Kevin M. Middleton, Ph.D.

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Professional Experience

2012 - Pres.	**Associate Professor** Department of Pathology & Anatomical Sciences	University of Missouri
2011 - 2012	**Associate Professor** Department of Biology	CSU San Bernardino
2007 - 2011	**Assistant Professor** Department of Biology	CSU San Bernardino
2005 - 2007	**NIH NRSA Postdoctoral Fellow** Effects of Genetics, Exercise, and Age on Bone Mechanics	Brown University and University of California, Riverside
2003 - 2005	**Postdoctoral Research Associate** Department of Ecology and Evolutionary Biology	Brown University

Education

1992 - 1995	**BS Biology** Summa Cum Laude	Wake Forest University
1996 - 2003	**PhD Ecology and Evolutionary Biology** Morphology, evolution, and function of the avian hallux	Brown University

Research Interests

My research focuses on musculoskeletal physiology, form, and function in the contexts of animal locomotion, feeding, and vertebrate evolution. In my work, I integrate studies across multiple scales from micro-scale structural materials of bone to macro-scale whole bone morphology to evolutionary changes across vertebrate taxa and with comparisons to extinct organisms.

Current Projects

- Effects of exercise and genetic background on skeletal form, physiology, and biomechanics using high activity mice as a model organism
- Evolution of the avian head: integrating cranial biomechanics, muscle modeling, and brain evolution to understand avian cranial kinesis
- Development of Bayesian and machine learning models for the prediction of craniofacial growth and form in humans
- Evolution of wing-propelled diving in birds: exploring patterns of evolution in bone microstructure, feather biomechanics, functional morphology, and sensory systems

Awards

2017 MU School of Medicine Awawrd for Outstanding Preclinical Faculty Education
2017 Ann K. Covington Award for Undergraduate Mentoring
2019 Gold Chalk Award for Graduate Teaching

Grants in Review

2019 National Institutes of Health: National Institute of Aging
Effects of early-life exercise on the aging body ($3,004,377)
Kevin Middleton Lead PI
Kristina Aldridge PI
Jaume Padilla PI
Dana Duren co-I

2019 National Institutes of Health: National Institute of Dental and Craniofacial Research
Craniofacial Growth Prediction in Different Facial Types ($3,492,140)
Richard Sherwood Lead PI
Kevin Middleton co-PI
Kieran McNulty co-PI

Heesoo Oh co-PI
Dana Duren co-I
David Hatcher co-I
Manish Valiathan co-I

Current and Past Grants and Fellowships

2019–2020 National Institutes of Health: National Institute of Dental and Craniofacial Research
Administrative Supplement to *Craniofacial Growth Prediction in Different Facial Types* ($116,169)
Richard Sherwood PI
Kevin Middleton co-I

2017 MU DNA Core Facility NextGen Sequencing Pilot Award
Differential Gene Expression of Bone in Response to Experimental Loading Regimes
PI ($10,760).

2015–2019 National Science Foundation – Integrative Organismal Systems
Collaborative Research: Dinosaur Jaw Muscle Evolution and the Origins of Avian Cranial Kinesis

Collaborative grant between Casey M. Holliday (lead PI), Kevin M. Middleton (co-PI), Julian Davis (University of Southern Indiana; co-PI), and Lawrence W. Witmer (Ohio University; co-PI) to study the evolution and function of cranial kinesis in dinosaurs and birds. (NSF IOS 1457319; $461,982).

2010–2015 National Science Foundation – Systematic Biology
Collaborative Research: Wings to flippers - phylogenetics, character acquisition, and feather biomechanics in the evolution of wing-propelled diving

Collaborative project with co-PIs Julia Clarke (University of Texas, Austin) and Daniel Ksepka (North Carolina State University) to integrate studies of phylogenetics, sensory systems evolution, bone microstructure, feather function, and wing biomechanics across multiple transitions from aerial flight to underwater wing-propelled diving. (NSF DEB 0949945; $471,717 total; $64,201 to PI Middleton).

2009–2014 National Science Foundation – Integrative Organismal Systems
Collaborative Research: LiT: Effects of environmental oxygen on growth and physiological performance in the American alligator: A case study in experimental paleophysiology

Collaborative project with co-PIs James Hicks (University of California, Irvine), Tomasz Owerkowicz (CSU, San Bernardino) and Bryan Rourke (CSU, Long Beach) to study the effects of altered environmental oxygen level on alligator physiology (growth, locomotor ability, muscle & bone structure). (NSF IOS 0922576; $517,931 total; $59,619 to PI Middleton).

2011–2014 National Science Foundation – Undergraduate Education
Maturation of an S-STEM scholarship program at a Hispanic/minority serving institution

Four years of continued funding and expansion of CSUSB Math and Science Scholars scholarship program designed to encourage minority, under-represented,and economically disadvantaged student to enter STEM disciplines. *This grant was awarded while I was at CSUSB, but I am no longer co-PI* (NSF DUE 1060632; co-PI; $591,231)

2008–2009 NIH – National Institute of Arthritis and Musculoskeletal and Skin Diseases
Extramural Associates Research Development Award (EARDA) pilot grant: *Establishment of an Inbred Strain of "Mini-muscle" Phenotype, High-activity Mice* ($15,000; sub-award from NIH 5G11HD052368-03)

2005–2007 NIH Ruth Kirschstein National Research Service Award
Effects of Genetics, Exercise, and Age on Bone Mechanics (NIH 1F32AR053008-01)

2002 Society of Vertebrate Paleontology
Honorable Mention, Alfred Sherwood Romer Prize

2000–2003 National Science Foundation
Dissertation Improvement Grant: "Evolution and Functional Morphology of the Theropod Foot"

1999 Paleontological Society
Grant-in-Aid of Paleontological Research
Award for Outstanding Student Scholarship Proposal

1999 Geological Society of America
Student Research Grant
Award for Exceptional Merit in Conception and Presentation

1999 Sigma Xi – Grant in Aid of Research

1997 National Science Foundation
Graduate Research Fellowship, Honorable Mention

Publications

Dissertation

1. Middleton, KM (2003). "Morphology evolution and function of the avian hallux". PhD thesis. Providence, RI: Brown University.

Refereed Research Papers

1. Gatesy, SM and KM Middleton (1997). Bipedalism, flight, and the evolution of theropod locomotor diversity. *J. Vert. Paleontol.* **17**(2), 308–329.
2. Gatesy, SM and KM Middleton (1999). Theropod hind limb disparity revisited: a response. *J. Vert. Paleontol.* **19**(3), 606–606.
3. Gatesy, SM, KM Middleton, FA Jenkins Jr, and NH Shubin (1999). Three-dimensional preservation of foot movements in Triassic theropod dinosaurs. *Nature* **399**(6732), 141–144.
4. Middleton, KM and SM Gatesy (2000). Theropod forelimb design and evolution. *Zool. J. Linn. Soc.* **128**(2), 149–187.
5. Middleton, KM (Oct. 2001). The morphological basis of hallucal orientation in extant birds. *J. Morphol.* **250**(1), 51–60.
6. Tian, X, J Iriarte-Diaz, K Middleton, R Galvao, E Israeli, A Roemer, A Sullivan, A Song, S Swartz, and K Breuer (2006). Direct measurements of the kinematics and dynamics of bat flight. *Bioinspir. Biomim.* **1**(4), S10–8.
7. Keeney, BK, DA Raichlen, TH Meek, RS Wijeratne, KM Middleton, GL Gerdeman, and T Garland Jr (2008). Differential response to a selective cannabinoid receptor antagonist (SR141716: Rimonabant) in female mice from lines selectively bred for high voluntary wheel-running behaviour. *Behav. Pharmacol.* **19**(8), 812–820.
8. Clarke, JA and KM Middleton (2008). Mosaicism, modules, and the evolution of birds: results from a Bayesian approach to the study of morphological evolution using discrete character data. *Syst. Biol.* **57**(2), 185–201.
9. Middleton, KM, CE Shubin, DC Moore, PA Carter, T Garland Jr, and SM Swartz (2008). The relative importance of genetics and phenotypic plasticity in dictating bone morphology and mechanics in aged mice: evidence from an artificial selection experiment. *Zoology* **111**(2), 135–147.
10. Middleton, KM, SA Kelly, and T Garland Jr (2008). Selective breeding as a tool to probe skeletal response to high voluntary locomotor activity in mice. *Integr. Comp. Biol.* **48**(3), 394–410.
11. Hannon, RM, SA Kelly, KM Middleton, EM Kolb, D Pomp, and T Garland Jr (2008). Phenotypic effects of the "mini-muscle" allele in a large HR x C57BL/6J mouse backcross. *J. Hered.* **99**(4), 349–354.
12. Lavin, SR, WH Karasov, AR Ives, KM Middleton, and T Garland Jr. (2008). Morphometrics of the avian small intestine compared with that of nonflying mammals: a phylogenetic approach. *Physiol. Biochem. Zool.* **81**(5), 526–550.
13. Swartz, SM and KM Middleton (2008). Biomechanics of the bat limb skeleton: scaling, material properties and mechanics. *Cells Tissues Organs* **187**(1), 59–84.
14. Malisch, JL, CW Breuner, EM Kolb, H Wada, RM Hannon, MA Chappell, KM Middleton, and T Garland Jr (2009). Behavioral despair and home-cage activity in mice with chronically elevated baseline corticosterone concentrations. *Behav. Genet.* **39**(2), 192–201.
15. Eisenmann, JC, EE Wickel, SA Kelly, KM Middleton, and T Garland Jr (2009). Day-to-day variability in voluntary wheel running among genetically differentiated lines of mice that vary in activity level. *Eur. J. Appl. Physiol.* **106**(4), 613–619.
16. Riskin, DK, J Iriarte-Díaz, KM Middleton, KS Breuer, and SM Swartz (2010). The effect of body size on the wing movements of pteropodid bats, with insights into thrust and lift production. *J. Exp. Biol.* **213**(Pt 23), 4110–4122.
17. Kolb, EM, SA Kelly, KM Middleton, LS Sermsakdi, MA Chappell, and T Garland Jr (2010). Erythropoietin elevates VO2,max but not voluntary wheel running in mice. *J. Exp. Biol.* **213**(3), 510–519.

