

## CURRICULUM VITAE

February 26, 2021

David R. Carrier  
Department of Biology  
University of Utah  
Salt Lake City, Utah 84112  
USA  
Phone - 801-585-7967  
Email - carrier@biology.utah.edu

### EDUCATION

Ph.D. 1988 University of Michigan, Ann Arbor, Biology  
M.A. 1982 University of Utah, Salt Lake City, Biology  
B.A. 1980 University of Utah, Salt Lake City, Biology & Geology

### APPOINTMENT

Professor, Department of Biology, University of Utah

### PREVIOUS APPOINTMENTS

2002-2003 Visiting Professor, Institut de Education Physique et Readapation,  
Universite Catholique de Louvain  
1998-2005 Associate Professor, Department of Biology, University of Utah  
1995-1998 Assistant Professor, Department of Biology, University of Utah  
1991-1995 Assistant Professor, Division of Biology and Medicine, Brown University  
1989-1991 N.I.H. Post Doctoral Fellow, University of California, Berkeley  
1990 Teaching Fellow, Department of Integrative Biology, University of  
California, Berkeley

### RESEARCH INTERESTS

Anatomical and physiological specialization for aggressive behavior.  
Evolution and functional morphology of hominins.  
Biomechanics and evolution of lung ventilation and locomotion.  
Ontogeny of the vertebrate musculoskeletal system and locomotor performance.

### PUBLICATIONS (undergraduate coauthors are shown in bold type)

Carrier, D. R. (1983). Postnatal ontogeny of the musculo-skeletal system in the Black-

- tailed jack rabbit (*Lepus californicus*). *J. Zool. (Lond.)* 201, 27-55.
- Bramble, D. M. and D. R. Carrier. (1983). Running and breathing in mammals. *Science* 219, 251-256.
- Carrier, D. R. (1984). The energetic paradox of human running and hominid evolution. *Cur. Anthro.* 25, 483-495.
- Gans, C., F. De Vree and D. R. Carrier. (1985). Mastication in the shingle-back lizard, *Trachydosaurus rugosus*: Usage pattern of a complex muscle mass. *Amer. J. Anat.* 173, 219-240.
- Carrier, D. R. (1987). The evolution of locomotor stamina in tetrapods: circumventing a mechanical constraint. *Paleobiology* 13, 326-341.
- Carrier, D. R. (1987). Lung ventilation during walking and running in four species of lizards. *Exp. Biol.* 47, 33-42.
- Carrier, D. R. (1989). Ventilatory action of the hypaxial muscles of *Iguana iguana*: a function of slow muscle. *J. Exp. Biol.* 143, 435-457.
- Carrier, D. R. (1990). Activity of the hypaxial muscles during walking in the lizard *Iguana iguana*. *J. Exp. Biol.* 152, 453-470.
- Carrier, D. R. and **L. R. Leon**. (1990). Skeletal growth and function in the California Gull. *J. Zool., (Lond.)* 222, 375-389.
- Carrier, D. R. (1991). Conflict in the hypaxial musculo-skeletal system: documenting an evolutionary constraint. *Amer. Zool.* 31, 644-656.
- Carrier, D. R. and **J. Auriemma**. (1992). A developmental constraint on the fledging time of birds. *Biol. J. Linn. Soc.* 47, 61-77.
- Swartz, S. M., M. B. Bennett, D. R. Carrier. (1992). Wing bone stresses in free flying bats and the evolution of skeletal architecture in flying vertebrates. *Nature* 359, 726-729.
- Carrier, D. R. (1993). Action of the hypaxial muscles during walking and swimming in the salamander, *Dicamptodon ensatus*. *J. Exp. Biol.* 180, 75-83.
- Carrier, D. R., N. C. Heglund and K. E. Earls. (1994). Variable gearing during locomotion in the human musculoskeletal system. *Science* 265, 651-653.
- Carrier, D. R. (1995). Ontogeny of jumping performance in the black-tailed jackrabbit (*Lepus californicus*). *Zoology* 98, 309-313.
- Carrier, D. R. and M. H. Wake. (1995). The mechanism of lung ventilation in the caecilian *Dermophis mexicanus*. *J. Morph.* 226, 289-295.
- Carrier, D. R. (1996). Invited Perspective. Ontogenetic limits on locomotor performance. *Physiol. Zool.* 69, 467-488.
- Carrier, D. R. (1996). Function of the intercostal muscles in trotting dogs: ventilation or locomotion? *J. Exp. Biol.* 199, 1455-1465.
- O'Rielly, J. C., D. A. Ritter, and D. R. Carrier. (1997). Hydrostatic locomotion in a limbless tetrapod. *Nature* 386, 269-272.

