

# Thomas J. Roberts

Curriculum Vitae March 2023

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## 1. Name and position

Thomas J. Roberts  
Professor of Biology  
Ecology, Evolution and Organismal Biology, Brown University

## 2. Education

- 1995-1998 Northeastern University  
Postdoctoral Fellow  
*Postdoctoral Advisor:* Dr. Richard Marsh
- 1990-1995 Harvard University  
Degrees received: A.M., Ph.D. in Biology. Dissertation title: Running economically: form, gait and muscle mechanics  
*Doctoral thesis advisor:* Dr. C. Richard Taylor
- 1988 University of Chicago  
Degree received: B.A. in Biology, with Honors

## 3. Professional appointments

- 2014-present Professor, Ecology and Evolutionary Biology, Brown University
- 2008-2014 Associate Professor, Ecology and Evolutionary Biology, Brown University
- 2004-2008 Assistant Professor, Ecology and Evolutionary Biology, Brown University
- 1998-2004 Assistant Professor, Department of Zoology, Oregon State University
- 1995-1998 Research Fellow, Department of Biology, Northeastern University
- 1994-1995 Research Assistant, Department of Organismic and Evolutionary Biology, Harvard University
- 1990-1994 Teaching Fellow, Harvard University
- 1989-1990 Research Assistant, Department of Organismic and Evolutionary Biology, Harvard University
- 1988 Teaching Assistant, Department of Ecology and Evolution, University of Chicago.

## 4. Completed publications

### a. Refereed Journal Articles

1. Boyer KA, Hayes KL, Umberger BR, Adamczyk PG, Bean JF, Brach JS, Clark BC, Clark DJ, Ferrucci L, Finley J, Franz JR, Golightly YM, Hortobagyi T, Hunter S, Narici M, Nicklas B, Roberts T, Sawicki G, Simonsick E & Kent JA. (2023). Age-related changes in gait biomechanics and their impact on the metabolic cost of

- walking: Report from a National Institute on Aging workshop. *Exp Gerontol* 173, 112102.
2. Taylor, Cameron R., William H. Clark, Ellen G. Clarrissimeaux, Seong Ho Yeon, Matthew J. Carty, Stuart R. Lipsitz, Roderick T. Bronson, Thomas J. Roberts, and Hugh M. Herr. "Clinical viability of magnetic bead implants in muscle." *Frontiers in Bioengineering and Biotechnology* 10 (2022): 1010276.
  3. Taylor, C. R., Yeon, S. H., Clark, W. H., Clarrissimeaux, E. G., O'Donnell, M. K., Roberts, T. J., & Herr, H. M. (2022). Untethered muscle tracking using magnetomicrometry. *Frontiers in Bioengineering and Biotechnology*, 1979.
  4. Smith, L. B., Anderson, C. V., Withangage, M. H. H., Koch, A., Roberts, T. J., & Liebl, A. L. (2022). Relationship between gene expression networks and muscle contractile physiology differences in Anolis lizards. *Journal of Comparative Physiology B*, 192(3-4), 489-499.
  5. Taylor, C. R., Srinivasan, S. S., Yeon, S. H., O'Donnell, M. K., Roberts, T. J., & Herr, H. M. (2021). Magnetomicrometry. *Science Robotics*, 6(57), eabg0656.
  6. Wold, E. S., Sleboda, D. A., & Roberts, T. J. (2021). Passive skeletal muscle can function as an osmotic engine. *Biology Letters*, 17(3), 20200738.
  7. Schuppe, E. R., Rutter, A. R., Roberts, T. J., & Fuxjager, M. J. (2021). Evolutionary and biomechanical basis of drumming behavior in woodpeckers. *Frontiers in Ecology and Evolution*, 478.
  8. Stover, K. K., Sleboda, D. A., Brainerd, E. L., & Roberts, T. J. (2021). Gastrocnemius Muscle Structural and Functional Changes Associated with Domestication in the Turkey. *Animals*, 11(7), 1850.
  9. Nuckolls GH, Kinnett K, Dayanidhi S, Domenighetti AA, Duong T, Hathout Y, Lawlor MW, Lee SSM, Magnusson SP, McDonald CM, McNally EM, Miller NF, Olwin BB, Raghavan P, Roberts TJ, Rutkove SB, Sarwark JF, Senesac CR, Vogel LF, Walter GA, Willcocks RJ, Rymer WZ, Lieber RL. Conference report on contractures in musculoskeletal and neurological conditions. *Muscle Nerve*. 2020;61(6):740-4. Epub 2020/02/29. doi: 10.1002/mus.26845. PubMed PMID: 32108365; PMCID: PMC7229996.
  10. Willwacher, S., Sleboda, D. A., Mählich, D., Brüggemann, G. P., Roberts, T. J., & Bratke, G. (2020). The time course of calf muscle fluid volume during prolonged running. *Physiological reports*, 8(9), e14414.
  11. Sleboda, D. A., Stover, K. K., & Roberts, T. J. (2020). Diversity of extracellular matrix morphology in vertebrate skeletal muscle. *Journal of morphology*, 281(2), 160-169.
  12. Sleboda, D. A., & Roberts, T. J. (2020). Internal fluid pressure influences muscle contractile force. *Proceedings of the National Academy of Sciences*, 117(3), 1772-1778.
  13. Anderson, C. V., & Roberts, T. J. (2020). The need for speed: functional specializations of locomotor and feeding muscles in Anolis lizards. *Journal of Experimental Biology*, 223(2).
  14. Rosario, M. V., & Roberts, T. J. (2020). Loading rate has little influence on tendon fascicle mechanics. *Frontiers in physiology*, 11, 255.
  15. Arellano, C. J., Konow, N., Gidmark, N. J., & Roberts, T. J. (2019). Evidence of a tunable biological spring: elastic energy storage in aponeuroses varies with transverse strain in vivo. *Proceedings of the Royal Society B*, 286(1900), 20182764.

16. Roberts, T. J. (2019). Some challenges of playing with power: does complex energy flow constrain neuromuscular performance?. *Integrative and comparative biology*, 59(6), 1619-1628.
17. Roberts, T. J., Eng, C. M., Sleboda, D. A., Holt, N. C., Brainerd, E. L., Stover, K. K., ... & Azizi, E. (2019). The multi-scale, three-dimensional nature of skeletal muscle contraction. *Physiology*, 34(6), 402-408.
18. Sleboda, D. A., Wold, E. S., & Roberts, T. J. (2019). Passive muscle tension increases in proportion to intramuscular fluid volume. *Journal of Experimental Biology*, 222(21).
19. Ruttiman, R. J., Sleboda, D. A., & Roberts, T. J. (2018). Release of fascial compartment boundaries reduces muscle force output. *Journal of Applied Physiology*, 126: 593-598.
20. Stover, K. K., Brainerd, E. L. and Roberts, T. J. (2018). Waddle and shuffle: gait alterations associated with domestication in turkeys. *J Exp Biol* 221.
21. Eng, C. M., Azizi, E. and Roberts, T. J. (2018). Structural Determinants of Muscle Gearing During Dynamic Contractions. *Integr Comp Biol* 58, 207-218.
22. Camp, A. L., Roberts, T. J. and Brainerd, E. L. (2018). Bluegill sunfish use high power outputs from axial muscles to generate powerful suction-feeding strikes. *J Exp Biol* 221.
23. Stover, K. K., Weinreich, D. M., Roberts, T. J. and Brainerd, E. L. (2018). Patterns of musculoskeletal growth and dimensional changes associated with selection and developmental plasticity in domestic and wild strain turkeys. *Ecol Evol* 8, 3229-3239.
24. Eng, C. M. and Roberts, T. J. (2018). Aponeurosis influences the relationship between muscle gearing and force. *J Appl Physiol (1985)* 125, 513-519.
25. Sleboda, D. A. and Roberts, T. J. (2017). Incompressible fluid plays a mechanical role in the development of passive muscle tension. *Biol Lett* 13.
26. Lieber, R. L., Roberts, T. J., Blemker, S. S., Lee, S. S. M. and Herzog, W. (2017). Skeletal muscle mechanics, energetics and plasticity. *J Neuroeng Rehabil* 14, 108.
27. Konow, N., Cheney, J. A., Roberts, T. J., Iriarte-Diaz, J., Breuer, K. S., Waldman, J. R. S. and Swartz, S. M. (2017). Speed-dependent modulation of wing muscle recruitment intensity and kinematics in two bat species. *J Exp Biol* 220, 1820-1829.
28. Kambic, R. E., Roberts, T. J. and Gatesy, S. M. (2017). 3-D range of motion envelopes reveal interacting degrees of freedom in avian hind limb joints. *J Anat* 231, 906-920.
29. Roberts, T. J. (2016). Contribution of elastic tissues to the mechanics and energetics of muscle function during movement. *J Exp Biol* 219, 266-75.
30. Kram, R. and Roberts, T. J. (2016). A. V. Hill sticks his neck out. *J Exp Biol* 219, 468-9.
31. Holt, N. C., Danos, N., Roberts, T. J. and Azizi, E. (2016). Stuck in gear: age-related loss of variable gearing in skeletal muscle. *J Exp Biol* 219, 998-1003.
32. Camp, A. L., Astley, H. C., Horner, A. M., Roberts, T. J. and Brainerd, E. L. (2016). Fluoromicrometry: A Method for Measuring Muscle Length Dynamics with Biplanar Videofluoroscopy. *J Exp Zool A Ecol Genet Physiol* 325, 399-408.
33. Arellano, C. J., Gidmark, N. J., Konow, N., Azizi, E. and Roberts, T. J. (2016). Determinants of aponeurosis shape change during muscle contraction. *J Biomech* 49, 1812-7.
34. Kambic, R. E., Roberts, T. J. and Gatesy, S. M. (2015). Guineafowl with a twist: asymmetric limb control in steady bipedal locomotion. *J Exp Biol* 218, 3836- 44.