18. Wallace, IJ, KM Middleton, S Lublinsky, SA Kelly, S Judex, T Garland Jr, and B Demes (2010). Functional significance of genetic variation underlying limb bone diaphyseal structure. *Am. J. Phys. Anthropol.* **143**(1), 21–30.
19. Middleton, KM, BD Goldstein, PR Guduru, JF Waters, SA Kelly, SM Swartz, and T Garland Jr (2010). Variation in within-bone stiffness measured by nanoindentation in mice bred for high levels of voluntary wheel running. *J. Anat.* **216**(1), 121–131.
20. Garland Jr, T, SA Kelly, JL Malisch, EM Kolb, RM Hannon, BK Keeney, SL Van Cleave, and KM Middleton (2011). How to run far: multiple solutions and sex-specific responses to selective breeding for high voluntary activity levels. *Proc. Biol. Sci.* **278**(1705), 574–581.
21. Keeney, BK, TH Meek, KM Middleton, LF Holness, and T Garland Jr (2012). Sex differences in cannabinoid receptor-1 (CB1) pharmacology in mice selectively bred for high voluntary wheel-running behavior. *Pharmacol. Biochem. Behav.* **101**(4), 528–537.
22. Altshuler, DL, EM Quicazán-Rubio, PS Segre, and KM Middleton (2012). Wingbeat kinematics and motor control of yaw turns in Anna's hummingbirds (*Calypte anna*). *J. Exp. Biol.* **215**(Pt 23), 4070–4084.
23. Cheney, JA, N Konow, KM Middleton, KS Breuer, TJ Roberts, EL Giblin, and SM Swartz (2014). Membrane muscle function in the compliant wings of bats. *Bioinspir. Biomim.* **9**(2), 025007.
24. Malisch, JL, K deWolski, TH Meek, W Acosta, KM Middleton, OL Crino, and T Garland Jr (2016). Acute restraint stress alters wheel-running behavior immediately following stress and up to 20 hours later in house mice. *Physiol. Biochem. Zool.* **89**(6), 546–552.
25. Read, TJG, PS Segre, KM Middleton, and DL Altshuler (2016). Hummingbirds control turning velocity using body orientation and turning radius using asymmetrical wingbeat kinematics. *J. R. Soc. Interface* **13**(116), 20160110.
26. Goller, B, PS Segre, KM Middleton, MH Dickinson, and DL Altshuler (2017). Visual sensory signals dominate tactile cues during docked feeding in hummingbirds. *Front. Neurosci.* **11**, 622.
27. Sellers, KC, KM Middleton, JL Davis, and CM Holliday (2017). Ontogeny of bite force in a validated biomechanical model of the American alligator. *J. Exp. Biol.* **220**, 2036–2046.
28. Ng'oma, E, EG King, and KM Middleton (2018). A model-based high throughput method for fecundity estimation in fruit fly studies. *Fly* **12**(3-4), 183–190.
29. Tsai, HP, KM Middleton, JR Hutchinson, and CM Holliday (2018). Hip joint articular soft tissues of non-dinosaurian Dinosauromorpha and early Dinosauria: evolutionary and biomechanical implications for Saurischia. *J. Vert. Paleontol.* **e1427593**, 1–23.
30. Peacock, SJ, BR Coats, JK Kirkland, CA Tanner, T Garland Jr, and KM Middleton (2018). Predicting the bending properties of long bones: Insights from an experimental mouse model. *Am. J. Phys. Anthropol.* **165**(3), 457–470.
31. Peacock, SJ, T Garland Jr, and KM Middleton (2018). Reply to Ruff, Warden, and Karlson. *Am. J. Phys. Anthropol.* **167**(1), 190–193.
32. Wilken, AT, KM Middleton, KC Sellers, IN Cost, and CM Holliday (2019). The roles of joint tissues and jaw muscles in palatal biomechanics of the savannah monitor (*Varanus exanthematicus*) and their significance for cranial kinesis. *J. Exp. Biol.* **222**(Pt 18).
33. Ng'oma, E, W Fidelis, KM Middleton, and EG King (2019). The evolutionary potential of diet-dependent effects on lifespan and fecundity in a multi-parental population of *Drosophila melanogaster*. *Heredity* **122**(5), 582–594.
34. Cost, IN, KM Middleton, KC Sellers, MS Echols, LM Witmer, JL Davis, and CM Holliday (July 2019). Palatal Biomechanics and Its Significance for Cranial Kinesis in Tyrannosaurus rex. en. *Anat. Rec.*
35. Lynch, R, V Lummaa, K Panchanathan, K Middleton, A Rotkirch, M Danielsbacka, D O'Brien, and J Loehr (2019). Integration involves a trade-off between fertility and status for World War II evacuees. *Nat Hum Behav* **3**(4), 337–345.
36. Sullivan, SP, FR McGechie, KM Middleton, and CM Holliday (2019). 3D Muscle Architecture of the Pectoral Muscles of European Starling (*Sturnus vulgaris*). *Integr Org Biol* **1**(1), oby010.

Manuscripts in Review

1. Smolinsky, AN and KM Middleton (n.d.). Endurance and impact activities differentially influence femoral cross-sectional geometry and mineral apposition. *J. Exp. Biol.* ().
2. Boeyer, ME, KM Middleton, DL Duren, and EV Leary (n.d.). Estimating peak height velocity in individuals: a comparison of statistical methods. *Annals of Human Biology* ().

Book Chapters

1. Gatesy, SM and KM Middleton (2007). "Skeletal Adaptations for Flight". In: *Fins Into Limbs*. Ed. by BK Hall. Chicago: University of Chicago Press.

2. Owerkowicz, T, C Musinsky, KM Middleton, and AW Crompton (2015). "Respiratory Turbinates and the Evolution of Endothermy in Mammals and Birds". In: *Great Transformations in Vertebrate Evolution*. Ed. by KP Dial, NH Shubin, and EL Brainerd. Chicago: University of Chicago Press, pp.143–166.

Invited Reviews

1. Clarke, J and K Middleton (May 2006). Bird evolution. *Curr. Biol.* **16**(10), R350–4.
2. Middleton, KM and LT English (Aug. 2014). Challenges and advances in the study of pterosaur flight. *Can. J. Zool.* **93**(12), 945–959.

Book Reviews

1. Middleton, KM (2003). *Dinosaurs of the Air: The Evolution and Loss of Flight in Dinosaurs and Birds* and *Mesozoic Birds: Above the Heads of Dinosaurs*. *Palaeontol. Electronica* **6**, 5.