- Wang, T., D. R. Carrier, and J. W. Hicks. (1997). Ventilation and gas exchange in lizards during treadmill exercise. *J. Exp. Biol.* 200, 2629-2639.
- Simmons, A. D.**, D. R. Carrier, C. G. Farmer, and **C. Gregerson.** (1997). Lack of locomotor - cardiac coupling in dogs. *Amer. J. Physiol.* 273, R1352-R1360.
- Carrier, C. R., **C. S. Gregersen** and N. A. Silverton. (1998). Dynamic gearing in running dogs. *J. Exp. Biol.* 201, 3185-3195.
- Gregersen, C. S.**, N. A. Silverton, and D. R. Carrier. (1998). External work and potential for elastic storage of energy at the limb joints of running dogs. *J. Exp. Biol.* 201, 3197-3210.
- Farmer, C. G. and D. R. Carrier. (2000). Pelvic aspiration in the American alligator (*Alligator mississippiensis*). *J. Exp. Biol.* 203, 1679-1687.
- Farmer, C. G. and D. R. Carrier. (2000). Ventilation and gas exchange during walking in the American Alligator (*Alligator mississippiensis*). *J. Exp. Biol.* 203, 1671-1678.
- Farmer, C. G. and D. R. Carrier. (2000). Ventilation and gas exchange during recovery from treadmill-locomotion in the American Alligator (*Alligator mississippiensis*). *Respiration Physiology* 120, 67-73.
- Carrier, D. R. and Farmer, C. G. (2000). The evolution of pelvic aspiration in archosaurs. *Paleobiology* 26, 271-293.
- Carrier, D. R. and Farmer, C. G. (2000). The Integration of Ventilation and Locomotion in Archosaurs. *Amer. Zool.* 40, 87-100.
- Watts, P. and D. R. Carrier. (2000). Human flight and exercise in microgravity. *J. Gravitational Physiol.* 7, 31-34.
- Nassar, P., A. Jackson, and D. R. Carrier. (2001). Entraining the natural frequencies of running and breathing in guinea fowl. *J. Exp. Biol.* 204, 1641-1651.
- Fife, M. M.**, C. Bailey, D. V. Lee, and D. R. Carrier. (2001). Function of the oblique hypaxial muscles in trotting dogs. *J. Exp. Biol.* 204, 2371-2381.
- Ritter, D., Nassar, P., **Fife, M.** and D. R. Carrier. (2001). Function of the epaxial muscles in trotting dogs. *J. Exp. Biol.* 204, 3053-3064.
- Carrier, D. R., D. V. Lee, and R. M. Walter. (2001). Influence of rotational inertia on the turning performance of theropod dinosaurs: clues from humans with increased rotational inertia. *J. Exp. Biol.* 204, 3917-3926.
- Lee, D. V., R. M. Walter, S. M. Deban, and D. R. Carrier. (2001). Influence of increased rotational inertia on the turning performance of humans. *J. Exp. Biol.* 204, 3927-3934.
- Owerkowicz, T., E. L. Brainerd, and D. R. Carrier. (2001). Electromyographic pattern of the gular pump in monitor lizards. *Bull. Mus. Comp. Zool.* 156, 237-248.
- Deban, S. M. and D. R. Carrier. (2002). Hypaxial muscle activity during running and breathing in dogs. *J. Exp. Biol.* 205, 1953-1967.
- Carrier, D. R., S. M. Deban, and **J. Otterstrom.** (2002). The face that sunk the Essex:

- Potential function of the spermaceti organ in aggression. *J. Exp. Biol.* 205, 1755-1763.
- Walter, R. M. and D. R. Carrier. (2002). Scaling of rotational inertia in murine rodents and two species of lizard. *J. Exp. Biol.* 205, 2135-2141.
- Chase, K., D. R. Carrier, F. R. Adler, T. Jarvik, E. A. Ostrander, T. D. Lorentzen and K. G. Lark. (2002). Genetic basis for systems of skeletal quantitative traits: principal component analysis of the canid skeleton. *PNAS* 99, 9930-9935.
- Carrier, D. R. (2002). Functional tradeoffs in specialization for fighting and running. Pp. 237-255, in *Topics in Functional and Ecological Vertebrate Morphology*, P. Aerts, K. D'Aout, A. Herrel, and R. Van Damme (eds.), Shaker Publishing.
- Pasi, B. M.** and D. R. Carrier. (2003). Functional tradeoffs in the limb muscles of dogs selected for running versus fighting. *J. Evol. Biol.* 16, 324-332.
- Carrier, D. R. (2004). The running-fighting dichotomy and the evolution of aggression in hominids. In, *From Biped to Strider: The Emergence of Modern Human Walking, Running, and Resource Transport*. (J. Meldrum and C. Hilton eds.) Kluwer/Plenum Press: New York.
- Gregersen, C. S.** and D. R. Carrier. (2004). Dynamic gearing during jumping in dogs. *J. Biomech.* 37, 1011-1018.
- Lee, D. V., E. F. Stakebake, R. M. Walter and D. R. Carrier. (2004). Effects of mass distribution on the mechanics of level trotting in dogs. *J. Exp. Biol.* 207, 1715-1728.
- Seymour, R. S., C. L. Bennett-Stamper, S. D. Johnston, D. R. Carrier and G. C. Grigg. (2004). Evidence for endothermic ancestors of crocodiles at the stem of archosaur evolution. *Physiol. Biochem. Zool.* 77, 1051-1067.
- Codd, J. R., D. F. Boggs, S. F. Perry and D. R. Carrier. (2005). Activity of three muscles associated with the uncinat processes of the giant Canada goose *Branta canadensis maximus*. *J. Exp. Biol.* 208, 849-857.
- Chase, K., D.F. Lawler, D.R. Carrier and K.G. Lark. (2005). Genetic regulation of osteoarthritis: A QTL regulating cranial and caudal acetabular osteophyte formation in the hip joint of the dog (*Canis familiaris*). *Am. J. Med. Genet.* 135A, 334-335.
- Kemp, T.J.**, K. N. Bachus, J.A. Nairn and D. R. Carrier. (2005). Functional tradeoffs in the limb bones of dogs selected for running versus fighting. *J. Exp. Biol.* 208, 3475-3482.
- Carrier, D.R., K. Chase and K.G. Lark. (2005). Genetics of canid skeletal variation: Size and shape of the pelvis. *Genome Res.* 15, 1825-1830.
- Chase, K., D.R. Carrier, F.R. Adler, E.A. Ostrander and K.G. Lark. (2005). Interaction between the X chromosome and an autosome regulates size sexual dimorphism in Portuguese Water Dogs. *Genome Res.* 15, 1820-1824.
- Lark, K.G., K. Chase, D.R. Carrier and F.R. Adler. (2005). Genetic analysis of the canid skeleton: Analysis of morphological loci (QTLs) in the Portuguese Water Dog population. Pp. 67-80, in *The Genome of the Domestic Dog*. Editors: E.A.

- Ostrander, U. Giger, and K. Lindblad-Toh. Cold Spring Harbor Press, Cold Spring Harbor, NY.
- Trut, L.N., A.V. Kharlamova, D.R. Carrier, K. Chase, A.V. Kukekova, G.M. Acland, and K.G. Lark. (2005). Morphology and behavior: Are they coupled at the genome level? Pp. 81-93, in *The Genome of the Domestic Dog*. Editors: E.A. Ostrander, U. Giger, and K. Lindblad-Toh. Cold Spring Harbor Press, Cold Spring Harbor, NY..
- Parker, C. R., D. R. Carrier, and J. M. Hollerbach. (2005). Validation of torso force feedback slope simulation through an energy cost comparison. In *Eurohaptics Conference, 2005 and Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, 2005. World Haptics 2005. First Joint* (pp. 446-451). IEEE.
- Carrier, D. R., S. M. Deban and **T. Fischbein**. (2006). Locomotor function of the pectoral girdle “muscular sling” in trotting dogs. *J. Exp. Biol.* 209, 2224-2237.
- Perry, S. F. and D. R. Carrier. (2006). The coupled evolution of breathing and locomotion as a game of leapfrog. *Physiol. Biochem. Zool.* 79, 997-999.
- Dudley, R., R. B. Huey, and D. R. Carrier. (2006). Living history of physiology: Carl Gans. *Adv. Physiol. Educ.* 30, 102-107.
- Carrier, D. R. (2007). The short legs of great apes: evidence for aggressive behavior in australopithecines. *Evolution* 61, 596-605.
- Walter, R. M. and D. R. Carrier. (2007). Ground forces applied by galloping dogs. *J. Exp. Biol.* 210, 208-216.
- Kharlamova, A. V., L. N. Trut, D. R. Carrier, K. Chase, and K.G. Lark. (2007). Genetic regulation of canine skeletal traits: trade-offs between the hind- and fore-limbs in the fox and dog. *Int. Comp. Biol.* 47, 373-381.
- Carrier, D. R., S. M. Deban, and **T. Fischbein**. (2008). Locomotor function of forelimb protractor and retractor muscles of dogs: evidence of strut-like behavior at the shoulder. *J. Exp. Biol.* 211, 150-162.
- Walter, R. M. and D. R. Carrier. (2009). Rapid acceleration in dogs: ground forces and body posture dynamics. *J. Exp. Biol.* 212, 1930-1939
- Schilling, N. and Carrier, D. R. (2009). Function of the epaxial muscles during trotting. *J. Exp. Biol.* 212: 1053-1063.
- Schilling, N., **T. Fischbein**, **E. P. Yang** and D. R. Carrier. (2009). Function of the extrinsic hindlimb muscles in trotting dogs. *J. Exp. Biol.* 212, 1036-1052.
- Markely, J. S. and D. R. Carrier. (2010). The cost of ventilation in birds measured via unidirectional artificial ventilation. *Comp. Biochem. Physiol. Part A* 155, 146-153.
- Cunningham, C. B., N. Schilling, C. Anders and D. R. Carrier. (2010). The influence of foot posture on the cost of transport in humans. *J. Exp. Biol.* 213, 790-797.
- Schilling, N. and D. R. Carrier. (2010). Function of the epaxial muscles in walking, trotting, and galloping dogs: Implications for the evolution of epaxial muscle function in tetrapods. *J. Exp. Biol.* 213, 1490-1502.