35. Konow, N., Cheney, J. A., Roberts, T. J., Waldman, J. R. and Swartz, S. M. (2015). Spring or string: does tendon elastic action influence wing muscle mechanics in bat flight? *Proc Biol Sci* 282, 20151832.
36. Camp, A. L., Roberts, T. J. and Brainerd, E. L. (2015). Swimming muscles power suction feeding in largemouth bass. *Proc Natl Acad Sci U S A* **112**, 8690-5.
37. Astley, H. C., Haruta, A. and Roberts, T. J. (2015). Robust jumping performance and elastic energy recovery from compliant perches in tree frogs. *J Exp Biol* 218, 3360-3.
38. Sawicki, G. S., Sheppard, P. and Roberts, T. J. (2015). Power amplification in an isolated muscle-tendon is load dependent. *J Exp Biol*. 218:3700-9.
39. Sawicki, G. S., Robertson, B. D., Azizi, E. and Roberts, T. J. (2015). Timing matters: tuning the mechanics of a muscle-tendon unit by adjusting stimulation phase during cyclic contractions. *J Exp Biol* 218, 3150-9.
40. Konow, N. and Roberts, T. J. (2015). The series elastic shock absorber: tendon elasticity modulates energy dissipation by muscle during burst deceleration. *Proc Biol Sci* 282, 20142800.
41. Holt, N. C., Roberts, T. J., & Askew, G. N. (2014). The energetic benefits of tendon springs in running: is the reduction of muscle work important? *The Journal of Experimental Biology*, 217(Pt 24), 4365–4371. doi:10.1242/jeb.112813
42. Astley, H. C., & Roberts, T. J. (2014). The mechanics of elastic loading and recoil in anuran jumping. *The Journal of Experimental Biology*, 217(Pt 24), 4372–4378. doi:10.1242/jeb.110296
43. Kambic, R. E., Roberts, T. J., & Gatesy, S. M. (2014). Long-axis rotation: a missing degree of freedom in avian bipedal locomotion. *The Journal of Experimental Biology*, 217(Pt 15), 2770–2782. doi:10.1242/jeb.101428
44. Cheney, J. A., Konow, N., Middleton, K. M., Breuer, K. S., Roberts, T. J., Giblin, E. L., & Swartz, S. M. (2014). Membrane muscle function in the compliant wings of bats. *Bioinspiration & Biomimetics*, 9(2), 025007.
45. Azizi, E., Roberts, T. J. (2014). Geared up to stretch: pennate muscle behavior during active lengthening. *J Exp Biol*, 217(Pt 3), 376-381.
46. Astley, H. C., Abbott, E. M., Azizi, E., Marsh, R. L., & Roberts, T. J. (2013). Chasing maximal performance: a cautionary tale from the celebrated jumping frogs of Calaveras County. *J Exp Biol*, 216(Pt 21), 3947-3953.
47. Roberts, T.J., Konow, N. (2013). How tendons buffer energy dissipation by muscle. *Exerc. Sport. Sci. Rev.* 41(4).
48. Azizi, E., Roberts, T.J. (2013). Variable gearing in a biologically inspired pneumatic actuator array. *Bioinspiration. & Biomimetics*. 8: 026002.
49. Astley, H.C., Roberts, T.J. (2012). Evidence for a vertebrate catapult: elastic energy storage in the plantaris tendon during frog jumping. *Biol. Lett.* 8: 386-389.
50. Matson, A., Konow, N., Miller, S., Konow, P.P., Roberts, T.J. (2012). Tendon material properties vary and are interdependent among turkey hindlimb muscles. *J. Exp. Biol.* 215: 3552-3558.
51. Konow, N., Azizi, E., Roberts, T.J. (2012). Muscle power attenuation by tendon during energy dissipation. *Proc. Biol. Sci.* 279: 1108-1113.
52. Langman, V.A., Rowe, M.F., Roberts, T.J., Langman, N.V., Taylor, C.R. (2012). Minimum cost of transport in Asian elephants: do we really need a bigger elephant?

- J. Exp. Biol.* 215: 1509-1514.
53. Roberts, T.J., Azizi, E. (2011). Flexible mechanisms: the diverse roles of biological springs in vertebrate movement. *J. Exp. Biol.* 214: 353-361.
  54. Roberts, T.J., Abbott, E.M., Azizi, E. (2011). The weak link: do muscle properties determine locomotor performance in frogs? *Philos. Trans. R. Soc. Lond. B. Biol. Sci.* 366: 1488-1495.
  55. Kim, H.R., Liu, K., Roberts, T.J., Hai, C.M. (2011). Length-dependent modulation of cytoskeletal remodeling and mechanical energetics in airway smooth muscle. *Am. J. Respir. Cell. Mol. Biol.* 44: 888-897.
  56. Roberts, T.J., Azizi, E. (2010). The series-elastic shock absorber: tendons attenuate muscle power during eccentric actions. *J. Appl. Physiol.* 109: 396-404.
  57. Azizi, E., Roberts, T.J. (2010). Muscle performance during frog jumping: influence of elasticity on muscle operating lengths. *Proc. Biol. Sci.* 277: 1523-1530.
  58. Azizi, E., Halenda, G.M., Roberts, T.J. (2009). Mechanical properties of the gastrocnemius aponeurosis in wild turkeys. *Integr. Comp. Biol.* 49: 51-58.
  59. Azizi, E., Roberts, T.J. (2009). Biaxial strain and variable stiffness in aponeuroses. *J. Physiol.* 587: 4309-4318.
  60. Gabaldon, A.M., Nelson, F.E., Roberts, T.J. (2008). Relative shortening velocity in locomotor muscles: turkey ankle extensors operate at low V/V<sub>max</sub>. *Am. J. Physiol. Regul. Integr. Comp. Physiol.* 294: R200-R210.
  61. Roberts, T.J., Gabaldon, A.M. (2008). Interpreting muscle function from EMG: lessons learned from direct measurements of muscle force. *Int. Comp. Biol.* 48: 312-320.
  62. Nelson, F.E., Roberts, T.J. (2008). Task-dependent force sharing between muscle synergists during locomotion in turkeys. *J. Exp. Biol.* 211: 1211-1220.
  63. Azizi, E., Brainerd, E.L., Roberts, T.J. (2008). Variable gearing in pennate muscles. *Proc. Natl. Acad. Sci. U. S. A.* 105: 1745-1750.
  64. Roberts, T.J., Higginson, B.K., Nelson, F.E., Gabaldón, A.M. (2007). Muscle strain is modulated more with running slope than speed in wild turkey knee and hip extensors. *J. Exp. Biol.* 210: 2510-2517.
  65. Roberts, T.J., Belliveau, R.A. (2005). Sources of mechanical power for uphill running in humans. *J. Exp. Biol.* 208: 1963-1970.
  66. Nelson, F.E., Gabaldon, A.M., Roberts, T.J. (2004). Force-velocity properties of two avian hindlimb muscles. *Comp. Biochem. Physiol. A. Mol. Integr. Physiol.* 137: 711-721.
  67. Biewener, A.A., Farley, C.T., Roberts, T.J., Temaner, M. (2004). Muscle mechanical advantage of human walking and running: implications for energy cost. *J. Appl. Physiol.* 97: 2266-2274.
  68. Gabaldón, A.M., Nelson, F.E., Roberts, T.J. (2004). Mechanical function of two ankle extensors in wild turkeys: shifts from energy production to energy absorption during incline versus decline running. *J. Exp. Biol.* 207: 2277-2288.
  69. Roberts, T.J., Scales, J.A. (2004). Adjusting muscle function to demand: joint work during acceleration in wild turkeys. *J. Exp. Biol.* 207: 4165-4174.
  70. Griffin, T.M., Roberts, T.J., Kram, R. (2003). Metabolic cost of generating muscular