Published Data Sets

1. Middleton, KM and SM Gatesy (2000). *Data from: Theropod forelimb design and evolution*. http://dx.doi.org/10.5061/dryad.jf6ht.
2. Read, TJG, PS Segre, KM Middleton, and DL Altshuler (2016). *Data from: Hummingbirds control turning velocity using body orientation and turning radius using asymmetrical wingbeat kinematics*. http://datadryad.org/handle/10255/dryad.111366.
3. Ng'oma, E, W Fidelis, KM Middleton, and EG King (2018). *Lifespan and fecundity data for: The evolutionary potential of diet-dependent effects on lifespan and fecundity in a multi-parental population of Drosophila melanogaster*. https://zenodo.org/record/1285237.
4. Peacock, SJ, BR Coats, JK Kirkland, CA Tanner, T Garland Jr, and KM Middleton (2018). *Data from: Predicting the bending properties of long bones: Insights from an experimental mouse model*. https://osf.io/3wxnh/.

Manuscripts in Preparation

1. Smolinsky, AN, KM Middleton, and CM Holliday (n.d.). Mechanical properties of the mandibular symphysis of American Alligators (*Alligator mississippiensis*). *J. Exp. Biol.* ().
2. Smith, CJ, CM Holliday, KM Middleton, and AM Bailleul (n.d.). Bending Properties of the Jugal Bone in Mallard Ducks and Its Significance for Cranial Biomechanics. *Anatomical Record* ().
3. Cost, IN, KC Sellers, KM Middleton, and CM Holliday (n.d.). Conveying 3D spatial data of muscle orientation throughout lineages, their ontogeny, and their feeding cycles to understand cranial mechanics. *Proc. Natl. Acad. Sci. U. S. A.* ().
4. Middleton, KM, SC Prior, and SM Swartz (n.d.). Scaling of cortical and subchondral bone thickness in the femora of terrestrial mammals. *J. Morphol.* ().
5. Kuo, S and KM Middleton (n.d.). Tensile mechanical properties of isolated penguin flipper feathers. *J. Morphol.* ().
6. Lujan, SL, T Owerkowicz, JW Hicks, and KM Middleton (n.d.). Atmospheric oxygen level does not alter growth or size-specific femoral cross-sectional geometry in the American alligator (*Alligator mississippiensis*). *Anat. Rec.* ().

Published Abstracts

1. Gatesy, SM and KM Middleton (1995). Sinking dinosaurs: Sub-surface foot kinematics in Greenlandic theropods. *Am. Zool.* **35**(5), 120A.
2. Gatesy, SM and KM Middleton (1996). Sinking dinosaurs: Sub-surface preservation of foot kinematics in Greenlandic theropods. *J. Vert. Paleontol.* **16**(3), 37A.
3. Middleton, KM and SM Gatesy (1998). The evolution of theropod forelimb design and function. *Am. Zool.* **37**(5), 58A.
4. Middleton, KM and SM Gatesy (1998). Theropod forelimb disparity and functional evolution. *J. Vert. Paleontol.* **18**(3), 63A.
5. Gatesy, SM and KM Middleton (1998). Reconstructing theropod foot function using 3-D computer-animated track simulation. *J. Vert. Paleontol.* **18**(3), 45A.
6. Middleton, KM (1999). Osteology and evolution of the avian reversed hallux. *Am. Zool.* **39**(5), 17A.
7. Middleton, KM (1999). Morphological basis for hallucal orientation in fossil birds. *J. Vert. Paleontol.* **19**(3), 64A.
8. Middleton, KM (2000). Comparative morphology and evolution of the hallux in extant and fossil birds. *Vert PalAsiatica* **38**(supplement), 20.
9. Middleton, KM (2000). Influence of hallucal reversion on terrestrial locomotion in birds. *Am. Zool.* **40**(5), 303A.
10. Middleton, KM (2002). Evolution of the perching foot in theropods. *J. Vert. Paleontol.* **22**(3), 88A.
11. Gatesy, SM, KS Kenny, KM Middleton, FA Jenkins Jr., and NH Shubin (2003). Skin impression microtopography in Triassic theropod tracks. *J. Vert. Paleontol.* **23**(3), 54A.

12. Middleton, KM and SM Gatesy (2004). Reconstructing leg function from osteology in Mesozoic birds. *J. Morphol.* **260**(3), 313.
13. Middleton, KM and SM Gatesy (2005). Wing design and disparity in flying vertebrates. *Integr. Comp. Biol.* **44**(6), 605.
14. Swartz, SM, KM Middleton, J Iriarte-Díaz, MM Lee, JM Wofford, KS Breuer, and DA Ritter (2005). Can bats actively control the mechanical properties of the wing membrane? *Integr. Comp. Biol.* **44**(6), 751.
15. Swartz, SM, N Kay, KM Middleton, and JA Blume (2005). The role of thickness and curvature in dictating subchondral bone stresses in mammalian joints. *Integr. Comp. Biol.* **44**(6), 649.
16. Keeney, BK, JL Malisch, SA Kelly, RM Hannon, EM Kolb, BP Lonquich, KM Middleton, and T Garland Jr. (2006). Life-history traits in house mice selectively bred for high voluntary wheel-running activity. *Integr. Comp. Biol.* **46**(supplement 1), e214.
17. Kolb, EM, SA Kelly, KM Middleton, LS Sermsakdi, and T Garland Jr. (2006). Effects of experimental erythropoietin elevation on voluntary exercise and maximal aerobic capacity in house mice. *Integr. Comp. Biol.* **46**(supplement 1), e76.
18. Middleton, KM, T Garland Jr., BD Goldstein, PR Guduru, SA Kelly, and SM Swartz (2006). Within-bone variation in stiffness measured by nanoindentation in high-running mice. *Integr. Comp. Biol.* **46**(supplement 1), e98.
19. Hannon, RM, SA Kelly, KM Middleton, EM Kolb, D Pomp, and T Garland Jr. (2006). Phenotypic effects of the "mighty mini-muscle" allele in a large HR X C57Bl/6J backcross. *Integr. Comp. Biol.* **46**(supplement 1), e55.
20. Swartz, SM, R Galvao, J Iriarte-Díaz, E Israeli, KM Middleton, A Roemer, X Tian, and KS Breuer (2006). Unique characteristics of aerodynamics of bat flight: evidence from direct visualization of patterns of airflow in the wakes of naturally flying bats. *Integr. Comp. Biol.* **45**(6), 1080.
21. Clarke, JA and KM Middleton (2007). Quantitative approaches to the study of morphological evolution using discrete characters and a Bayesian phylogenetic approach to investigating mosaicism in avialan evolution. *J. Vert. Paleontol.* **27**(3), 59A.
22. Middleton, KM, SA Kelly, and T Garland Jr. (2007). Bone to run: selective breeding and skeletal response to high voluntary activity in mice. *Integr. Comp. Biol.* **47**(supplement 1), e82.
23. Hannon, RM, SA Kelly, KM Middleton, EM Kolb, D Pomp, and T Garland Jr. (2007). Phenotypic effects of the "Mini-muscle" allele in a large HR X C57Bl/6J backcross. *Int Mouse Genome Conf* **S1-S4**, 185.
24. Gatesy, SM and KM Middleton (2007). Exploring footprint morphospace by 3-D computer-animated track simulation. *J. Vert. Paleontol.* **27**(3), 80A.
25. Middleton, KM, MG Conners, and SM Swartz (2009). Variation in rachis cross-sectional geometry within and among feathers in the Barn Owl (*Tyto alba*). *Integr. Comp. Biol.* **49**(supplement 1), e273.
26. Swartz, SM, DK Riskin, J Iriarte-Díaz, KM Middleton, and KS Breuer (2009). Scaling of flight characteristics in bats. *Integr. Comp. Biol.* **49**(supplement 1), e166.
27. Keeney, BK, TH Meek, KM Middleton, L Holness, GL Gerdeman, DA Raichlen, and T Garland Jr. (2010). Sex-specific involvement of the CB1 receptor in the high voluntary wheel running of selectively bred mice. *Integr. Comp. Biol.* **50**(supplement 1), e88.
28. Riskin, DK, J Iriarte-Díaz, KM Middleton, KS Breuer, and SM Swartz (2010). How do bats accelerate? *Integr. Comp. Biol.* **50**(supplement 1), e147.
29. Wallace, IJ, KM Middleton, S Lublinsky, SA Kelly, S Judex, T Garland Jr, and B Demes (2010). Activity, genes, and diaphyseal structure. In: *American Journal of Physical Anthropology*. Vol. 141, pp.238.
30. Owerkowicz, T, F Andrade, RM Elsey, KM Middleton, and JW Hicks (2010). Atmospheric hypoxia increases bone robusticity in the American alligator. *J. Vert. Paleontol.* **28**(3), 142A.
31. Coats, BR, KM Middleton, SA Kelly, and T Garland (2011). Cross-sectional limb bone geometry in mice bred for high levels of voluntary wheel running. *Integr. Comp. Biol.* **51**(supplement 1), e176.
32. Wallace, IJ, T Garland Jr., SA Wallace, KM Middleton, SA Kelly, S Judex, and B Demes (2011). Genetic and epigenetic effects on diaphyseal morphology in selectively bred mice with the mini-muscle allele. *Integr. Comp. Biol.* **51**, e263.
33. Bradford, KK, JA Clarke, and KM Middleton (2011). *Estimating bending mechanics of extant and fossil penguin contour feathers*. Society of Vertebrate Paleontology. Las Vegas, NV.
34. English, LT and KM Middleton (2011). *Phylogenetic patterns of pterosaur wing skeleton allometry*. Society of Vertebrate Paleontology 2011 Annual Meeting. Las Vegas, NV.
35. Lujan, SL, KM Middleton, T Owerkowicz, RM Elsey, and JW Hicks (2011). *Hypoxia-induced alterations in limb bone growth and geometry in Alligator mississippiensis*. Society for Integrative and Comparative Biology. Salt Lake City.
36. Coats, BR, KM Middleton, SA Kelly, and T Garland Jr (2012). Cross sectional anatomy of the femoral diaphysis in mice bred for high levels of voluntary wheel running. *FASEB J.* **26**, 723.11.