- Carrier, D. R. (2011). The advantage of standing up to fight and the evolution of habitual bipedalism in hominins. *PLoS ONE* 6(5): e19630.
- Walter, R. M. and D. R. Carrier. (2011). Effects of fore-aft body mass distribution on acceleration in dogs. *J. Exp. Biol.* 214, 1763-1772.
- Carrier, D. R., C. Anders, and N. Schilling. (2011). The musculoskeletal system of humans is not tuned to maximize the economy of locomotion. *PNAS* 108, 18631-18636.
- Deban, S. M., N. Schilling, and D. R. Carrier. (2012). Activity of extrinsic limb muscles in dogs at walk, trot and gallop. *J. Exp. Biol.* 215, 287-300.
- Dial T. R. and D. R. Carrier. (2012). Precocial hindlimbs and altricial forelimbs: partitioning ontogenetic strategies in Mallard ducks (*Anas platyrhynchos*). *J. Exp. Biol.* 215, 3703-3710.
- Ross, C.F., R.W., Blob, D.R. Carrier, M.A. Daley, S.M. Deban, B. Demes, J.L. Gripper, J. Iriarte-Diaz, B.M. Kilbourne, T. Landberg, J.D. Polk, N. Schilling and B. Vanhooydonck. (2013). The evolution of locomotor rhythmicity in tetrapods. *Evolution* 67, 1209-1267.
- Daley, M. A., D. M. Bramble, and D. R. Carrier. (2013). Impact Loading and Locomotor-Respiratory Coordination Significantly Influence Breathing Dynamics in Running Humans. *PloS one*, 8(8), e70752.
- Morgan, M. H.** and D. R. Carrier. (2013). Protective buttressing of the human fist and the evolution of hominin hands. *J. Exp. Biol.* 216, 236-244.
- Carrier, D. R. and **M. H. Morgan.** (2013). Response to ‘Human fist evolution: a critique’. *J. Exp. Biol.* 216, 2360-2360.
- Cunningham, C. B., J. S. Ruff, K. Chase, W. K. Potts, and D. R. Carrier. (2013). Competitive ability in male house mice (*Mus musculus*): Genetic influences. *Behavior Genetics* 43, 151-160.
- Galis, F., D. R. Carrier, J. van Alphen, S. D. van der Mije, T. J. Van Dooren, J. A. Metz, and C. M. ten Broek. (2014). Fast running restricts evolutionary change of the vertebral column in mammals. *PNAS* 111, 11401-11406.
- Carrier, D. R. and M. H. Morgan. (2015). Protective buttressing of the hominin face. *Biological Reviews* 90, 330-346.
- Horns, J., R. Jung** and D. R. Carrier. (2015). In vitro strain in human metacarpal bones during striking: testing the pugilism hypothesis of hominin hand evolution. *Journal of Experimental Biology* 218, 3215-3221.
- Carrier, D. R., N. Schilling and C. Anders. (2015). Muscle activation during maximal effort tasks: evidence of the selective forces that shaped the musculoskeletal system of humans. *Biology open* bio-014381.
- Morris, J. S. and D. R. Carrier. (2016). Sexual selection on skeletal shape in Carnivora. *Evolution* 70, 767-780.
- Carrier, D. R. (2016). The Fight or Flight Dichotomy: Functional Tradeoff in

Specialization for Aggression Versus Locomotion. Editor: J. Bertram. Pp 325 – 348, in: *Understanding mammalian locomotion: Concepts and applications*. John Wiley and Sons, Inc., Hoboken.