- force in human walking: insights from load-carrying and speed experiments. *J. Appl. Physiol.* 95: 172-183.
71. Roberts, T.J., Marsh, R.L. (2003). Probing the limits to muscle-powered
  72. Roberts, T.J. (2002). The integrated function of muscles and tendons during locomotion. *Comp. Biochem. Physiol. A. Mol. Integr. Physiol.* 133: 1087-1099.
  73. Roberts, T.J., Scales, J.A. (2002). Mechanical power output during running accelerations in wild turkeys. *J. Exp. Biol.* 205: 1485-194.
  74. Roberts, T.J. (2001). Muscle force and stress during running in dogs and wild turkeys. *Bull. Mus. Comp. Zool.* 156: 283-291.
  75. Biewener, A.A., Roberts, T.J. (2000). Muscle and tendon contributions to force, work, and elastic energy savings: a comparative perspective. *Exerc. Sport. Sci. Rev.* 28: 99-107.
  76. Roberts TJ (1998) Moving on land: optimizing for minimum cost. In: Weibel ER, Taylor CR, Bolis LC, editors. Diversity in biological design: Symmorphosis - fact or fancy. Cambridge: Cambridge University Press. pp. 114-120.
  77. Roberts, T.J., Kram, R., Weyand, P.G., Taylor, C.R. (1998). Energetics of bipedal running. I. Metabolic cost of generating force. *J. Exp. Biol.* 201: 2745-2751.
  78. Roberts, T.J., Chen, M.S., Taylor, C.R. (1998). Energetics of bipedal running. II. Limb design and running mechanics. *J. Exp. Biol.* 201: 2753-2762.
  79. Roberts, T.J., Marsh, R.L., Weyand, P.G., Taylor, C.R. (1997). Muscular force in running turkeys: the economy of minimizing work. *Science.* 275: 1113-1115.
  80. Taylor, C.R., Weibel, E.R., Weber, J., Vock, R., Hoppeler, H., Roberts, T.J., Brichon, G. (1996). Design of the oxygen and substrate pathways. I. Model and strategy to test symmorphosis in a network structure. *J. Exp. Biol.* 199: 1643-1649.
  81. Roberts, T.J., Weber, J., Hoppeler, H., Weibel, E.R., Taylor, C.R. (1996). Design of the oxygen and substrate pathways. II. Defining the upper limits of carbohydrate and fat oxidation. *J. Exp. Biol.* 199: 1651-1658.
  82. Weber, J., Roberts, T.J., Vock, R., Weibel, E.R., Taylor, C.R. (1996). Design of the oxygen and substrate pathways. III. Partitioning energy provision from carbohydrates. *J. Exp. Biol.* 199: 1659-1666.
  83. Weibel, E.R., Taylor, C.R., Weber, J., Vock, R., Roberts, T.J., Hoppeler, H. (1996). Design of the oxygen and substrate pathways. VII. Different structural limits for oxygen and substrate supply to muscle mitochondria. *J. Exp. Biol.* 199: 1699-1709.
  84. Langman, V.A., Rowe, M., Forthman, D., Whitton, B., Langman, N., Roberts, T.J., Huston, K., Boling, C., Maloney, D. (1996). Thermal Assesment of Zoological Exhibits I: Sea Lion Enclosure at the Audobon Zoo. *Zoo. Biology.* 15: 403-411.
  85. Langman, V.A., Roberts, T.J., Black, J., Maloiy, G.M., Heglund, N.C., Weber, J.M., Kram, R., Taylor, C.R. (1995). Moving cheaply: energetics of walking in the African elephant. *J. Exp. Biol.* 198: 629-632.
  86. Weber, J.M., Roberts, T.J., Taylor, C.R. (1993). Mismatch between lipid mobilization and oxidation: glycerol kinetics in running African goats. *Am. J. Physiol.* 264: R797-R803.

b. Non-refereed Journal Articles

Roberts TJ & Petersen JC. (2023). An ambitious study finds the limits of force production in human skeletal muscles. *J Physiol*.

Kram, R. and Roberts, T.J. (2016). A.V. Hill sticks his neck out. *J. Exp. Biol.*, 219, 468-469.

Aziz, E. and Roberts, T. J. (2009). Sheet-like tendons are stiffened by bulging muscles. *Physiology News* 77, 28-29.

Roberts, T. (2005). A step forward for locomotor mechanics. *J. Exp. Biol.* 208, 4191-41922.

e. Conference Presentations

Roberts, T. J. What can muscles teach us about engineered actuators? Invited talk for a symposium at the annual meeting of the *Society for Experimental Biology*, Montpellier, France, July 2022.

Rutter, A.R., Roberts, T.J., Is wood resilience important for woodpecker drumming mechanics? *Society for Integrative and Comparative Biology*, 2022, Phoenix, AZ.

Clark, WH; Eng, CM; Marsh, RL; Roberts, TJ, Multi-scale contributions to muscle shortening velocity during ramped contractions. *Society for Integrative and Comparative Biology*, 2022, Phoenix, AZ.

Petersen, J.C., Roberts, T.J. Power amplification from an intramuscular spring. *Society for Integrative and Comparative Biology*, 2022, Phoenix, AZ.

Petersen, J.C., Roberts, T.J. Evidence of multiple sites of power amplification in frog muscle. *Fast Movements: Nature, robotics and materials*, 2022. Duke University, NC.

Rutter, A.R., Roberts, T.J. Woodpecker drumming mechanics: A fast drummer or a fast drum? *Fast Movements: Nature, robotics and materials*, 2022. Duke University, NC.

Petersen JC, Eng CM, Marsh RL, Azizi E, Roberts TJ. Architectural elasticity in pennate muscle. *Society for Integrative and Comparative Biology*, 2021, virtual.

Rutter AR, Roberts TJ. Amplitude patterns in woodpecker drumming. *Society for Integrative and Comparative Biology*, 2021, virtual.

Roberts, T.J. Some challenges of playing with power. *Society for Integrative and Comparative Biology*, Tampa, FL.

Eng, C.M., Oliver, J.D., Marsh, R.L., Azizi, E., Roberts, T.J. A new role for intramuscular springs in energy cycling during locomotion. *Society for Integrative and Comparative Biology*, Tampa, FL.

Sleboda, D. and Roberts, T. The interaction of intracellular fluid and extracellular collagen influences active contractile force in skeletal muscle. *Society for Integrative and Comparative Biology*, Tampa, FL.

Passive muscle stiffness is correlated to in vivo muscle operating lengths. *Society for Integrative and Comparative Biology*, Tampa, FL.

- Smith, L.B, Anderson, C.V., Roberts, T.J., Liebl, A. L. Gene Expression and Muscle Performance in Anolis Lizards. *Society for Integrative and Comparative Biology*, Tampa, FL.
- Roberts, T.J. Muscle shape changes and the role of intramuscular springs. *World Congress of Biomechanics*, Dublin, Ireland.
- Sleboda, D. Roberts, T.J. The interaction of extracellular connective tissues and pressurized intracellular fluid influences active muscle force. *World Congress of Biomechanics*, Dublin, Ireland.
- Roberts, T.J. Eng, C., Marsh, R.L., and Azizi, E. A model for internal elastic energy storage and recovery in deforming muscles. *American Society of Biomechanics*, Rochester, MN.
- Eng, C.M., Azizi, E., and Roberts, T.J. (2018). The battle of the bulge: structural determinants of muscle gearing during dynamic contractions. *Society for Integrative and Comparative Biology*, San Francisco, CA.
- Stover, K.K., Brainerd, E.L., and Roberts, T.J. (2018). Not so fast food: Morphological speed limits in the domestic turkey. *Society for Integrative and Comparative Biology*, San Francisco, CA.
- Sleboda, D.A. and Roberts, T.J. (2018). Diversity in connective tissue morphology across vertebrate muscle. *Society for Integrative and Comparative Biology*, San Francisco, CA.
- Rosario, M.V. and Roberts, T.J. (2018). The ability of tendons to buffer energy during eccentric contractions depends on lengthening dynamics. *Society for Integrative and Comparative Biology*, San Francisco, CA.
- Sleboda, D.A. and Roberts, T.J. (2017). A Mechanical Role for Incompressible Fluid in Stretched Muscle. *American Society of Biomechanics*, Boulder, CO.
- Arellano, C.J., Gidmark, N.J., Konow, N., and Roberts, T.J. (2017). Elastic Shape Changes and Mechanical Behavior in the Aponeuroses of Jumping and Landing Turkeys. *American Society of Biomechanics*, Boulder, CO.
- Roberts, T.J. (2016). Muscle as an actuator: mechanics, energetics and plasticity. *Biomechanics and Neural Control of Movement*, Mt. Sterling, OH.
- Anderson, C.J. and Roberts, T.J. (2016) The need for speed: functional specializations of locomotor and feeding muscles in *Anolis* lizards. *Society for Experimental Biology*, Manchester, U.K.
- Roberts, T.J. (2016) What might studies of limb muscle mechanics teach us about feeding systems? *Society for Experimental Biology*, Manchester, U.K.
- Camp, A.L., Roberts, T.J., Brainerd, E.L. (2016) A powerful perspective on suction feeding shows the importance of body muscles for feeding in fish. *Society for Experimental Biology*, Manchester, U.K.
- Stover, K.K, Brainerd, E.L, and Roberts, T.J. (2017) Plodding Poultry: Locomotor impacts of muscle mass distribution and altered center of mass in the turkey. *Society for Integrative and Comparative Biology*, New Orleans, LA.
- Stover, K.K, Roberts, T.J., and Brainerd, E.L (2016) Tipping the scale: Muscle mass distribution and its effect on center of mass position in the wild and modern domestic turkey. *International Congress of Vertebrate Morphology*, Washington, D.C.