37. Clarke, JA and KM Middleton (2012). *Bayesian approaches to the investigation of morphological rate heterogeneity in distinct anatomical subregions*. Society of Vertebrate Paleontology Annual Meeting 2012. Raleigh, NC.
38. Lujan, SL, T Owerkowicz, RM Elsey, JW Hicks, and KM Middleton (2012). Effects of hypoxia on growth and biomechanics in limb bones of *Alligator mississippiensis*. *FASEB J.* **26**, 908.4.
39. Tsai, HP, KM Middleton, and CM Holliday (2013). *Anatomy of saurischian hip joint soft tissues and its significance in body size evolution*. Society of Vertebrate Paleontology 2013 Annual Meeting. Los Angeles, CA.
40. Cheney, JA, KM Middleton, N Konow, EL Giblin, KS Breuer, and SM Swartz (2013). Electromyography of bat wing membrane muscles. *Integr. Comp. Biol.* **53**, e34.
41. Johnson, KE, CJ Andrus, and KM Middleton (2013). Comparative anatomy of flight and contour feathers in aquatic birds. *Integr. Comp. Biol.* **53**, e304.
42. Middleton, KM and BR Coats (2013). Energy metabolism of small muscle phenotype mice compared to inbred strains in response to exercise. *Integr. Comp. Biol.* **53**, e146.
43. Middleton, KM, SL Lujan, JW Hicks, and T Owerkowicz (2013). Effects of atmospheric oxygen on femur biomechanics in *Alligator mississippiensis*. *Anat. Rec.* **296**(special feature), 238–239.
44. Holliday, CM, KC Sellers, JL Davis, KM Middleton, and LM Witmer (2014). Modeling cranial biomechanics in archosaurs using 3D computational methods. *Journal of Vertebrate Paleontology, Program and Abstracts* **2014**, 149.
45. Tsai, HP, KM Middleton, and CM Holliday (2014). Archosaur hip joint and its significance in body size and locomotor evolution. *Integr. Comp. Biol.* **54**, e211.
46. Tsai, HP, KM Middleton, and CM Holliday (2014). More than one way to be a giant: convergence and disparity in saurischian dinosaur hip joints during body size evolution. *Integr. Comp. Biol.* **55**, e186.
47. Proffitt, JV, KM Middleton, and JA Clarke (2014). Patterns of morphological evolution during a locomotor transition: Lessons from the evolution of wing-propelled diving in penguins. *Integr. Comp. Biol.* **54**, e334.
48. Proffitt, JV, KM Middleton, and JA Clarke (2014). Patterns of morphological evolution during the evolution of wing-propelled diving in penguins: Insights into the evolution of form and function. *Ornithol. Sci.* **13**(supplement), 342.
49. Harper-Judd, J, CM Holliday, M Knocke, LN Butaric, ID George, KM Middleton, EA Moffett, S Swartz, HP Tsai, and AL Warren (2014). Dinosaurs & Cavemen Science Expo: Science outreach using interactive and experiential anatomical learning. *Journal of Vertebrate Paleontology, Program and Abstracts* **2014**, 241.
50. Middleton, KM and DL Altshuler (2014). *Analysis of motor variability in the maneuvering flight of hummingbirds*. World Congress of Biomechanics. Boston, MA.
51. Middleton, KM, KE Johnson, and JA Clarke (2014). Estimating bending mechanics of extant and fossil penguin contour feathers. *Ornithol. Sci.* **13**(supplement), 144.
52. Lujan, SL, T Owerkowicz, RM Elsey, JW Hicks, and KM Middleton (2014). Acute and chronic alterations in atmospheric oxygen do not alter femoral biomechanics in *Alligator mississippiensis*. *Integr. Comp. Biol.* **54**, e308.
53. Smolinsky, AN, KM Middleton, F Pfeiffer, and CM Holliday (2015). Material properties of the mandibular symphysis in *Alligator mississippiensis*. *Integr. Comp. Biol.* **55**, e173.
54. Tsai, HP, KM Middleton, and CM Holliday (2015). Solutions for gigantism: evolutionary and biomechanical implications of dinosaur hip joint soft tissues. *FASEB J.* **29**(supplement), 351.4.
55. Cost, IN, A Spates, KC Sellers, JL Davis, KM Middleton, LM Witmer, and CM Holliday (2015). Biomechanics of the avian feeding apparatus. *Journal of Vertebrate Paleontology, Program and Abstracts* **2015**, 110.
56. Cheney, JA, N Konow, KM Middleton, KS Breuer, TJ Roberts, EL Giblin, and SM Swartz (2015). Shaping the wings of bats: Muscle and wing skin interactions in flight. *Integr. Comp. Biol.* **55**, e29.
57. Sellers, KC, JL Davis, KM Middleton, and CM Holliday (2015). Ontogeny and biomechanics of the American alligator skull. *Journal of Vertebrate Paleontology, Program and Abstracts* **2015**, 211.
58. Smolinsky, AN and KM Middleton (2016). Comparison of impact loading and wheel running on femoral cross-section morphology in young outbred mice. *Anat. Rec.* **299**(special feature), 246.
59. Spates, A, IN Cost, KC Sellers, KM Middleton, and CM Holliday (2016). Using novel methods to visualize jaw muscle biomechanics and its significance for the evolution of the avian feeding apparatus. *FASEB J.* **30**, 779.6.
60. Holliday, CM, CA Hill, JL Davis, LM Witmer, and KM Middleton (2016). Inside Dinosaurs: A broader impacts program for research, teaching and public education through dinosaur biology, physics and evolution. *Journal of Vertebrate Paleontology, Program and Abstracts* **2016**, 155–156.
61. Tsai, HP, KM Middleton, and CM Holliday (2016). The cartilage cone of archosauromorphs: biomechanical implications for hip joint loading and femoral ossification. *Anat. Rec.* **299**(special feature), 197.
62. Tsai, HP, KM Middleton, and CM Holliday (2016). The cartilage cone of archosauromorphs: implications of chondro-osseous junction on hip joint loading and femoral ossification. *Journal of Vertebrate Paleontology, Program and Abstracts* **2016**, 239.