- Panagiotopoulou, O., P. Spyridis, H. Mehari Abraha, D. R. Carrier and T. C. Pataky. (2016). Architecture of the sperm whale forehead facilitates ramming combat. *PeerJ* 4, e1988.
- Kilbourne, B. M. and D. R. Carrier. (2016). Manipulated Changes in Limb Mass and Rotational Inertia in Trotting Dogs (*Canis lupus familiaris*) and Their Effect on Limb Kinematics. *Journal of Experimental Zoology Part A: Ecological Genetics and Physiology* 325, 665-674.
- Carrier, D. R. and C. Cunningham. (2017). The effect of foot posture on capacity to apply free moments to the ground: implications for fighting performance in great apes. *Biology Open* 6, 269-277.
- Morris, J. S., J. S. Ruff, W. K. Potts and D. R. Carrier. (2017). A disparity between locomotor economy and territory-holding ability in male house mice. *Journal of Experimental Biology* 220, 2521-2528.
- Morris, J. S., Cunningham, C. B., and Carrier, D. R. (2019). Sexual dimorphism in postcranial skeletal shape suggests male-biased specialization for physical competition in anthropoid primates. *Journal of morphology* 280(5), 731-738.
- Bye, T. K., Carter, K. R., Carrier, D. R., and Elmer, S. J. (2019). An outside-the-box activity to demonstrate how humans and animals turn. *Advances in Physiology Education* 43(3), 282-287.
- Morris, J. S., Link, J., Martin, J. C., and Carrier, D. R. (2020). Sexual dimorphism in human arm power and force: implications for sexual selection on fighting ability. *Journal of Experimental Biology* 223(2).
- Cooper, A. N., Cunningham, C. B., Morris, J. S., Ruff, J. S., Potts, W. K., and Carrier, D. R. (2020). Musculoskeletal mass and shape are correlated with competitive ability in male house mice (*Mus musculus*). *Journal of Experimental Biology*, 223(3).
- Luttmer, N., **Truong, T.**, Boynton, A., Carrier, D., and Minor, M. (2020). Treadmill Based Three Tether Parallel Robot for Evaluating Auditory Warnings While Running. Conference: 2020 International Conference on Robotics and Automation (ICRA).
- Beseris, E. A.**, Naleway, S. E., and Carrier, D. R. (2020). Impact Protection Potential of Mammalian Hair: Testing the Pugilism Hypothesis for the Evolution of Human Facial Hair. *Integrative Organismal Biology*, 2(1), obaa005.
- Morris, J. S., **Rogers, N.**, Rogers, A. R., and Carrier, D. R. (2020). Sexual dimorphism in skeletal shape in microtine voles: disparate selection on male bodies and female heads. *Journal of Mammalogy*, 101(4), 951-957.

## **GRANTS**

University of Utah Seed Grant. The role of fascicle length in determining muscle power versus economy. 2018. \$23,313.

National Science Foundation. SCH: INT: Reducing Traumatic Brain Injury Risk with Impact Compensation. 2016 - 2020. Currently in no cost extension. CoPI. \$2,055,860.

National Science Foundation. DISSERTATION RESEARCH: The functional basis of whole-organism trade-offs between locomotor economy and physical competitive ability. 2016. \$14,364.

University of Utah Seed Grant. The Evolution of Social Dominance: A Selection Experiment in Wild Mice. 2009. \$24,000.

National Science Foundation. Functional Tradeoffs in Specialization for Locomotion Versus Fighting. 2008-2013. \$290,921

National Science Foundation, Symposium -The 2007 annual of the Society of Integrative and Comparative Biology. 2007. \$18,740

National Science Foundation, Integration of axial and appendicular function in a model mammalian system. 2003-2006. \$361,437

National Science Foundation, Function of the axial musculoskeletal system in locomotion and ventilation. 1998-2001. \$228,000

National Science Foundation, Role of the axial musculoskeletal system in locomotion. 1993-1996. \$222,000

National Young Investigator, National Science Foundation, 1992-1997.

Post Doctoral Fellow, NRSA, National Institute of Health, University of California, Berkeley, 1989-91.