- Camp, A.L., Roberts, T.J., Brainerd, E.L. (2017) A little mouth with a lot of power: how cranial and axial muscles generate suction expansion in bluegill sunfish. *Society for Integrative and Comparative Biology*, New Orleans, LA.
- Sleboda, D. and Roberts, T.J. (2017) Are all skeletal muscles helically-reinforced hydrostats? *Society for Integrative and Comparative Biology*, New Orleans, LA.
- Camp, A.L., Astley, H.C., Horner, A.M., Roberts, T.J., Brainerd, E.L. (2016) Fluoromicrometry: using X-ray video to measure the in vivo muscle dynamics of animal behaviors. *Society for Integrative and Comparative Biology*, New Orleans, LA.
- Camp, A.L., Roberts, T.J., Brainerd, E.L. (2015) Swimming muscles power suction feeding in centrarchid fish. *Society for Experimental Biology*, Prague.
- Sleboda, D., Roberts, T.J. (2015) A Simple Physical Model Replicates Two Behaviors of Passive Skeletal Muscle. Fourth International Fascia Research Congress, Washington, DC.
- Park, N.R., Anderson, C.V., Roberts, T.J. (2016) Muscle twitch time limits gait dynamics in anolis lizards. *Society for Integrative and Comparative Biology*, Portland, OR.
- Anderson, C.V., Jain, S.S., Park, N.R., Roberts, T.J. (2016) Locomotor and feeding muscles in Anolis lizards are tuned to different functional demands. *Society for Integrative and Comparative Biology*, Portland, OR.
- Konow, N., Hedberg, M.L., Roberts, T.J., Swartz, S.M. (2016) Antebrachial muscle contraction counteracts tendon elastic action in hovering bat flight. *Society for Integrative and Comparative Biology*, Portland, OR.
- Stover, K.K., Brainerd, E.L., Roberts, T.J. (2016) Muscle mechanical performance in wild and domestic turkeys. *Society for Integrative and Comparative Biology*, Portland, OR.
- Eng, C.M., Roberts, T.J. Does aponeurosis influence the relationship between muscle gearing and force? (2016) *Society for Integrative and Comparative Biology*, Portland, OR.
- Sleboda, D.A., Roberts, T.J. (2016) A simple physical model suggests a hydrostat-like interaction within individual skeletal muscles. *Society for Integrative and Comparative Biology*, Portland, OR.
- Cheney, J.A. Konow, N; Middleton, K.M., Breuer, K.S.; Roberts, T.J.; Giblin, E.L.; Swartz, S.M. (2015) Shaping the wings of bats: Muscle and wing skin interactions in flight. *Society for Integrative and Comparative Biology*, West Palm Beach, FL.
- Ruttiman, R.J., Sleboda, D., Roberts, T.J. (2015) Functional importance of fascia in the preservation of muscle tension. *Society for Integrative and Comparative Biology*, West Palm Beach, FL.
- Sleboda, D., Roberts, T.J. (2015) Confining compartments: restricting muscle bulging alters force and work production. *Society for Integrative and Comparative Biology*, West Palm Beach, FL.
- Stover, K.K., Brainerd, E.L., Roberts, T.J. (2015) Supersize me: Extreme body mass in domestic turkeys influences locomotor mechanics. *Society for Integrative and Comparative Biology*, West Palm Beach, FL.
- Sustaita, D., Gatesy, S.M., Roberts, T.J. (2015) Reconciling variation in moment arms and measurement techniques of Emu toe joints. *Society for Integrative and Comparative Biology*, West Palm Beach, FL.
- Camp AL, Brainerd EL, and Roberts TJ. (2015) Feeding power from swimming muscles: the role

- of body muscles in producing power for suction feeding Society of Experimental Biology annual meeting, Manchester, United Kingdom.
- T. J. Roberts, N.J. Gidmark, N. Konow and E. Azizi. (2014) Exploring the spring in the muscle: Does extracellular matrix provide an important elastic mechanism? *World Congress of Biomechanics*, Boston, MA.
- N. Konow, T.J. Roberts and S.M. Swartz (2014) X-ray Based Reconstruction of Proximal Wing Muscle Tendon Unit Mechanics during Bat Flight. *World Congress of Biomechanics*, Boston, MA.
- N. Konow, T.J. Roberts (2014). Muscle Tendon Unit Mechanics during Energy Absorbing Activities. *World Congress of Biomechanics*, Boston, MA.
- A.L. Camp, E.L. Brainerd, T.J. Roberts (2014). Suction expansion power in largemouth bass. *Society for Experimental Biology*, Manchester, England.
- Gidmark, NJ, Konow, N, Arellano, C, Roberts, TJ (2014). Determinants of muscle shape change during lengthening and shortening contractions. *Society for Integrative and Comparative Biology*, Austin, TX.
- Konow, N., Roberts, T.J., Boerma, D., von Busse, R., Swartz, S.M. (2014) Mechanics of proximal limb muscle tendon units in a small flying mammal. *Society for Integrative and Comparative Biology*, Austin, TX.
- Lin, Y.F., Horner, A.M., Ekstrom, L. J., Roberts, T. J. , Dumont, E.R. (2014). How moles destroy your lawn: the “lateral stroke” of Eastern moles (*Scalopus aquaticus*). *Society for Integrative and Comparative Biology*, Austin, TX.
- Horner, AM, Mouradian, G, Grogan, S, Roberts, TJ. (2014). Does advanced age alter in vivo muscle operating length? *Society for Integrative and Comparative Biology*, Austin, TX.
- Stover, KK, Roberts, TJ, Brainerd, EL. (2014). Compensating for an altered center of mass: a comparative study of the pelvis and pelvic limbs of three turkey strains. *Society for Integrative and Comparative Biology*, Austin, TX.
- Astley, H. C., Roberts, T. J. (2014). The mechanics of elastic loading and recoil in anuran jumping. *Society for Integrative and Comparative Biology*, Austin, TX.
- Camp, A.L., Roberts, T.J., Brainerd, E.L. (2014). Comparison of cranial and axial muscle power for suction feeding in largemouth bass. *Society for Integrative and Comparative Biology*, Austin, TX.
- Roberts, T. J., Konow, N. and Gidmark, N. (2013). Mechanisms governing muscle bulging during locomotor activities. *10th International Congress of Vertebrate Morphology*, Barcelona, Spain.
- Konow, N., Busse, R., Roberts, T.J. and Swartz, S. (2013). Can bat wing muscles stretch their tendon to enable force control of joint movement? *Society for Experimental Biology*, Valencia, Spain.
- Konow, N., Busse, R., Roberts, T.J. and Swartz, S. (2013). Can bat wing muscles operate as force controllers? *10th International Congress of Vertebrate Morphology*, Barcelona, Spain.
- Camp, A.L, Roberts, T.J., and Brainerd, E.L. (2013). The role of lateral mouth expansion during suction feeding in Largemouth Bass. *Society for Experimental Biology*, Valencia, Spain.
- Gatesy, S., Kambic, R., and Roberts, T.J. (2013). An inside look at limbed locomotion: Reconstructing moving morphology to access missing dimensions. *10th International*