63. Cost, IN, A Spates, KC Sellers, JL Davis, KM Middleton, LM Witmer, and CM Holliday (2016). Relative kinetic competency in the palatal complexes of birds and other diapsids. *Anat. Rec.* **299**(special feature), 208–209.
64. Cost, IN, KC Sellers, JL Davis, KM Middleton, LM Witmer, and CM Holliday (2016). Postural changes and kinetic competency in the palates of birds and other diapsids. *Journal of Vertebrate Paleontology, Program and Abstracts* **2016**(Supplement 1), 120–121.
65. Sellers, KC, JL Davis, KM Middleton, and CM Holliday (2016). A high-fidelity, 3D model of the skull of Alligator mississippiensis (Archosauria: Crocodylia) and its significance for vertebrate feeding biomechanics. *Anat. Rec.* **299**(special feature), 120–121.
66. Sellers, KC, JL Davis, KM Middleton, and CM Holliday (2016). Biomechanics and the evolution of the crocodyliform skull. *Journal of Vertebrate Paleontology, Program and Abstracts* **2016**, 221.
67. Middleton, KM, AC Hurtado, and SM Swartz (2016). Scaling of Haversian systems in a phylogenetically diverse sample of mammals is consistent with physical and physiological constraints. *Anat. Rec.* **299**(special feature), 70.
68. Middleton, KM, SJ Peacock, JK Kirkland, and T Garland Jr. (2016). Comparison of morphology and bending mechanics of femora in response to chronic exercise in three strains of mice. *FASEB J.* **30**, 368.2.
69. Peacock, SJ, BR Coats, JK Kirkland, CA Tanner, T Garland Jr., and KM Middleton (2016). *History of exercise, cross-sectional geometry, and bending mechanics: inferences based on three strains of mice*. American Association of Physical Anthropologists. Atlanta, GA.
70. Kuo, S and KM Middleton (2016). *Tensile mechanical properties of isolated penguin flipper feathers*. Society for Integrative and Comparative Biology 2016 Annual Meeting. Portland, OR.
71. Lujan, SL, T Owerkowicz, RM Elsey, JW Hicks, and KM Middleton (2016). Atmospheric oxygen conditions do not constrain growth or biomechanical performance of limb bones in Alligatoridae: *Alligator mississippiensis*. *Anat. Rec.* **299**(special feature), 72–73.
72. Wilkin, AT, KM Middleton, KC Sellers, IN Cost, JL Davis, and CM Holliday (2017). Modeling Complex Cranial Joints in *Varanus exanthematicus*. *FASEB J.* **31**(Supplement 1), 577.5.
73. Smolinsky, AN and KM Middleton (2017). The effects of muscle- and impact-dominated loading on femoral cross-section morphology and mineral apposition in young outbred mice. *Integr. Comp. Biol.* **57**(Suppl. 1), e395.
74. Smolinsky, AN and KM Middleton (2017). Comparing Femur Cross-sectional Morphology in Young Outbred Mice Following Daily Exposure to Muscle-, Impact-, or Combined Loading of the Hind Limb Skeleton. *FASEB J.* **31**(Supplement 1), 577.15.
75. Smith, CJ, CM Holliday, KM Middleton, and AM Bailleul (2017). Bending Properties of the Jugal Bone in Mallard Ducks and Its Significance for Cranial Biomechanics. *FASEB J.* **31**(Supplement 1), 577.6.
76. Holliday, CM, CA Hill, JL Davis, LM Witmer, and KM Middleton (2017). Inside Dinosaurs: a broader impacts program for research, teaching and public education through dinosaur biology, physics and evolution. *FASEB J.* **31**(Supplement 1), 734.8.
77. Hill, CA, K Aldridge, CM Holliday, KM Middleton, CV Ward, S Maiolino, and ME Jorgensen (2017). The Minute Clinic: Increasing Student Engagement in an Undergraduate Systems-Based Anatomy Course. *FASEB J.* **31**(Supplement 1), 733.8.
78. Tsai, HP, KM Middleton, and CM Holliday (2017). *The cartilage cone of archosauromorphs: implications for hip loading and femoral ossification*. Society for Integrative and Comparative Biology Annual Meeting. New Orleans, LA.
79. Cost, IN, KM Middleton, LM Witmer, MS Echols, and CM Holliday (2017). Biomechanics of the Feeding Apparatus of Parrots (Aves: Psittaciformes). *FASEB J.* **31**(Supplement 1), 577.7.
80. Sellers, KC, KM Middleton, JL Davis, and CM Holliday (2017). Biomechanics and the Evolution of the Crocodyliform Skull. *FASEB J.* **31**(Supplement 1), 579.1.
81. Peacock, SJ, KA Bates, OO Talton, LC Schulz, and KM Middleton (2017). Effects of perinatal circadian programming on activity and skeletal morphology in C57BL/6 mice. *FASEB J.* **31**(Supplement 1), 577.18.
82. Smolinsky, AN, K Aldridge, and KM Middleton (2018). Muscle-intensive and high-impact exercises differentially influence whole bone 3D morphology in young male mice. *FASEB J.* **32**, 9650.
83. Wilkin, AT, KM Middleton, KC Sellers, IN Cost, and CM Holliday (2018). *Finite element analysis of the Savannah Monitor, Varanus exanthematicus, and its implications for lepidosaur cranial kinesis*. Society for Integrative and Comparative Biology.
84. Smolinsky, AN and KM Middleton (2018). *Muscle- and impact-dominated activities differentially affect bone morphology and mineral apposition in young outbred mice*. Society for Integrative and Comparative Biology.
85. Sethi, A, KC Sellers, IN Cost, F McGechie, KM Middleton, and CM Holliday (2018). *3D fiber tracking of jaw muscles reveals a diversity of muscle architectures in the heads of reptiles*. Society for Integrative and Comparative Biology.

86. Smith, CJ, KM Middleton, AM Bailleul, and CM Holliday (2018). *Bending properties of the lower temporal bar in ducks and its significance for cranial biomechanics*. Society for Integrative and Comparative Biology.
87. Holliday, CM, IN Cost, KC Sellers, and KM Middleton (2018). *Using ternary plots to convey 3D jaw muscle orientation in space and time*. Society for Integrative and Comparative Biology.
88. McGechie, F, K Aldridge, and KM Middleton (2018). Plastic and evolved responses to postural behavior in the morphology of the cranium. *Am. J. Phys. Anthropol.* **165**, 171.
89. Cost, IN, KM Middleton, and CM Holliday (2018). *Mechanical performance in the skulls of parrots (Aves: Psittaciformes)*. Society for Integrative and Comparative Biology.
90. Sellers, KC, KM Middleton, and CM Holliday (2018). *Biomechanics and Evolution of the Crocodyliform Skull*. Society for Integrative and Comparative Biology.
91. Sellers, KC, KM Middleton, JM Clark, and CM Holliday (2018). *Cranial joints and the evolution of extreme feeding performance in Crocodyliformes*. Society of Vertebrate Palentology Annual Meeting. Albuquerque, NM.
92. Sullivan, SP, CM Holliday, AM Bailleul, and KM Middleton (2018). *Digital reconstruction of the avian pectoral girdle with implications for furcula function*. Society for Integrative and Comparative Biology.
93. Owerkowicz, T, KM Middleton, and AW Crompton (2018). Selective forces behind the evolution of respiratory turbinates in mammals and birds. In: *5th International Palaeontological Congress*. Paris, pp.893.
94. Smolinsky, AN, K Aldridge, AA Castro, T Garland Jr, and KM Middleton (2019). Artificial Selection for Increased Voluntary Wheel Running Alters Limb Skeleton Shape and Exercise Plasticity in Mice. *FASEB J.* **10.6**.
95. Ruth, AA and KM Middleton (2019). Mechanical stimulus vs. selection in determining enthesis morphology in mice. *Am. J. Phys. Anthropol.* **168**(S68), 212.
96. McGechie, F, S Sullivan, KM Middleton, CM Holliday, TK Nalley, N Grider-Potter, and CV Ward (2019). Using novel 3D techniques to visualize and quantify primate neck anatomy. *Am. J. Phys. Anthropol.* **168**(S68), 160.
97. McGechie, F, S Sullivan, KM Middleton, CM Holliday, TK Nalley, N Grider-Potter, and CV Ward (2019). 3D Analysis of Primate Neck Anatomy using Contrast-Enhanced CT Imaging, Fascicle-Tracking Algorithms, and Muscle Mechanics. *FASEB J.* **612.1**.
98. Middleton, KM, AN Smolinsky, and T Garland Jr (2019). Creation of a Novel Inbred Mouse Model for High Activity with a Small Muscle Phenotype. *FASEB J.* **769.1**.
99. Lough, CP, SD Gieg, WA Bezold, KP Feltz, KM Middleton, and NW Skelley (2020). *Mechanical Properties Of 3D Printed Orthopaedic Internal Fixation Implants*. ORS 2020 Annual Meeting. Phoenix, AZ.