## **Ph.D. CANDIDATES ADVISED**

Dale A. Ritter, Ph.D. (1996)

Morphology Course Director and Senior Lecturer in Biology Department of Ecology and Evolutionary Biology, Brown University

Peter Nassar, Ph.D. (1994)

Associate Director of Anatomy Labs in the Department of Animal Biology, University of Pennsylvania

Carmen Bailey, Ph.D. (2000)

Deputy Director Utah's Public Lands Policy Coordinating Office

David Lee, Ph.D. (2009)



Associate Professor, Department of Life Sciences, University of Nevada Las Vegas

Rebecca Walter, Ph.D. (2008)

Associate Professor, Department of Biology, Bloomfield College

Jessamyn Markley, PhD (2011)

Instructor Continuing Education, University of Utah

Christopher B. Cunningham, Ph.D. (2014)

Lecturer, Department of Biosciences, Swansea University

Jeremy Morris, Ph.D. (2018)

Assistant Professor, Department of Biology, Wofford College

Amanda Cooper, Ph.D. (2020)

Biology Teaching Lab Coordinator, School of Biological Sciences, University of Utah.

Jeremy Klingler, Ph.D (2020)

Assistant Professor, Department of Biology, Southwestern Oklahoma State University.

#### **CURRENT Ph.D. STUDENTS**

Lindsey Reader, Alicia Boynton, Alex Horns

#### **SYMPOSIUM CHAIRED**

Boggs, D. F., D. R. Carrier, and D. M. Bramble. 1995. Impact of Locomotion on Ventilation in Tetrapods. FASEB.

Perry, S. F. and D. R. Carrier. 2004. Respiration and Locomotion: Coupled Systems in Vertebrate Evolution. 7th International Congress of Vertebrate Morphology.

Galis, F. and Carrier, D. 2007. Linking Genes and Morphology in Vertebrates for the January 2007 meeting of Society of Integrative and Comparative Biology.

Carrier, D. R., A. Herrel and K. Lapin. 2007. Tooth and Claw: The Evolutionary and Functional Morphology of Aggression. 8th International Congress of Vertebrate Morphology

Cashdan E. A., Carrier, D. R., Downes, S. 2009. The Evolution of Human Aggression: Lessons for Today's Conflicts. Third Annual Barbara L. and Norman C. Tanner Center for Nonviolent Human Rights Advocacy Forum.

#### **INVITED SEMINARS**

CARTA Symposium, University of California, San Diego, Salk Center for Academic Research and Training in Anthropology, 2021

Grinnell College, Department of Biology, 2020

University of Calgary, Biological Sciences, 2020  
Northeast Ohio Medical University, Department of Anatomy and Neurobiology, 2019  
University of New Orleans, Department of Biological Sciences, 2018  
University of California, Irvine, Center for Exercise Medicine and Sport Science, 2018  
Human Anatomy and Physiology Society, Annual Conference, Plenary Speaker, 2017  
Naturalis, Leiden, The Netherlands, 2016  
Academic Medical Center, Amsterdam, The Netherlands, 2016  
LBT, University of Leiden, The Netherlands, 2016  
Utah Valley University, Orem, UT, Depart. Biol. Darwin Day Celebration, 2015  
Utah Entrepreneurial Faculty Scholars, Salt Lake City, UT, 2014  
University of Nevada, Department of Biology, Las Vegas, NV, 2013  
Science at Breakfast, Salt Lake City, UT, 2013  
SICB Southwest Regional Meeting, San Bernardino, CA, Plenary Speaker, 2012  
California State University, San Bernardino, CA, 2012  
Alta Club, Salt Lake City, UT, 2012  
Department of Orthopedics, Salt Lake City, UT, University of Utah, 2012  
University of Liverpool, Liverpool, UK, Department of Anthropology 2011  
Royal Veterinary College, Hatfield, UK, Structure Motion Laboratory, 2011  
Pixar Animation Studios, Emeryville, CA, 2008  
University of Utah, Salt Lake City, Department of Anthropology, 2008  
University of California, Riverside, Department of Biology, 2007.  
University of Chicago, Evolutionary Morphology Seminar Series, 2007.  
Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Palmerston  
North New Zealand, 2006  
International Congress of Respiratory Biology, Symposium titled - Integration of  
locomotion and ventilation, Bonn, Germany, 2006  
Friedrich-Schiller-University, Institute of Systematic Zoology and Evolutionary Biology,  
Jena, Germany, 2006  
Brown University, Department of Ecology and Evolutionary Biology, 2005  
7th International Congress of Vertebrate Morphology, Florida Atlantic University,  
symposium titled - Linking genes and morphology, 2004.  
Harvard University, Department of Anthropology, 2004.  
Universitaet Bonn, Institut fuer Zoologie, 2003.  
Annual Symposium, Instituut Biologie Leiden University, Netherlands, 2003.

6th International Congress of Comparative Physiology and Biochemistry, La Trobe University, Australia, symposium titled – Energetics of locomotion, do we have all the answers?, 2003.