- Congress of Vertebrate Morphology*, Barcelona, Spain.
- Gatesy, S., Kambic, R., Roberts T.J. (2012). Long-axis rotation (LAR): a missing degree of freedom in avian bipedal locomotion. *Dynamic Walking Conference*, Pensacola, FL.
- Konow, N., Roberts T.J. (2012). Series elastic compliance protects actuators during high-powered deceleration. *Dynamic Walking Conference*, Pensacola, FL
- Gatesy, S., Kambic, R., Roberts T.J. (2012). Six Degree of Freedom Range of Motion in Guineafowl. *Dynamic Walking Conference*, Pensacola, FL.
- Roberts, T.J., Konow, N. (2012). Determinants of passive force production in muscle during locomotion. *Society for Experimental Biology*, Salzburg, Austria.
- Konow, N. and Roberts, T. J. (2012). Does extended training alter the operating length of leg extensor muscles? *Society for Integrative and Comparative Biology*, Charleston, SC.
- Astley, H.C., Haruta, A. and Roberts, T. J. (2012). The Effects of Substrate Compliance on Jump Performance in the Cuban Tree Frog (*Osteopilus septentrionalis*). *Society for Integrative and Comparative Biology*, Charleston, SC.
- Abbott, E., Azizi, E., and Roberts, T. J. (2012). Extrinsic loading in Cuban tree frog jumping. *Society for Integrative and Comparative Biology*, Charleston, SC.
- Horner, A.M., Aslley, H.C. and Roberts, T. J. (2012). Analysis of rat hindlimb muscle and tendon mechanics using x-ray videoradiography. *Society for Integrative and Comparative Biology*, Charleston, SC.
- Kambic, R., Roberts, T.J. and S. Gatesy. (2012). Walking With a Twist. *Society for Integrative and Comparative Biology*, Charleston, SC.
- Konow, N. and Roberts, T. J. (2011). Energy absorption by muscle during steady and non-steady movement. *Society for Integrative and Comparative Biology*, Salt Lake City, UT.
- Kambic, Roberts and Gatesy (2011). Beyond Hinges: 6 DOF Joint Kinematics in Avian Bipedalism . *Society for Integrative and Comparative Biology*, Salt Lake City, UT.
- Matson, A. M., Konow, P., Konow, N. and Roberts, T. J. (2011). Variations in tendon material properties among muscles . *Society for Integrative and Comparative Biology*, Salt Lake City, UT. .
- Abbott, E. M., Marsh, R. L., Azizi, E. and Roberts, T. J. (2010). The celebrated jumping frogs of Calaveras County: how far can a frog really jump? *Society for Integrative and Comparative Biology*, Seattle, WA.
- Aslley, H. C., Abbott, E. M., Azizi, E. and Roberts, T. J. (2010). Measuring maximal animal performance with the celebrated jumping frogs of Calaveras County. *Society for Experimental Biology*, Prague.
- Astley, H. and Roberts, T. J. (2010). The Celebrated Jumping Frogs of Calaveras County: Determining Maximal Jumping Performance in Frogs. *Joint Meeting of Ichthyologists and Herpetologists*, Providence RI.
- Astley, H. and Roberts, T. J. (2010). Decoupling of muscle shortening and joint kinematics during frog jumping. *American Society of Biomechanics*, Providence RI .
- Astley, H. C. and Roberts, T. J. (2010). Decoupling of muscle shortening and joint kinematics during frog jumping . *Society for Integrative and Comparative Biology*,

Seattle, WA.

- Azizi, E. and Roberts, T. J. (2010). Geared up to stretch: pinnate muscle behavior during active lengthening . *Society for Integrative and Comparative Biology, Seattle, WA.*
- Azizi, M. and Roberts, T. J. (2010). Influence of elasticity on muscle operating lengths. *Society for Experimental Biology, Prague.*
- Crynes, G. L., Azizi, E. and Roberts, T. J. (2010). Variable gearing in artificial pneumatic “muscles” . *Society for Integrative and Comparative Biology, Seattle, WA.*
- Crynes, G. L., Azizi, E. and Roberts, T. J. (2010). Variable gearing in artificial pneumatic “muscles” . *Society for Integrative and Comparative Biology, Seattle, WA.*
- Gatesy, S., Kambic, R. and Roberts, T. J. (2010). Beyond Hinges: 3-D joint function in erect bipeds. *Society for Vertebrate Paleontology, Pittsburgh, PA.*
- Konow, N., Azizi, E. and Roberts, T. J. (2010). Avian all-terrain: Tendons as power attenuators during rapid energy absorption . *Society for Integrative and Comparative Biology, Seattle, WA.*
- Konow, N., Azizi, E. and Roberts, T. J. (2010). Limb Muscle Function During High-Powered Energy Absorption . *American Society of Biomechanics, Providence RI.*
- Konow, N., Azizi, E. and Roberts, T. J. (2010). Limb muscle-tendon unit function in power- attenuation during rapid energy absorption. *Society for Experimental Biology, Prague.*
- Roberts, T. J. and Wilson, A. (2010). Function and control of biological elastic mechanisms: an introduction. *Society for Experimental Biology, Prague.*
- Roberts, T. J. (2010). Fast, cheap and out of control: dynamic interactions of elastic structures and muscle motors. *Dynamic Walking, MIT, Boston, MA.*
- Roberts, T. J., Abbott, E. M. and Azizi, E. (2010). *American Physiological Society, Denver, CO.*
- Sawicki, G. S. and Roberts, T. J. (2010). Benefits of Compliant Muscle-tendon Architecture in Steady and Accelerative Movements. *World Congress of Biomechanics, Singapore.*
- Sawicki, G. S. and Roberts, T. J. (2010). Muscle-tendon architecture shapes conditions for economical force production . *Society for Integrative and Comparative Biology, Seattle, WA.*
- Astley, H. and T. J. Roberts, 2009. Decoupling of muscle shortening and joint kinematics during frog jumping, Society for Experimental Biology, Glasgow.
- Azizi, E. and T.J. Roberts, 2009. Biaxial strain and variable stiffness in aponeuroses. Society for Experimental Biology, Glasgow.
- Sawicki, G.S., Sheppard, P. and T. J. Roberts, 2009. Mechanical power amplification in a compliant muscle–tendon working on an inertial load in gravity, Society for Experimental Biology, Glasgow.
- Sawicki, G. and T. J. Roberts, 2009. Isometric force production requires asymmetric muscle-tendon length trajectory. American Society of Biomechanics, State College, PA.
- Roberts, T. J. and E. Azizi, 2009. Power attenuation by muscle series elastic elements. American Society of Biomechanics, State College, PA.

- Sheppard, P. Sawicki, G. and T. J. Roberts, 2009. Power augmentation in a compliant muscle-tendon system. American Society of Biomechanics, State College, PA.
- Abbott, E. and T.J. Roberts, 2009. Elastic mechanisms as a determinant of anuran jumping performance: do toads bounce? Society for Integrative and Comparative Biology, Boston, MA.
- Azizi, E. and T.J. Roberts, 2009. Mechanical behavior of aponeuroses. Society for Integrative and Comparative Biology, Boston, MA.
- Roberts, T.J. and E. Azizi, 2009. The series elastic shock absorber: tendon elasticity reduces peak muscle forces during active lengthening. Society for Integrative and Comparative Biology, Boston, MA.
- Azizi, E. and T.J. Roberts, 2009. Muscle performance during frog jumping: influence of series elasticity on muscle length-tension behavior. Society for Integrative and Comparative Biology, Boston, MA.
- Astley, H. and T. J. Roberts, 2009. Decoupling of muscle shortening and joint kinematics during frog jumping. Workshop on multi-scale muscle mechanics, Woods Hole, MA.
- Sawicki GS, Azizi E, Roberts TJ, 2008. Muscle activation timing influences muscle-tendon mechanical performance during cyclic contractions. North American Congress on Biomechanics, August 5-9, Ann Arbor, Michigan.
- Roberts, T.J., 2008. Interpreting muscle function from EMG: lessons learned from direct measurements of muscle force. Society for Integrative and Comparative Biology, San Antonio, TX.
- Hsieh, S.T. and T.J. Roberts, 2008. Do hindlimb joints serve multiple functions during jumping in the Cuban tree frog? Society for Integrative and Comparative Biology, San Antonio, TX.
- Azizi, E. and T.J. Roberts, 2008. Three-dimensional strain patterns in aponeuroses. Society for Integrative and Comparative Biology, San Antonio, TX.
- Roberts, T.J., and B.K. Higginson, 2007. The versatile mechanical function of two proximal hindlimb muscles in running turkeys. Society for Integrative and Comparative Biology, Phoenix, AZ.
- Azizi, M. and T. J. Roberts, 2007. *Variable gearing in pinnate muscles*. Society for Integrative and Comparative Biology, Phoenix, AZ.
- Azizi, M. and T. J. Roberts, 2006. *Variable gearing in pinnate muscles*. American Physiological Society meeting, Va. Beach, Va.
- Roberts, T.J., 2006. *Muscle Mechanical Function and the Energy Cost of Running - When does Work Matter?* American College of Sports Medicine Annual Meeting. Denver, CO.
- Roberts, T.J., 2006. *Integrated muscle-tendon function during running accelerations*. World Congress of Biomechanics, Munich, Germany.
- Roberts, T. J. and A. M. Gabaldon, 2006. *Does rate of force production increase with running speed in individual muscles?* Society for Integrative and Comparative Biology, Orlando, FL.
- Roberts, T. J. 2005. Biomechanics of acceleration and muscle performance in terrestrial acceleration. Society for Experimental Biology, Barcelona, Spain.
- Gabaldón, A.M., F.E. Nelson, and T.J. Roberts 2004. Force-velocity characteristics of ankle extensor muscles in wild turkeys during running and *in vivo*. *Society for Integrative and Comparative Biology*, New Orleans, LA.
- Gabaldón, A.M., F.E. Nelson, and T.J. Roberts 2003. Effect of running speed on the mechanical work output of two ankle extensor muscles in wild turkeys. *Experimental*

