Research Symposium.
21. †Nija White (2016 – present): Viral transgenic constructs for magnetic stimulation of neurons. Presented at Temple Bioengineering Summer Research Symposium.
20. †Jailene Miranda (2015–2017): Locomotor behavior data collection and analysis for "DREADDs based afferent modulation for enhanced recovery from spinal cord injury."
19. †Zack Wallace (2016–2017) – Fabrication of a Robot Operating System (ROS) based feedback controlled rodent treadmill for biomedical research.
18. †Mayank Parmar (2015–2017): Locomotor behavior data collection and analysis for "DREADDs based afferent modulation for enhanced recovery from spinal cord injury."
17. †Lubaina Shakir (2015–2017): Locomotor behavior data collection and analysls for "DREADDs based afferent modulation for enhanced recovery from spinal cord injury."
    Currently: Masters student in Biomedical Engineering at Columbia University
16. †Vincent Ruggieri (2015–2016) Insect and rodent neuromechanics to understand the regulation of gait.
15. †Maddison Vealey (2015–2016) Insect and rodent neuromechanics to understand the regulation of gait.
14. †Kazim Jafri (2015–2016) Tracking of insect and rodents video data to understand coordination of gait.

13. Alex Corbisiero (Summer 2016) – Tracking of rodent video data to understand coordination of gait.
    Currently: Masters in BME at University of Pennsylvannia
12. †Nicholas Caccese (2015–2017) – Insect and rodent neuromechanics to understand the regulation of gait.
    Currently: Accelerated Masters student in Temple BioE.
11. †Rachel McDonald (2015–present) Rodent neuromechanics and robotic treadmills for basic science and spinal cord injury. Presented at Temple Bioenginering Summer Research Symposium.
10. †Hira Majid (2015–2016) Neurogenetic and Experimental Tools to Dissect the Control of Locomotion. Presented at Temple Bioenginering Summer Research Symposium.
9. †Delara Kiani (2014-2015): Optogenetic neural perturbations to understand gait control in fruit flies.
8. †Larry Gardner (2015): Rough terrain perturbations of running insects to understand gait regulation.
7. †Tarek Hassan (2014–2015) – Computer vision for tracking rodents.
6. †Igor Smola (2016) – Testing bioinspired gait controllers in a RHex robot.

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5. †Kaitlyn Finnerty (2016–2017): Locomotor behavior data collection and analysls for "DREADDs based afferent modulation for enhanced recovery from spinal cord injury." Presented at Temple Biology Department Research Symposium.
4. †Lyanna Kestler (2016–2017): Optogenetic neural perturbations to understand gait control in fruit flies. Presented at Temple Biology Department Research Symposium.
    Currently: Neuroscience Research Technician at University of Pennsylvannia

University of Pennsylvannia
School of Engineering and Applied Sciences

3. Justin Starr (2011–2015) Validation of bioinspired robot gait controllers in a RHex robot. Coauthor on multiple conference presentations. Currently: Working in robotics startup industry in Washington, DC.

International Undergraduate Students

2. †Giulia Lucidi (2014–2015): Optogenetic neural perturbations to understand gait control in fruit flies. Visiting student from La Sapienza, Rome. Oral presentation and independent study report.
1. †Patricia Silva (Summer 2015): Neurogenetic and Experimental Tools to Dissect the Control of Locomotion. Presented at Temple Bioenginering Summer Research Symposium. International student from Brazil.

Service

Professional

Reviewer – Journals	Nature Scientific Reports Current Biology Journal of the Royal Society Interface Proceedings of the Royal Society B Royal Society Open Science PLoS Computational Biology IEEE ICRA (International Conference on Robotics and Automation) The Journal of Experimental Biology The Journal of Applied Physiology Frontiers in Physiology Bioinspiration and Biomimetics Journal of Neuroscience Methods Journal of Theoretical Biology Applied Animal Behaviour Science Microgravity – Science and Technology The Veterinary Journal The Journal of Experimental Zoology A Neurocomputing
Reviewer – Funding Agencies	National Science Foundation (US) Army Research Office (US) Swiss National Science Foundation The Leverhulme Trust Engineering and Physical Science Research Council (EPSRC—UK) Biotechnology and Biological Sciences Research Council (BBSRC—UK)
Advisory Panels	NASA Rodent Research Science Working Group – May 24th, 2018 Engineering and Physical Science Research Council (EPSRC—UK)
Memberships	Society for Neuroscience Society for Integrative and Comparative Biology Society for Experimental Biology
Conference organization	Session Chair, "Locomotion — substrates." Society for Integrative and Comparative Biology 2012. Session organizer, *Integration of active and passive control mechanisms in locomotion*, Society for Experimental Biology 2009.

Institutional

University Level	• 2016–present. Co-founded an interdepartmental seminar series *TEMOSC: Temple Movement Science Club* with faculty from Kinesiology, Physical Therapy, Biology and further departments. • Fall 2015–Spring 2017. GenEd Executive Committee Member
College Level	• Fall 2017–present. College of Engineering Faculty Senate Representative • Fall 2017–present. College of Engineering Resource Planning Committee

- Fall 2018–present. College of Engineering Resource Planning and Collegiate Assembly Secretary

Departmental Level

- Lead writer of our founding departmental **Strategic Plan**
- Chair, Strategic Planning Committee
- Member, Assessment Committee
- Member, Research Committee
- Member, Faculty Search Committee (2017 – present)
- Instrumental to successful ABET Accreditation 2017-2018

Outreach

- Support the Temple chapter of the Biomedical Engineering Society (BMES) with guest lectures and equipment for demonstrations.