6th International Congress of Comparative Physiology and Biochemistry, La Trobe University, Australia, symposium titled – Dinosaur physiology, 2003.

9th Benelux Congress of Zoology, Plenary lecture, University of Antwerp, Belgium, 2002.

Festschrift for Fritz De Vries, University of Antwerp, Belgium, 2002.

6th International Congress of Vertebrate Morphology, Friedrich-Schiller-Universität, Jena, Germany, 2001

The Society for Experimental Biology, Symposium titled: Biomechanics and Evolution. University of Kent, England, 2001.

Leiden University, Netherlands, Institute of Evolutionary and Ecological Sciences, Departmental Seminar. 2001.

The Society for Experimental Biology, Symposium titled: Muscle, Molecules to Movement. University of Exeter, England, 2000.

21st Annual International Gravitational Physiology Meeting, Symposium titled: Gravity and the Musculoskeletal System. Nagoya, Japan, 2000.

American Association of Physical Anthropologists, Symposium titled: From Biped to Strider. San Antonio, Texas, 2000.

University of Texas, Austin, Department of Integrative Biology, 1999.

University of California, Irvine, Department of Ecology and Evolutionary Biology, Graduate Seminar, 1999.

California State Polytechnic University, Pomona, Biological Sciences Department, Consulting on electromyography, 1999.

University of California, Irvine, Department of Ecology and Evolutionary Biology, Departmental seminar, 1999.

Society of Experimental Biology, Symposium titled: Mechanics of Respiration and Circulation, 1999

Society of Integrative and Comparative Biology, Symposium titled: The function and evolution of the vertebrate axis, 1999.

University of Utah, Department of Geology and Geophysics, 1999.

University of California, Berkeley, Dept. of Integrative Biology, Internet Seminar on Locomotion, 1997.

University of Utah, Dept. of Mechanical Engineering, 1997

Dalhousie University, Halifax, Department of Anatomy, 1995.

Dalhousie University, Halifax, Department of Biology, 1995.

Brown University, Providence, Department of Psychology, 1995.  
International Congress of Vertebrate Morphology, Symposium titled: The Many Guises of the Phoenix, 1994.  
University of Pennsylvania, Philadelphia, Biology Department, 1993  
Villanova University, Villanova, Biology Department, 1993  
University of Connecticut, Storrs, Department of Biology, 1992  
Harvard School of Public Health, Boston, Respiration Physiology, 1992  
Brown University, Providence, Pulmonary Research Group, 1992  
University of California, Irvine, Department of Ecology and Evolutionary Biology, 1991  
California Academy of Sciences, San Francisco, Herpetology, 1991  
California Academy of Sciences, San Francisco, Workshop for High School Teachers, 1991  
Stanford University, Palo Alto, Department of Engineering, 1991  
First World Congress of Biomechanics, Symposium on Mechanical Properties of Cortical Bone. 1990  
American Society of Zoologist Symposium on Experimental Approaches to the Analysis of Form and Function. 1989

### **CLASSES TAUGHT**

Animal Biology, 1995 and 1996  
Animal Physiology, 1997 and 1998  
Comparative Physiology, 1999 - 2007  
Comparative Physiology Lab, 1999 - 2000  
Comparative Vertebrate Morphology, 2001 – 2017, 2021  
Evolution and Diversity of Life, 2002, 2004, 2006, 2008, 2009, 2010  
Evolution of Aggressive Behavior, 2006 - 2010  
Evolution and Physiological Basis of Health, co-taught with David Temme, 2009 – 2018  
Comparative Vertebrate Morphology, 2011 – 2018  
Fundamentals of Biology II, 2019 (Spring and Fall Semesters)  
Human Biology, 2020 – 2021  
Being Human in STEM, 2021 (co-instructor)

### **TEACHING AWARDS**

Student Advisory Committee Professor of the Year, 1998-1999

Student Advisory Committee Professor of the Year, 1999-2000  
Student Advisory Committee Professor of the Year, 2000-2001

## **LABORATORY VISITING SCHOLARS**

Sabine Moritz, Graduate Student, Friedrich-Schiller-University, Jena, 2007, 2008.  
Nadja Schilling, Assistant Professor, Friedrich-Schiller-University, Jena, 2004 - 2011.  
Brandon Kilborn, Graduate Student, University of Chicago, 2007, 2008.  
Stephen Perry, Professor, Bonn University, 2004.  
Jonathon Codd, Graduate Student, Bonn University, 2004.  
Dona Boggs, Professor, Eastern Washington University, 2004.  
Marguerite Butler, Assistant Professor, University of Tennessee, 2004, 2006.  
Suzy Munns, Post Doctoral Associate, University of California, Irvine, 2002  
Lynn Hartzler, Graduate Student, University of California, Irvine 2002  
Dan Lieberman, Associate Professor, George Washington University, 2001  
Thomaz Owerkowicz, Graduate Student, Harvard University, 2000  
James O'Reilly, Post Doctoral Associate, University of Massachusetts, 2000  
Stan Lindstedt, Professor, Northern Arizona University, 2000  
James Hicks, Professor, University of California, Irvine, 2000