- Biology*, San Diego, CA.
- Roberts, T. J. 2002. Mechanical power production for acceleration: the challenges of being a biped. *World Congress of Biomechanics*, Calgary CA.
- Roberts, T.J. 2002. The integrated function of muscles and tendons during locomotion. *Society for Integrative and Comparative Biology*, Anaheim, CA.
- Roberts T.J. and R. A. Belliveau 2002. The source of power for uphill running. *Experimental Biology*, New Orleans, LA.
- Gabaldon, A. M. and T. J. Roberts. 2002. Diverse mechanical functions in a single muscle: How muscles change function for different locomotor demands. *American Physiological Society*, San Diego, CA.
- Llewellyn, M. A.. and T. J. Roberts. 2002. Ground reaction forces in accelerating dogs. *Experimental Biology*, New Orleans, LA.
- Nelson, F. E., Gabaldon, A. M., and T. J. Roberts. 2002. Force-velocity properties of an avian muscle. *Society for Integrative and Comparative Biology*, Anaheim, CA.
- Gabaldon, A. M., Nelson, F. E., and T. J. Roberts. 2002. Gastrocnemius muscle mechanics in turkeys during uphill and downhill running. *Society for Integrative and Comparative Biology*, Anaheim, CA.
- Harty, T. L. and T. J. Roberts. 2002. Mighty mice: Amazing jumping power from the pacific jumping mouse. *Society for Integrative and Comparative Biology*, Anaheim, CA.
- Llewellyn, M. A. 2002. The work of acceleration in running dogs. *Society for Integrative and Comparative Biology*, Anaheim, CA.
- Roberts, T.J. and J. A. Scales. 2001. The source of power for acceleration in turkeys. *Society for Integrative and Comparative Biology*, Chicago, IL.
- Roberts, T. J. 2000. Muscle forces in running dogs and turkeys: testing the similar stress hypothesis. *American Physiological Society*, Portland, Maine.
- Roberts, T.J. and J. A. Scales. 2000. Power development during acceleration in wild turkeys. *Society for Experimental Biology*, Exeter, U.K.
- Roberts, T.J. and H.A. Humphries. 1999. Hind limb forces during acceleration in wild turkeys. *American Zoologist*, 39(5): 65A.
- Roberts, T. J., Marsh, R. L. and C. R. Taylor. 1997. Force development in passive muscle during running. *Experimental Biology*, San Francisco, CA.
- Roberts, T. J. and R. L. Marsh. 1997. Elastic energy storage in jumping frogs. *American Zoologist*, 37(5): 174A.
- Roberts, T. J., 1996. From whole animals to muscle fibers; a look inside the black box of locomotor energetics. Presented at *A life in comparative physiology: a tribute to the diverse interests and influences of C. R. Taylor*, Harvard University, MA.
- Roberts, T.J., R.L. Marsh, and C.R. Taylor. 1996. Running economically: elastic energy storage in tendon and muscle. *Society for Experimental Biology*, Lancaster, U. K.
- Roberts, T.J., R.L. Marsh, P.G. Weyand and C.R. Taylor. 1995. Muscle performance during running: the price of power. *American Zoologist*, 35(5): 140A.
- Roberts, T.J. 1995. Moving on land: optimizing for minimum cost. *12<sup>th</sup> International Conference on Comparative Physiology*, Ascona, Switzerland.
- Roberts, T. J., R.A. Belliveau, and C. R. Taylor. 1994. Does uphill running require high muscle forces? *American Zoologist* 34(5): 46A.
- Roberts, T. J., R. L. Marsh, C. I. Buchanan, P. G. Weyand, and C. R. Taylor. 1994. The work of running: do tendons pull their weight? *The Physiologist* 37(5): 54A.

- Roberts, T., S. Shulman, R. Belliveau, M. Chen and C. R. Taylor. 1993. Energetics of locomotion: testing the force hypothesis. *Proc. of the XXXII Congress of the IUPS*, Glasgow, Scotland, 284.21/P.
- Roberts, T. J., J.-M. Weber and C. R. Taylor. 1990. Does fuel preference depend on aerobic capacity? Fat and carbohydrate oxidation in running coyotes, dogs and goats. *The Physiologist* 33(4):110A.

f. Invited lectures

- 1995 12<sup>th</sup> International Conference on Comparative Physiology, Ascona, Switzerland.
- 1996 Northeastern University Department of Biology  
University of Arizona Department of Ecology and Evolutionary Biology
- 1997 Brown University, Department of Ecology and Evolutionary Biology
- 1998 Massachusetts Institute of Technology, Leg Lab
- 1999 California State Polytechnic University Pomona, Equine Research Center  
University of Chicago, Department of Organismal Biology and Anatomy
- 2000 University of California, Berkeley, Integrative Biology Department  
University of California, Berkeley, Biomechanics Seminar Group  
Society for Experimental Biology, Exeter, U.K.
- 2002 Society for Integrative and Comparative Biology. Anaheim, CA.  
American Physiological Society, San Diego, CA.  
IV World Congress of Biomechanics, Calgary, AB.
- 2004 University of Colorado, Boulder  
University of Portland
- 2005 Society for Experimental Biology, Barcelona, Spain.
- 2006 Georgia Tech University, Atlanta  
Rhode Island College, Providence  
World Congress of Biomechanics, Munich, Germany.
- 2007 Harvard University, Concord Field Station  
MIT Biomechatronics Group  
University of Rhode Island, Biology Department
- 2008 Muscle, Limb, Brain Workshop, Mathematical Biosciences Institute, OH  
Society for Integrative and Comparative Biology, San Antonio
- 2010 Harvard University, Department of Organismic and Evolutionary Biology  
Northeastern University Action Club  
Penn State University Action Club  
American Physiological Society, Denver CO.  
Dynamic Walking, MIT.
- 2011 University of Chicago, Department of Organismal Biology and Anatomy
- 2012 Dynamic Walking Conference, Keynote lecture, Pensacola, FL.  
Dynamic Walking Conference, Tutorial Presenter, Pensacola, FL.  
Orthopedics Research Seminar, Lifespan Hospital, Providence.
- 2013 International Congress of Vertebrate Morphology, Barcelona.
- 2015 Northwestern University Biomedical Engineering  
University of Massachusetts Kinesiology Department  
Second International Berlin School of Movement Science, Berlin  
JEB symposium: Muscles to Molecules, Massa Marita, Italy.
- 2016 Pennsylvania State University, CMOST symposium  
Biomechanics and Neural Control, Ohio  
Society for Experimental Biology, Feeding and Locomotion Symposium, U.K.
- 2017 University of South Dakota, Biology Department  
Mathematical BioSciences Institute, Columbus, OH  
Yale University Engineering, Robotics group

- 2018 Ga Tech University, Depts. Of Mech. Engineering and Applied Physiology  
World Congress of Biomechanics, Keynote Speaker  
Humboldt University, Berlin, Autumn School  
Shirley Ryan Ability Lab, Chicago, IL, meeting on Contractures in Duchenne and  
Other Neuromuscular Conditions  
U Massachusetts, Center for Evolutionary Materials  
Society of Integrative and Comparative Biology, Playing with Power Symposium
- 2020 University of Southern California Biomechanics Group  
International Fascia Retreat, Keynote speaker, Rome, Italy (cancelled due to  
pandemic)
- 2021 Norwegian School of Sports Sciences, Biomechanics Group seminar (virtual)
- 2022 Keynote speaker, Sixth International Fascia Research Congress, Montreal,  
Quebec.  
Keynote speaker, Comparative Neuromuscular Biomechanics working group of  
the International Society of Biomechanics, Symposium on vertebrate movement,  
2022. Virtual.

