Morgan L. Turner, PhD

Curriculum Vitae

Department of Biomedical Informatics
Harvard Medical School
Harvard University
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Research Areas: biological data visualization, paleobiology, locomotor evolution, vertebrate foot structure and function, ichnology, animation methods for reconstruction of *in-vivo* skeletal kinematics, interactive visualization design for spatially and temporally referenced multivariate skeletal motion data.

Education

Dec 2020 **Ph.D., Ecology and Evolutionary Biology, Brown University**
Thesis: Internal and external foot kinematics at the animal-substrate interface
Advisor: Stephen M. Gatesy
Committee: Elizabeth L. Brainerd, Thomas J. Roberts, David H. Laidlaw

May 2018 **Sc.M., Ecology and Evolutionary Biology, Brown University**

June 2013 **B.A., Biological Anthropology, University of Washington**
Minor: Paleobiology
Advisor: Christian A. Sidor

2009 - 2010 Bellevue Community College, WA

Appointments

Harvard Medical School, Harvard University
2022 - present R&D Manager and Visualization Scientist | Departement of Biomedical Informatics

University of Minnesota
2021 - 2022 Computing Innovation Fellow | Computing Research Association, Computing Community Consortium, and National Science Foundation
2021 - 2022 Postdoctoral Associate | Department of Computer Science and Engineering
2022 - 2022 Associate Director | Interactive Visualization Lab

University of Washington
2013 - 2016 Scientific Illustrator | Department of Biology
2014 - 2015 Casting and Molding Technician | Burke Museum of Natural History and Culture

National Park Service
summer 2014 Artist in Residence | John Day Fossil Beds National Monument

Awards, Grants, and Fellowships

2022 **Inclusivity & Diversity Scholarship,** IEEE Visualization Conference ($1210)

2021 **Alfred Sherwood Romer Prize Finalist,** Society of Vertebrate Paleontology
outstanding scientific contribution in Vertebrate Paleontology by a predoctoral student

2021 **Leadership Development Grant,** Office of Postdoctoral Initiatives, Univ. of Minn. ($500)

2020 **Computing Innovation Fellow,** Computing Research Association, Computing Community Consortium, and National Science Foundation ($253,800; 3rd year extension: $55,299)
a two-year postdoctoral fellowship and career-enhancing bridge experience for computing PhD graduates to combat hiring disruptions due to COVID-19

2020 **Grant in Aid for Research,** "The impact of interdigital substrate flow on theropod dinosaur footprint diversity", Society of Integrative and Comparative Biology ($706)

2019 **Doctoral Dissertation Enhancement Grant,** "Postural Grades and Foot Function Gradients in Archosaurs", Dept. of Ecology and Evolutionary Biology, Brown University ($12,343)

2018 **Best Poster Award,** "Developing Virtual Reality Visualizations of Dinosaur Track Creation with Scientific Sketching", IEEE VIS

2016 **Graduate Research Fellowship Program Honorable Mention,** National Science Foundation

2015 **Life Sciences Fellowship,** University of Missouri (Declined)

Peer-Reviewed Journal Publications

2022 Inner workings of the alligator ankle reveal the mechanistic origins of archosaur locomotor diversity. Turner ML and Gatesy SM. *Journal of Anatomy.* DOI: 10.1111/joa.13801 Links to: paper video

2022 What is stance phase on deformable substrates? Turner ML, Falkingham PL, and Gatesy SM. *The Journal of Integrative and Comparative Biology.* DOI: 10.1093/icb/icac009 Links to: paper

2022 A proposed standard for quantifying 3-D hindlimb joint poses in living and extinct archosaurs. Gatesy SM, Manafzadeh AR, Bishop PJ, Turner ML, Kambic RE, Cuff AR, and Hutchinson JR. *Journal of Anatomy.* DOI: 10.1111/joa.13635 Links to: paper

2021 Virtual and Augmented Reality: new tools for visualizing, analyzing, and communicating complex morphology. Cieri RL, Turner ML, Carney RM, Falkingham PL, Kirk AM, Wang T, Jensen B, Novotny J, Tveite J, Gatesy SM, Laidlaw DH, Kaplan H, Moorman AFM, Howell M, Engel B, Cruz C, Smith A, Gerichs W, Lian Y, Schultz JT, and Farmer C. *Journal of Morphology.* DOI: 10.1002/jmor.21421 Links to: paper

2021 Alligators employ intermetatarsal reconfiguration to modulate plantigrade ground contact. Turner ML and Gatesy SM. *The Journal of Experimental Biology.* DOI: 10.1242/jeb.242240 Links to: paper video

2020 Constructing and testing hypotheses of dinosaur foot motions from fossil tracks using digitization and simulation. Falkingham PL, Turner ML, and Gatesy SM. *Palaeontology.* DOI: 10.1111/pala.12502 Links to: paper

2020 It's in the loop: shared subsurface foot kinematics in birds and other dinosaurs shed light on a new dimension of fossil track diversity. Turner ML, Falkingham PL, and Gatesy SM. *Biology Letters.* DOI: 10.1098/rsbl.2020.0309 Links to: paper video

2020 Contrast-enhanced XROMM reveals in vivo soft tissue interactions in the hip of Alligator mississippiensis. Tsai HP, Turner ML, Manafzadeh AR, and Gatesy SM. *Journal of Anatomy.* DOI: 10.1111/joa.13101 Links to: paper

2019 Developing Virtual Reality Visualizations for Unsteady Flow Analysis of Dinosaur Track Formation using Scientific Sketching. Novotny J, Tveite J, Turner ML, Gatesy SM, Drury F, Falkingham P, and Laidlaw DH. *IEEE Transactions on Visualization and Computer Graphics.* DOI: 10.1109/TVCG.2019.2898796 Links to: paper video