## **ACADEMIC SERVICE**

Academic Editor, PLOS ONE, 2013 – present.  
Mock Review of the Structure and Motion Laboratory of the Royal Veterinary College in preparation for the 2021 Research Excellence Framework review, Feb. & Oct. 2019.  
Associate Editor, *Evolution*, 2011-2014.  
Editorial Advisory Board Members of 'The Open Paleontology Journal', 2009 - 2012.  
Executive Committee, International Congress of Vertebrate Morphology, 2007 - 2013.  
Internal Review Committee for Graduate Council - Department of Geology and Geophysics, University of Utah, Spring 2011.  
Review Committee for the Evolution, Ecology, and Organismal Biology (EEOB), Graduate Program at the University of California, Riverside, Spring 2009.  
Ecological and Evolutionary Physiology Panel, Integrative Biology and Neuroscience, National Science Foundation, Fall, 2006.  
Associate Editor, *Journal of Experimental Zoology (Molecular and Comparative Physiology)*, 2003-2005.

Sensory and Movement Panel, Integrative Biology and Neuroscience, National Science Foundation, Fall, 2003.

Dissertation Improvement Grant Panel, Integrative Biology and Neuroscience, National Science Foundation. Spring, 1996.

Committee of Visitors for the Physiology and Behavior Cluster of Integrative Biology and Neuroscience of The National Science Foundation. August, 1994

Host for Northeast Regional Meeting of the American Society of Zoologists. Fall 1993

Expert Advisory Committee to Integrative Biology and Neuroscience of The National Science Foundation. Spring 1993

Graduate Student and Post Doc Committee, American Society of Zoologists, 1986-1988.

### **UNIVERSITY SERVICE**

Institutional Animal Use and Care Committee, 2019-2020

Internal Review of The Department of Anthropology, 2018

Integrated Science Core Committee, 2017-2018

Search Committee for Chair of Department of Nutrition and Integrative Physiology, 2015

Academic Senate Ad Hoc Re-Investment Dialogue Committee, 2015-2016

Academic Senate Committee on Socially Responsible Investment, 2015

College of Science Curriculum Committee, 2012-2013

Co-Organizer of the Integrative Human Biology Initiative, 2009-2010

Academic Senate, 2008-2011.

Academic Freedom and Faculty Rights Committee, 2007-2009

College of Science Council, 2004-2005

Science General Education Area Committee, 2003-2004

Institutional Animal Use and Care Committee, 1997-2001

Institutional Animal Use and Care Committee, Chair, 1998-2001

### **DEPARTMENT SERVICE**

Safety Committee, Chair

Curriculum Committee

Curriculum Reform Committee

Curriculum Committee

Graduate Student Committee

Curriculum Committee, Chair

BioURP Committee, Chair  
Animal Use Committee  
Executive Committee  
Communication Committee

## **COMMUNITY SERVICE**

Co-founder of Clean the Darn Air ballot initiative, 2019.  
Co-organizer and facilitator of Utah Citizens' Counsel, 2008-2020.  
Plaintiff in a successful lawsuit against Salt Lake County Government to stop illegal gravel quarrying in Parley's Canyon, Utah State Supreme Court, 2003-2004.  
Plaintiff in a successful lawsuit against Salt Lake County Government to stop illegal gravel quarrying in Parley's Canyon, 10th District Court, 2001-2002.  
Advisory Board of Save Our Canyons, 1999-2002.

## **MEETINGS ATTENDED**

The Society for Integrative and Comparative Biology (yearly).  
American Association of Physical Anthropologists (2008, 2009, 2011)  
Society of Experimental Biology, (1999, 2000, 2001, 2011).  
Northeast Regional Meeting of the American Society of Zoologists. (yearly through 1994).  
American Physiological Society Intersociety Meetings on Comparative Physiology.  
International Congress of Vertebrate Morphology (every three years).  
First World Congress of Biomechanics. (1990).  
American Society of Vertebrate Paleontology, (1985, 1999).  
American Association of Physical Anthropologists, (2000).  
International Society for Gravitational Physiology, (2000).  
International Congress of Comparative Physiology and Biochemistry (2003).  
The Evolution of Sexual Size Dimorphism, Universitat Zurich, Switzerland (2005)