## 5. Research Grants

### a. Current grants

- 2023-2028 National Institutes of Health, *Elastic mechanisms in locomotion* (co-PI  
with E. Azizi). \$2,240,070 total, \$1,605,229 to Brown.

### b. Completed Grants

- 2017-2022 National Institutes of Health, *Elastic mechanisms in locomotion* (co-PI  
with E. Azizi). \$1,716,019 total, \$1,238,063 to Brown.
- 2018-2022 National Science Foundation, EFRI C3 SoRo: *Muscle-like Cellular  
Architectures and Compliant, Distributed Sensing and Control for Soft  
Robots* (co-PI with A. Dollar, Yale; J. Smith, U Washington; J. Trinkle,  
RPI) \$2,000,000 total, \$460,000 to Brown.
- 2021 MIT Biomechatronics Group, subcontract from Salah Foundation, *Testing  
the magnetomicrometry project in turkeys as an animal model*. \$81,615 to  
Brown.
- 2014-2018 National Science Foundation  
*A functional perspective on adaptive radiation: explaining differences in  
the evolutionary diversification of island and mainland Anolis lizard* (PI,  
collaborative grant with J. Losos, Harvard U.). \$346,831 to Brown.
- 2012-2017 National Institutes of Health, *Elastic mechanisms in locomotion* (PI).  
\$1,931,617.



- 2012-2016 Air Force Office of Scientific Research, *Dynamics of bat wing musculature*. (co-PI with Sharon Swartz). \$1,219,619.
- 2013-2014 Air Force Office for Scientific Research, Defense University Research Instrumentation Program, *High speed kinematics and velocimetry equipment for biological and cyber-physical studies* (PI: Breuer, co-PIs Swartz, Roberts and Mandre). \$519,000.
- 2009-2013 National Science Foundation, *Kinematics and kinetics of long-axis rotation in avian bipedal locomotion* (co-PI with Stephen Gatesy). \$422,979.
- 2008-2012 National Institutes of Health, *Elastic mechanisms in locomotion* (PI). \$950,137.
- 2010-2011 National Institutes of Health, 2010  
2010 American Society of Biomechanics Meeting  
\$18,000
- 2006-2010 W. M. Keck Foundation, Phase II Proposal, *A proposal to design and build a dynamic 3-D Skeletal imaging system*, \$1,800,00. (One of 7 co-investigators. PI: E. Brainerd)
- 2006-2010 National Science Foundation, *Integrated muscle-tendon function in frog jumping* (Principal Investigator). \$385,000.
- 2000-2005 National Institutes of Health, *Dynamics of muscle force production during running* (Principle Investigator). \$557,502.
- 1999-2000 Medical Research Foundation of Oregon, *Influence of muscle force-velocity properties on running mechanics* (Principal Investigator). \$24,575.
- 2000-2003 GAANN training grant, (Dept. of Education) *Analysis of Complex Behaviors* (One of 9 core faculty. P.I.: S. Arnold). \$304,500.
- 1998 National Science Foundation Postdoctoral Fellowship in Biosciences Related to the Environment (declined award).
- 1995-1998 Individual National Research Service Award, National Institutes of Health Stipend and research allowance for three years, \$78,000.
- 1990-1993 National Science Foundation Graduate Fellowship Stipend for three years, \$51,000.

#### Grants to postdoctoral Trainees

- 2008-2011 *Influence of tendon elasticity on muscle-tendon contractile element mechanics*. NIH NRSA to G. Sawicki, T.J. Roberts sponsor. \$132,000.
- 2007-2010 *Mechanical role of titin in limiting eccentric muscle damage*. NIH NRSA to E. Azizi, T.J. Roberts sponsor. \$132,000.

- 2015-2018 Direct determination of the role of aponeurosis in modulating muscle force and speed. NIH NRSA to C. Eng, T.J. Roberts sponsor. \$162,000.
- 2016-2018 From slow stretches to impulsive impacts: does tendon function change with stretch speed? NSF Postdoctoral Fellowship to Michael Rosario, T.J. Roberts sponsor. \$140,000.

## 6. Service

### a. Service to the University

Associate Provost for Academic Space, July 2020-present  
 Biology Concentrator Advisor (2018-present)  
 Animal Care Governance Committee, 2018-present  
 Member, Core Research Facility Infrastructure Review Committee, 2019-present  
 Vice-Chair, Department of Ecology and Evolutionary Biology, 2014-2022  
 First Year Advisor (2019-2021)  
 Member, Goldwater Fellowship Nomination Committee, 2020  
 Summer UTRA review committee, 2019  
 Chair, Organismal Biology Faculty Search Committee, 2018-2019  
 Past Chair, Faculty Executive Committee, 2018-2019  
 EEB admissions committee, 2019  
 First Readings Discussion Leader, 2 student groups and 1 staff group (2019)  
 Member, Tenure Committee, Dept. of Engineering, 2017-2018  
 Core Research Facility Infrastructure Review Committee, 2018  
 Gwise Young Scholars' Conference, Judge, 2018  
 Past Chair, Faculty Executive Committee, 2016-2017  
 Member, NEASC Faculty Issues Committee, 2016-present  
 Member, Committee on Faculty Equity and Diversity, 2016-2017  
 Vice-Chair, Department of Ecology and Evolutionary Biology, 2014-2017  
 Member, Tenure Committee, Dept. of Engineering, 2017-2018  
 Chair, Faculty Executive Committee, 2015-2016  
 Member, Capital Planning Committee, 2015-present  
 Vice-Chair, Faculty Executive Committee, 2014-2015  
 Member, FEC, 2014-2107  
 Member, Working Group on Animal Care Training Program for Researchers, 2014  
 Chair, Plant Biology Faculty Search Committee, 2012-2013  
 Co-Director of Graduate Studies, EEB, 2011-2013  
 Co-author, Motion Systems Sciences Strategic Initiative White Paper  
 Freshman Advisor, 2012-2013  
 Concentration Advisor, Biology, 2007-present  
 Member, Institutional Animal Care and Use Committee, 2008-2013  
 Vice Chair, Institutional Animal Care and Use Committee, 2011-2013  
 Member, Medical Committee on Academic Standing, 2008-2012  
 Member, College Committee on Academic Standing, 2009-2012  
 Mentor, Junior Faculty Mentorship Program, 2012-present  
 Small group session leader, Biomed tenure and promotion workshop, Feb 2010  
 Member, Health Careers Advisory Committee, 2011-present  
 Participant, Sheridan Center Junior Faculty Roundtable on the tenure process 2011  
 Panel participant, Sheridan Center "Preparing for Your First Year as a Faculty Member" (2009)  
 EEB space committee, 2004-2007  
 EEB graduate admissions committee, 2006, 2010-2012  
 University Animal Users Committee, 2007

b. To the Profession

Faculty Representative, American Physiological Society “Hill Day”. Visited U.S. Congress to advocate for NSF funding  
Stood for Election as President, American Society of Biomechanics (2019)  
Congress Offices to Advocate for NSF funding, April 2019.  
Judge, Best Student Presentation Competition, American Society of Biomechanics, 2018  
Judge, Best Student Presentation Competition, Society Int. Comp. Bio, 2018  
Panel Reviewer, NSF IOS, 2016  
Session Chair, American Society of Biomechanics Conference, 2017  
Member, Editorial Advisory Board, *Zoology*, 2012-2016  
Meeting Chair, American Society of Biomechanics Annual Meeting, 2010  
Organizer, SEB symposium on Elastic Mechanisms, 2010  
NSF panel service, 2009, 2010  
Chair nomination committee, Division of Comparative Biomechanics, SICB, 2009  
Awards Committee, American Society of Biomechanics, 2004  
Judge, Scholander Award Competition, American Physiological Society, 2002  
Proposal reviewer: I review 2 to 4 proposals a year, and have reviewed for the: National Science Foundation; National Institutes of Health; Murdoch Charitable Trust; Natural Sciences and Engineering Research Council of Canada; Biotechnology and Biological Sciences Research Council, UK; National Center for Biological Sciences, India; The Research Foundation - Flanders; The German Research Foundation  
I served on the NIH NIAMS Special Emphasis Panel ZRG1 in November 2022.  
Journal editorial review: I review about 8 papers per year on average, and have reviewed for the following journals: *Science*; *Nature*; *Proceedings of the Royal Society, London*; *Proceedings of the National Academy of Sciences*; *Evolution*; *Journal of Theoretical Biology*; *American Zoologist*; *American Journal of Physical Anthropology*; *American Journal of Physiology*; *Comparative Biochemistry and Physiology*; *European Journal of Applied Physiology*; *Exercise and Sports Science Reviews*; *Journal of Biomechanics*; *Journal of Experimental Biology*; *Journal of Applied Physiology*; *Journal of Morphology*; *Journal of Physiology, London*, *Physiological Zoology*, *Canadian Journal of Physiology and Pharmacology*, *Paleobiology*, *Anatomical Record*, *Cells, Tissues, Organs*; *Biology Letters*; *Journal of the Royal Society Interface*; *Muscle Nerve*; *Nature Medicine*; *Acta Biomaterialia*