Other Presentations

1. Swartz, SM, R Galvao, J Iriarte-Díaz, E Israeli, KM Middleton, A Roemer, A Sullivan, X Tian, and KS Breuer (2005). *Unique characteristics of aerodynamics of bat flight: Evidence from direct visualization of patterns of airflow in the wakes of naturally flying bats*. North American Symposium on Bat Research.
2. Bahlman, JW, DK Riskin, KM Middleton, J Iriarte-Díaz, and SM Swartz (2007). *Flying squirrels don't glide steady: Implications for bat evolution*. North American Symposium on Bat Research.
3. Middleton, KM, SM Swartz, JM Kovnats, MM Lee, and KM McComas (2007). *Material properties of bat wing bones estimated by cantilever bending*. North American Symposium on Bat Research.
4. Riskin, DK, J Iriarte-Díaz, KM Middleton, KS Breuer, and SM Swartz (2008). *Effects of body size on the wing kinematics of bats*. Society for Experimental Biology Annual Meeting. Marseille, France.
5. Riskin, DK, J Iriarte-Díaz, KM Middleton, KS Breuer, and SM Swartz (2010). *How do bats modulate thrust and lift production during flight?* North American Symposium on Bat Research.
6. Holliday, CM, M Knocke, LW Cowgill, KM Middleton, A Woods, SD Maddux, CV Ward, DL Dufeau, AL Warren, ID George, EA Moffett, HP Tsai, CR Savage, S Swartz, EJ Lo Presti, RA Munds, AS Hammond, KC Sellers, CA Gant, and ZJ Winkler (2013). *K-12 and community outreach using interactive and experiential anatomical learning: Dinosaurs & Cavemen*. MU School of Medicine Medical Education Day.
7. Salas, DL, BR Coats, SA Kelly, T Garland Jr, and KM Middleton (2013). *Effects of genetics and exercise on mid-femoral diaphyseal mineral apposition in mice*. University of Missouri Summer 2013 Undergraduate Research and Creative Achievements Forum.
8. Middleton, KM (2013). *The physiology, function, and evolution of vertebrate locomotor tissues*. University of Missouri Life Sciences Week.
9. Cheney, JA, N Konow, KM Middleton, KS Breuer, TJ Roberts, EL Giblin, and SM Swartz (2014). *Wing membrane muscle activity in bats*. North American Society for Bat Research. Albany, NY.

10. Bira, NP and KM Middleton (2014). *Development of an inexpensive method for studying small animal locomotion through indirect scientific rotoscoping*. University of Missouri Summer 2014 Undergraduate Research and Creative Achievements Forum.
11. Peacock, SJ, BR Coats, CA Tanner, and KM Middleton (2014). *Minimsc genotype increases resistance to bending in mouse femora*. MU Life Sciences Week 2014.
12. Casey, TK and KM Middleton (2014). *Estimating comparative bending properties of feather rachises in four species of birds*. University of Missouri Summer 2014 Undergraduate Research and Creative Achievements Forum.
13. Smolinsky, AN, F Pfeiffer, KM Middleton, and CM Holliday (2015). *Fracture mechanics of the mandible in Alligator mississippiensis*. University of Missouri Life Sciences Week.
14. Tsai, HP, KM Middleton, and CM Holliday (2015). *The hip joint functional module and its significance in the evolution of avian locomotor posture*. University of Missouri Life Sciences Week.
15. Rashid, IS, PA Carter, T Garland Jr., and KM Middleton (2015). *Axial loading of caudal and lumbar vertebrae of selected high running lines of mice with different exercise regimens*. University of Missouri Summer 2015 Undergraduate Research and Creative Achievements Forum.
16. Kirkland, JK, SJ Peacock, BR Coats, and KM Middleton (2015). *Effects of cross sectional area on bone strength in three strains of mice*. ABRCMS. Seattle, WA.
17. Kirkland, JK, SJ Peacock, BR Coats, and KM Middleton (2015). *Effects of cross sectional area on bone strength in three strains of mice*. University of Missouri Summer 2015 Undergraduate Research and Creative Achievements Forum.
18. Bira, NP and KM Middleton (2015). *Inexpensive study of small animal locomotion through indirect scientific rotoscoping*. University of Missouri Spring 2015 Undergraduate Research and Creative Achievements Forum.
19. Smolinsky, AN and KM Middleton (2016). *Comparison of impact loading and wheel running on femoral cross-section morphology and growth in young outbred mice*. University of Missouri Life Sciences Week.
20. Smolinsky, AN and KM Middleton (2016). *Comparison of impact loading and wheel running on femoral cross-section morphology and growth in young outbred mice*. University of Missouri Health Science Research Day.
21. Herbst, E, J Cooper, IN Cost, KC Sellers, KM Middleton, and CM Holliday (2016). *3D reconstruction of the feeding biomechanics of the North American aetosaur Desmatosuchus*. University of Missouri Summer 2016 Undergraduate Research and Creative Achievements Forum.
22. Cooper, J, E Herbst, KC Sellers, IN Cost, JL Davis, KM Middleton, and CM Holliday (2016). *The impact of muscle anatomy on skull loading in hard-biting animals*. University of Missouri Summer 2016 Undergraduate Research and Creative Achievements Forum.
23. Sellers, KC, JL Davis, KM Middleton, and CM Holliday (2016). *A high-fidelity, 3D model of the skull of Alligator mississippiensis (Archosauria: Crocodylia) and its significance for vertebrate feeding biomechanics*. University of Missouri Health Sciences Research Day.
24. Peacock, SJ, BR Coats, JK Kirkland, CA Tanner, T Garland Jr., and KM Middleton (2016). *History of exercise, cross-sectional geometry, and bending mechanics: inferences based on three strains of mice*. University of Missouri Health Science Research Day.
25. Peacock, SJ and KM Middleton (2016). *Predicting the bending properties of long bones: insights from an experimental mouse model*. University of Missouri Life Sciences Week.
26. Wilkin, AT, KM Middleton, KC Sellers, IN Cost, JL Davis, and CM Holliday (2017). *Modeling Complex Cranial Joints in Varanus exanthematicus*. University of Missouri Life Sciences Week.
27. Smolinsky, AN and KM Middleton (2017). *The effects of muscle- and impact-dominated loading on femoral cross-section morphology and mineral apposition in young outbred mice*. University of Missouri Life Sciences Week.
28. Smolinsky, AN and KM Middleton (2017). *Comparing Femur Cross-sectional Morphology in Young Outbred Mice Following Daily Exposure to Muscle-, Impact-, or Combined Loading of the Hind Limb Skeleton*. University of Missouri Life Science Week.
29. Smith, CJ, CM Holliday, KM Middleton, and AM Bailleul (2017). *Bending Properties of the Jugal Bone in Mallard Ducks and Its Significance for Cranial Biomechanics*. University of Missouri Life Sciences Week.
30. Ward, CV, K Aldridge, CA Hill, CM Holliday, L Johnson, KM Middleton, and R Sherwood (2017). *10 years of active learning in the anatomy curriculum*. University of Missouri School of Medicine Health Sciences Research Day.
31. Holliday, CM, CA Hill, JL Davis, LM Witmer, and KM Middleton (2017). *Inside Dinosaurs: a broader impacts program for research, teaching and public education through dinosaur biology, physics and evolution*. University of Missouri School of Medicine Health Sciences Research Day.
32. Hill, CA, K Aldridge, CM Holliday, L Johnson, KM Middleton, R Sherwood, and CV Ward (2017). *Approaches for Active Learning in a Flipped Undergraduate Health Sciences Anatomy Classroom*. University of Missouri School of Medicine Health Sciences Research Day.

33. Ng'oma, E, A Perinchery, KM Middleton, and EG King (2017). *Coordination of resource availability with allocation in a synthetic population: lifespan and its heritability across dietary regimes*. University of Missouri Life Sciences Week.
34. Ng'oma, E, A Perinchery, KM Middleton, and EG King (2017). *Coordination of resource availability with allocation in a synthetic population: lifespan and its heritability across dietary regimes*. 58th Annual Drosophila Research Conference. San Diego, CA.
35. Ng'oma, E, A Perinchery, KM Middleton, and EG King (2017). *Evolutionary potential of nutrition-dependent effects on lifespan in a multi-parental population of Drosophila melanogaster*. Evolution 2017.
36. Cost, IN, KM Middleton, LM Witmer, MS Echols, and CM Holliday (2017). *Biomechanics of the Feeding Apparatus of Parrots (Aves: Psittaciformes)*. University of Missouri Life Sciences Week.
37. Sellers, KC, KM Middleton, JL Davis, and CM Holliday (2017). *Biomechanics and the Evolution of the Crocodyliform Skull*. University of Missouri Life Sciences Week.
38. Peacock, SJ, KA Bates, OO Talton, LC Schulz, and KM Middleton (2017). *Effects of perinatal circadian programming on activity and skeletal morphology in C57BL/6 mice*. University of Missouri Life Sciences Week.
39. Smolinsky, AN, K Aldridge, and KM Middleton (2018). *Muscle-intensive and High-Impact Exercises Differentially Influence Whole Bone 3D Morphology in Young Outbred Male Mice*. University of Missouri Life Sciences Week.
40. Smith, CJ, KM Middleton, AM Bailleul, and CM Holliday (2018). *Bending properties of the lower temporal bar in ducks and its significance for cranial biomechanics*. University of Missouri Life Sciences Week.
41. Ward, CV, K Aldridge, CA Hill, CM Holliday, L Johnson, KM Middleton, and R Sherwood (2018). *10 years of active learning in the anatomy curriculum*. University of Missouri Medical Education Research Day.
42. Holliday, CM, CA Hill, KM Middleton, M Knocke, and MU Integrative Anatomy (2018). *Inside Dinosaurs: a broader impacts program for research, teaching and public education through using biology, physics & evolution*. University of Missouri Medical Education Research Day.
43. Middleton, KM, AJ Rahman, AN Smolinsky, NJ Bivens, CA Bottoms, SA Givens, and EG King (2018). *Differential gene expression in mouse long bones and marrow in response to three forms of mechanical loading*. University of Missouri Life Sciences Week.
44. Johnson, LE, K Aldridge, CA Hill, CM Holliday, KM Middleton, A Nesbitt, RJ Sherwood, and CV Ward (2018). *Integrating patient-based learning into the anatomy lab: design and implementation of a new multi-use anatomy facility*. University of Missouri Medical Education Research Day.
45. Peacock, SJ and KM Middleton (2018). *Effects of nocturnal blue light exposure on physiology and skeletal morphology in two strains of mice*. University of Missouri Life Sciences Week.
46. Smolinsky, AN, K Aldridge, AA Castro, T Garland Jr, and KM Middleton (2019). *Effects of Artificial Selection for Increased Voluntary Wheel Running on Hindlimb Skeletal Shape in Mice*. International Congress of Vertebrate Morphology. Prague, CZ.
47. Wilken, AT, KM Middleton, KC Sellers, IN Cost, and CM Holliday (2019). *Functional Morphology of the Palate in Varanus exanthematicus (Squamata: Varanidae) and Its Significance for the Evolution of Cranial Kinesis*. International Congress of Vertebrate Morphology. Prague, CZ.
48. Holliday, CM, AT Wilken, AM Bailleul, KC Sellers, IN Cost, RE Rozin, and KM Middleton (2019). *Connecting the Chondrocranium: Biomechanics of the Palatocranial Joints of Sauropsids*. International Congress of Vertebrate Morphology. Prague, CZ.
49. Sellers, KC, KM Middleton, and CM Holliday (2019). *Joint Loading and Transformation in Suchian Evolution*. International Congress of Vertebrate Morphology. Prague, CZ.
50. Middleton, KM, KC Sellers, IN Cost, AT Spates, and CM Holliday (2019). *Methods for Visualizing and Comparing Force Vectors in Two- and Three-Dimensions, with Applications for Vertebrate Feeding and Locomotion*. International Congress of Vertebrate Morphology. Prague, CZ.
51. Sullivan, SP, KM Middleton, and CM Holliday (2019). *Morphology and Function of the Avian Furcula*. International Congress of Vertebrate Morphology. Prague, CZ.
52. Owerkowicz, T, M Poff, KM Middleton, and AW Crompton (2019). *Metabolic and Environmental Factors Shaping the Morphology of Respiratory Turbinates in Mammals and Archosaurs*. International Congress of Vertebrate Morphology. Prague, CZ.

Teaching Experience

University of Missouri

2019–2020 *Clinically Oriented Human Gross Anatomy*
Block 1: all lectures (8), all labs (8), anatomy block leader

Evolutionary Morphology (PTH_AS 8150; team taught)

2018–2019 *Clinically Oriented Human Gross Anatomy*
Block 2: all lectures (8), all labs (8), anatomy block leader

Foundations of Evolutionary Biology: Evolutionary Biology (PTH_AS 8100; course leader, team taught)

Methods in Pathology and Anatomical Sciences: Quantitative Approaches in Life Sciences (PTH_AS 8285; co-course director)

Ethical Conduct of Research (BCH/BSC 8060): Discussant

2017–2018 *Clinically Oriented Human Gross Anatomy*
Block 2: all lectures (7), all labs (8), anatomy block leader

Foundations of Evolutionary Biology: Evolutionary Morphology (PTH_AS 8150; team taught)

Ethical Conduct of Research (BCH/BSC 8060): Discussant

2016–2017 *Clinically Oriented Human Gross Anatomy*
Block 1: all labs (7)
Block 2: all lectures (7), all labs (8), anatomy block leader

Methods in Pathology and Anatomical Sciences: Quantitative Approaches in Life Sciences (PTH_AS 8285; co-course director, new course)

Foundations of Evolutionary Biology: Evolutionary Biology (PTH_AS 8100; team taught)

Ethical Conduct of Research (BCH/BSC 8060): Discussant

2015–2016 *Clinically Oriented Human Gross Anatomy*
Block 2: all lectures (7), all labs (8), anatomy block leader

Foundations of Evolutionary Morphology (PTH_AS 8150; team taught)

Methods in Pathology and Anatomical Sciences: Multivariate Statistics (PTH_AS 8285; course director; new course)

Topics in Biological Sciences: Evolution Bootcamp (BIO_SCI 8002; team taught)

Ethical Conduct of Research (BCH/BSC 8060): Discussant

2014–2015 *Clinically Oriented Human Gross Anatomy*
Block 1: all labs (7)
Block 2: all lectures (7), all labs (7), anatomy block leader

Human Anatomy Lab (PTH_AS 2203; team taught)

Foundations of Evolutionary Biology: Evolutionary Biology (PTH_AS 8100; team taught)

2013–2014 *Clinically Oriented Human Gross Anatomy*
Block 1: all labs (7)
Block 2: abdomen labs (4)
Block 4: all lectures (7) and labs (7); anatomy block leader

Foundations of Evolutionary Biology: Evolutionary Morphology (PTH_AS 8100; team taught)

Current Issues in Anatomy (PTH_AS 8010; Fall and Spring; team taught)

Research in Pathology and Anatomical Sciences (PTH_AS 8290)

2012–2013 *Clinically Oriented Human Gross Anatomy*
Block 1: all labs (7)
Block 2: thorax lectures (3), all labs (7)
Block 3: lower limb lectures (5) and labs (6)

Foundations of Evolutionary Biology: Evolutionary Biology (PTH_AS 8100; team taught)

Human Anatomy Lecture (PTH_AS 2201; team taught)

California State University, San Bernardino

2007-2011	Biology of the Chordates
2008-2012	Human Physiology and Anatomy
2010-2012	Biostatistics
2008, 2010, 2012	Graduate Seminar
2008-2011	Biology Seminar
2008	Advanced Vertebrate Morphology

Postdoctoral Supervisor

2015-2018 **Alida Bailleul, PhD**
Currently a postdoctoral research associate at the Institute of Vertebrate Paleontology and Paleoanthropology, Beijing

Graduate Advisor

2015-2019 **Sarah Peacock** Ph.D. University of Missouri
Currently Assistant Teaching Professor at Northeastern University

2013-2018 **Amanda Smolinsky** Ph.D. University of Missouri
Currently a Postdoctoral Research Associate at Rocky Vista University

2011-2012 **Katherine Johnson** M.S., CSUSB
Completed doctoral studies at University of California, Riverside

2010-2012 **Brittney Coats** M.S., CSUSB
Completed doctoral studies at the University of Chicago

2008-2012 **Susan Lujan** M.S., CSUSB
Currently a lecturer at California State University, San Bernardino