c. To the community

Interviewed on woodpecker biomechanics for *Science*, *National Audubon Society* and others, July 2022.  
Interviewed about novel techniques in prosthetics for IEEE pulse, *Brown Daily Herald* and others, 2022.  
Featured Scientist for hour-long NPR program, “You’re the Expert”, November 2014. Work featured in *Time*, *The Daily Mail*, and others.  
Hosted visit to Brown human anatomy laboratory for Bristol Community College, 2006, 2007  
Guest speaker, Hope High School, 2009  
High School Teacher Research Experience Host, six weeks summer 2009  
Outreach project, Calaveras County Fair, 2009  
High School Teacher Research Experience Host, six weeks summer 2008  
Disseminated research to popular press via stories in the *BBC*, *New York Times*, *CBS Evening News* and others.  
Work featured Speaker for Visual Cascade of Science, OSU, April 1999 and April 2000.  
Coordinator for High-School visits to Anatomy and Physiology Labs, Oregon State University (approx. 6 per year).

## 8. Academic Honors, Fellowships and Professional Memberships

Brown Medical School Dean's Teaching Excellence Award, 2004-2017.  
NSF Postdoctoral Fellowship, 1998 (declined)  
NIH Postdoctoral Fellowship, 1995  
NSF Graduate Research Fellowship, 1990  
Chapman Fellowship, Harvard University  
Member: American Society of Biomechanics, Society for Integrative and Comparative Biology, Society for Experimental Biology, American Physiological Society

## 9. Teaching

### INSTRUCTIONAL SUMMARY, BROWN UNIVERSITY:

| Term   | Course number    | Course Name   | Enrollment |
|--------|------------------|---|------------|
| F 2004 | Bio181           | Human Morphology (co-taught with S. Gatesy, D. Ritter)                                | 65         |
| F 2005 | Bio 181          | Human Morphology(co-taught with E. Brainerd, D. Ritter)                               | 68         |
| F 2006 | MD2010           | Human Anatomy, (co-taught with E. Brainerd, S. Gatesy, D. Ritter)                     | 94         |
| F 2007 | MD2011           | Human Anatomy, (co-taught with E. Brainerd, S. Gatesy, D. Ritter)                     | 94         |
| S 2008 | BIOL 2440        | EEB Grad Seminar -Evolutionary and Ecological Physiology, (co-taught with J. Schmitt) | 15         |
| F 2008 | MD2012           | Human Anatomy, (co-taught with S. Gatesy, D. Ritter)                                  | 95         |
| F 2010 | MD2014           | Human Anatomy, (co-taught with S. Gatesy, E. Brainerd, D. Ritter)                     | 100        |
| F 2011 | MD2015           | Human Anatomy, (co-taught with S. Gatesy, E. Brainerd, D. Ritter)                     | 105        |
| F 2012 | MD2016           | Human Anatomy, (co-taught with S. Gatesy, E. Brainerd, D. Ritter)                     | 120        |
| F 2012 | Biol2440         | Structure and Function of Skeletal Muscle (graduate seminar)                          | 7          |
| S 2014 | Biol2440         | Structure and Function of Skeletal Muscle (graduate seminar)                          | 6          |
| F 2014 | MD2016           | Human Anatomy, (co-taught with S. Gatesy, E. Brainerd, D. Ritter)                     | 128        |
| S 2015 | Med Ed Biol 3644 | Human Anatomy (co-taught with S. Gatesy, E. Brainerd, and D. Ritter)                  | 144        |

|        |                     |  |     |
|--------|---------------------|--|-----|
| F 2015 | Med Ed<br>Biol 3644 | Human Anatomy (co-taught with S. Gatesy and D. Ritter)                       | 144 |
| S 2016 | Med Ed<br>Biol 3644 | Human Anatomy (co-taught with S. Gatesy, E. Brainerd and D. Ritter)          | 144 |
| F 2016 | Med Ed<br>Biol 3644 | Human Anatomy (co-taught with S. Gatesy, E. Brainerd and D. Ritter)          | 144 |
| S 2017 | Med Ed<br>Biol 3644 | Human Anatomy (co-taught with S. Gatesy, E. Brainerd and D. Ritter)          | 144 |
| S 2017 | Biol 2440           | Instrumentation for Biologists   | 10  |
| F 2018 | Biol 3644           | Human anatomy (co-taught with S. Gatesy, E. Brainerd, and D. Ritter)         | 144 |
| F2019  | Biol3644            | Human anatomy (co-taught with A. Chew, S. Gatesy, and D. Ritter)             | 144 |
| F 2019 | Biol 2440           | From Muscle to Movement (co-taught with R.L. Marsh)                          | 8   |
| S2020  | Biol3644            | Human anatomy (co-taught with A. Chew, S. Gatesy, E. Brainerd and D. Ritter) | 144 |
| S2021  | Biol3644            | Human anatomy (co-taught with A. Chew, S. Gatesy, E. Brainerd and D. Ritter) | 144 |
| S2022  | Biol3644            | Human anatomy (co-taught with A. Chew, S. Gatesy, and D. Ritter)             | 144 |

#### Graduate Students

Frank Nelson, Ph.D. 2006, Oregon State University. Current: Assistant Professor, Temple University

Jacquelyn Parente, M.A. 2007, Bioengineering, Brown U. Current: PhD candidate, University of Otago, New Zealand

Henry Astley, Ph.D. 2013, Brown EEB. Current: Assistant Professor, U Akron.

Roy Ruttiman, M.Sc. Biomedical Engineering Brown 2017. Current: Resident Fellow, John's Hopkins.

Ariel Camp, Ph.D. 2015, co-advised with B. Brainerd.. Current: Tenure-track Fellow, U. Liverpool

Kris Stover, Ph.D. 2017, co-advised with B. Brainerd. Assistant Professor, Ohio State U.

Jillian Oliver. Current: laboratory assistant, U.Toronto.

David Sleboda, Ph.D. 2019. Current: Postdoctoral Fellow, UC Irvine.

Kaelan Yao, Masters in Biotechnology, 2022. Current: medical student, Yale U.

Amy Rutter, current Ph.D. student

Jarrold Petersen, current Ph.D. student

Rachel Fleming, current Ph.D. student

I currently serve on the graduate committees of six students at Brown, two at MIT, and one at Southern Methodist University. I have served on the graduate committee of more than 20 students at Brown and at 10 other institutions (University of British Columbia, Queensland University, Harvard, University of Colorado, U. Rhode Island, Johns Hopkins University, Southern Methodist University, Oregon State University, MIT).

#### Postdoctoral Research Associates

- Dr. Annette Gabaldon, 2000-2004. Current: Professor, Colorado State University
- Dr. S. Tonia Hsieh, 2006-2007. Current: Associate Professor, Temple University
- Dr. Gregory Sawicki (2007-2009). Current: Associate Professor, Ga. Tech
- Dr. Emanuel Azizi (2005-2010). Current: Associate Professor, University of California, Irvine
- Dr. Angela Horner (2010-2013) Current: Assistant Professor, California State University, San Bernardino
- Dr. Nick Gidmark (2012-2013) Current: Assistant Professor, Knox college
- Dr. Nicolai Konow (2012-2016) Current: Assistant Professor, University of Massachusetts, Lowell
- Dr. Chris Arellano (2014-2016) Current: Assistant Professor, University of Houston.
- Dr. Chris Anderson (2013-2016) Current position: Associate Professor, University of South Dakota
- Dr. Carolyn Eng (2015-2018): Current: Research Project Manager, Kaiser Permanente.
- Dr. Michael Rosario (2016-2018) Current: Assistant Professor, Westchester University.
- Dr. David Sleboda (2019-2020). Current: Postdoc, UC Irvine.
- Dr. Mary Kate O'Donnell (2019-2021). Current position, Assistant Professor, Lycoming College.
- Dr. William Clark (2021-2022). Current position, Research Engineer, SPR therapeutics.