Graduate Committee Member

Current

2019-Present	**Alec Wilken**	M.S.; Pathology and Anatomical Sciences
2019-Present	**Emily Lessner**	Ph.D.; Pathobiology
2019-Present	**Samuel Sullivan**	Ph.D.; Pathobiology
2019-Present	**Mikaela Pulsipher**	M.S.; Geological Sciences
2018-Present	**Sean Greer**	Ph.D.; Pathobiology
2017-Present	**Faye McGechie**	Ph.D.; Pathobiology
2017-Present	**Rebecca Dirkes**	Ph.D.; Nutrition & Exercise Physiology
2016-Present	**Kaleb Sellers**	Ph.D.; Pathobiology
2016-Present	**Melanie Boeyer**	Ph.D.; Pathobiology
2016-Present	**Elizabeth Cho**	Ph.D.; Anthropology
2016-Present	**Deise Cruz**	Ph.D.; Biological Sciences
2015-Present	**Rob'yn Johnston**	Ph.D.; Anthropology

Past

2015-2019	**Sharon Kuo** Currently postdoctoral research Associate at Pennsylvania State University	Ph.D.; Pathobiology
2018-2019	**Ellee Cook**	Ph.D.; Biological Sciences
2015-2019	**Ian Cost** Currently assistant professor at Albright College	Ph.D.; Pathobiology
2017-2018	**Landry Konan**	M.S.; Pathology and Anatomical Sciences
2017-2018	**Stephanie Rosbach**	M.S.; Geological Sciences
2016-2018	**Tara Selly** Currently research associate at the University of Missouri	Ph.D.; Geological Sciences
2015-2017	**Edward Ramirez**	Ph.D.; Biological Sciences
2015-2017	**Steven Hanson**	Ph.D.; Pathobiology
2014-2017	**Luésoni Johnson**	Ph.D.; Biological Sciences
2013-2016	**Elizabeth Moffett** Currently an Assistant Professor at Rocky Vista University	Ph.D.; Biological Sciences
2014-2015	**Kaleb Sellers**	M.S.; Pathology
2012-2015	**Henry Tsai** Currently an Assistant Professor at Missouri State University	Ph.D.; Pathobiology
2009-2012	**Kandee Bain**	M.S.; Biology, CSUSB
2008-2012	**Kim Scott**	M.S.; Biology, CSUSB
2007-2008	**Adam Huttenlocker** Currently an Assistant Professor at the University of Southern California	M.S.; Biology, CSUSB
2007-2008	**Candace Reno**	M.S.; Biology, CSUSB

Undergraduate Mentoring

University of Missouri only. 23 additional students at Brown University and UC Riverside; 2003–2012

2019-Present	**Joshua Fajardo**
2018	**Kendra Lewis** MU School of Medicine Summer Research Intern from Washington University in St. Louis
2016-2019	**Alec Wilken** Currently Master's student at the University of Missouri
2016-2018	**Caitlyn Smith** Currently a student in the University of Missouri School of Medicine
2016-2018	**Rebecca Meyer**
2016-2017	**Nicholas Ferrari**
2016	**Jake Cooper** NSF Inside Dinosaurs Research Fellow
2016	**Eva Herbst** NSF Inside Dinosaurs Research Fellow
2014-2018	**Nicholas Bira** C3 Hughes Research Fellow
2015	**Kyle Kirkland** MU School of Medicine Summer Research Intern from Michigan State University
2014-2015	**Imran Rashid**
2014-2015	**Michael Sojka** C3 Hughes Research Fellow, MU School of Journalism
2014	**Tarrin Casey** Currently a student in the University of Missouri School of Medicine
2013	**Diana Salas** MU School of Medicine Summer Research Intern from Indiana University

Invited Seminars

2001 University of Chicago
2001 American Museum of Natural History
2007 CSU, San Bernardino
2007 University of California, Riverside
2007 CSU, Fullerton
2007 Loma Linda University
2010 Grove High School, Redlands, CA
2010 CSU, Northridge
2011 University of Missouri
2012 La Sierra College
2012 Grinnell College
2013 MU Evolutionary Studies EvoBlitz
2013 University of Texas at Austin
2013 Saint Louis University
2013 MU Division of Biological Sciences
2014 Northeast Ohio Medical University
2014 MU Math in Life Sciences Freshman Interest Group
2014 MU LSUROP Evening Seminar Speaker
2017 MU Saturday Morning Science
2018 MU Department of Pathology and Anatomical Sciences

Professional Service

Referee

- Acta Anatomica
- Acta Palaeontologica Polonica
- Acta Zoologica Sinica
- Ameghiniana
- American Journal of Physical Anthropology
- Anatomical Record
- Biology Letters
- Comparative Biochemistry and Physiology
- Current Biology
- Evolution
- IEEE Visualization & Graphics
- International Journal of Primatology
- Journal of Anatomy
- Journal of Morphology
- Journal of Vertebrate Paleontology
- Journal of Zoology
- Nature
- Nature Communications
- Naturwissenschaften
- Palaeontology
- Paleobiology
- Paleobios
- PeerJ
- PLoS One
- Proceedings of the National Academy of Sciences USA
- Proceedings of the Royal Society (Biological Sciences)
- Quarterly Review of Biology
- Restoration Ecology
- Royal Society Open Science
- Zoological Journal of the Linnean Society
- Zoology

NSF Panel Service

2012 Division of Evolutionary Biology – Systematics and Biodiversity Science

NSF Ad Hoc Reviewer

2009 National Science Foundation – IOB
2010 National Science Foundation – DEB
2012 National Science Foundation – IOB
2017 National Science Foundation – IOB
2019 National Science Foundation – IOB

University of Missouri Research Board

2015 Ad hoc reviewer

Reviewer (Textbooks)

2003	Miller, KR and JS Levine. Biology	Pearson-Prentice Hall
2010	Tate, P. Anatomy and Physiology	McGraw Hill
2010	Biological Sciences Curriculum Studies. BSCS Biology: A Human Approach. 4th Ed.	Kendall Hunt Publishing

Reviewer for Deutsche Forschungsgemeinschaft (German Research Foundation)

2018 Life Sciences 1: Molecular and Organismic Biology

Department and University Service

Current

2018-Present MU School of Medicine Faculty Committee for Diversity and Inclusion
2015-Present School of Medicine Advice Support and Career (ASC) Preclerkship Advisor
2014-Present School of Medicine Block 2 Planning Committee
2014-Present School of Medicine eResources Committee
2013-Present PAS Director of Admissions
2013-Present PAS Promotion and Tenure Committee
2012-Present MU Doctoral Faculty
2012-Present MU Graduate Faculty
2012-Present Pathobiology Area Program Faculty

Past

2016-2019 Evolution and Social Science Group (ESS) steering committee
2016-2019 MU School of Medicine Admissions Committee
2016-2019 MU Information Technology Committee
2016-2018 MU Library Committee
2016 Chair, MU Life Sciences Week Genetics, Evolution, and Environment Poster Competition
2016 MU Office of Undergraduate Research focus group
2015 Life Sciences Undergraduate Research Opportunity Program Selection Committee
2014-2018 MU Life Sciences Week poster competition judge
2013-2017 PAS Director of Graduate Studies
2013-2016, 2019 SOM Summer Research Internship in Medical Sciences Selection Committee
2013, 2015-2019 PAS Assistant Teaching Professor Search Committee
2013-2019 PAS Lecturer Search Committee
2013-2014 School of Medicine Block 4 Planning Committee

California State University, San Bernardino

2009-2012 Institutional Animal Care and Use Committee
2008-2012 NSF Mathematics and Science Scholars Mentor
2007-2012 Pre-Dental Club Faculty Advisor
2007-2012 Health Professions Advisory Committee
2007-2012 Biology Department Webmaster
2009 College of Natural Sciences Outstanding Students Evaluation Committee

Professional Organizations

- American Association of Anatomists
- International Association of Dental Research
- International Society of Vertebrate Morphology
- Society of Avian Paleontology and Evolution
- Society of Integrative and Comparative Biology
- Society of Vertebrate Paleontology

Televised Outreach

2009 **National Geographic Channel** – Prehistoric Predators
National Geographic Channel's *Prehistoric Predators* featured an episode on phorusrhacids (also known as "Terror Birds" – an extinct group of gigantic carnivorous birds from the Cenozoic of South and North America).

2009 **Discovery Channel** – Megabeasts
Discovery Channel's *Megabeasts* also features an episode on "Terror Birds".

2008 **Coastline Community College**
On-camera expert on skeletal biology for an Anatomy & Physiology course produced by Coastline Community College (Orange County, CA). This course will be utilized by 2-year colleges and 4-year universities as well as broadcast by PBS.

2008 **CBC Television Canada** – Project X
The *Project X* episode "Flight" showcases collaborative work with Drs. Sharon Swartz, Kenneth Breuer, Daniel Riskin, and José Iriarte-Díaz on the aeromechanics of bat flight.