2018 Footfall Pattern of a Bottom-Walking Crocodile (*Crocodylus acutus*). Farlow JO, Robinson NJ, Turner ML, Black J, and Gatesy SM. *Palaios.* DOI: 10.2110/palo.2018.037 Links to: paper video

2017 Pathology in a Permian Parareptile: Congenital Malformation of Sacral Vertebrae. Turner ML and Sidor CA. *Journal of Zoology.* DOI: 10.1111/jzo.12519 Links to: paper

2015 The vertebrate fauna of the Upper Permian of Niger—IX. The appendicular skeleton of Bunostegos akokanensis (Parareptilia: Pareiasauria). Turner ML, Tsuji LA, Ide O, and Sidor CA. *Journal of Vertebrate Paleontology.* DOI: 10.1080/02724634.2014.994746 Links to: paper

For links to publications and media, see `https://morganlturner.com/publications/`

Presentations

Invited Talks

Mar 2022 Ecology and Evolutionary Biology Behavior Group, University of Minnesota, MN.
Inferring extinct archosaur locomotor variability and diversity using modern-day alligators and birds.

Feb 2022 Minnesota Robotics Institute, MN.
Can insight from the feet of alligators, birds, and dinosaurs serve the robotics field?

June 2021 Endotherm Research Group, Bell Museum of Natural History, MN.
Internal and external foot kinematics at the animal-substrate interface.

July 2020 Beneski Museum of Natural History and Culture, MA.
Research Trajectory: How I came to study fossil dinosaur tracks.

Nov 2019 PaleoLunch, Burke Museum of Natural History and Culture, WA.
The dynamic interaction between foot and ground.

Oct 2019 CCV-Con, Center for Computation and Visualization, Brown University, RI.
Developing Virtual Reality Visualizations for Exploring Dinosaur Track Formation.

Feb 2019 Ecology and Evolutionary Ecology Brown Bag Seminar, Brown University, RI.
Tanziania field trip report.

Sept 2018 Ecology and Evolutionary Ecology Brown Bag Seminar, Brown University, RI.
Where does footprint morphology come from? Integrating 3D methods for exploring dinosaur track formation.

Jan 2018 Initiative to Maximize Student Development, Brown University, RI.
Predatory Journals and Plagiarism.

April 2017 Scientific Visualization Group, Department of Computer Science, Brown University, RI.
Dinosaur Feet Underground: visualizing, Aligning, and Comparing Toe Path Trajectories.

Feb 2016 Ecology and Evolutionary Ecology Brown Bag Seminar, Brown University, RI.
Pareiasaurs and Paleoart.

Invited Symposia

May 2022 How Did Dinosaurs Walk? Turner ML. Networking and Information Technology Research and Development (NITRD; `nitrd.gov`) 30th Anniversary Symposium. *International Spy Museum, Washington, D.C.*

Jan 2022 Walking, swimming, and everything in between: Guineafowl limb kinematics on firm, soft, and semi-liquid substrates. Falkingham PL, Turner ML, Gatesy SM. Evolutionary conservation and diversity in a key vertebrate behavior: "walking" as a model system. *Society for Integrative and Comparative Biology, virtual.*

July 2019 Where does footprint morphology come from? Developing virtual reality visualizations for exploring dinosaur track formation. Turner ML, Novotny J, Falkingham PL, Laidlaw DH, Gatesy SM. VirtMorph - Using Virtual Reality to Visualize and Analyze Vertebrate Morphology. *International Congress of Vertebrate Morphology, Prague, Czech Republic.*

Oct 2018 Where does footprint morphology come from? Integrating 3D methods for exploring dinosaur track formation. Turner ML, Falkingham PL, Gatesy SM. Building a Phenomic Universe:

Collection, Management, and Applications of Digital Morphological Data. *Society of Vertebrate Paleontology, Albuquerque, NM.*

May 2017 Sub-Surface Foot Trajectories and Fossil Dinosaur Tracks. Turner ML, Falkingham PL, Gatesy SM. Last Days of Pangea Triassic-Jurassic Research Symposium. *Bruce Museum, CT.*

Panels

April 2022 Work-life balance and time management, University of Massachusetts Amherst, MA

June 2021 Careers in Biomechanics, International Women in Biomechanics

July 2019 Summit for Women in STEM, Wheaton College, MA

Workshops

Jan 2021 - Dec 2021 Bi-weekly skill-building workshop series for the Interactive Visualization Lab.

Aug 2021 Motion and Animation: Unity for the Interactive Visualization Lab Workshop series.

July 2019 Virtual Morphology (VirtMorph) symposium, at the International Congress of Vertebrate Morphology conference, Prague, Czechia.

Contributed Conference Presentations

† undergraduate mentee ♦ *refereed submission*

2022 Linked Spatial and Temporal Normalization for Analysis of Cyclical 4D Skeletal Motion Data. Turner ML, Herman B, Broske M, and Keefe DF. *IEEE VIS.* ♦

2021 Inside the "Black Box" of the Crurotarsal Ankle and Insights into the Pedal Origins of Locomotor Diversity in Archosaurs. Turner ML. *Society of Vertebrate Paleontology Annual Meeting [virtual].* **Alfred Sherwood Romer Prize Finalist.**

2021 An exploratory visualization tool for linking 2D and 3D biomechanical motion data. †Deibert C, Turner ML, and Keefe DF. *REU Virtual Poster Symposium [virtual].*

2021 Intermetatarsal mobility in the American alligator. Turner ML, and Gatesy SM. *Society of Integrative and Comparative Biology Annual Meeting [virtual].*

2021 Reticulated pythons roll their hemimandibles and splay their quadrates to engulf enormous prey. Capano JG, Kaczmarek EB, Lomax JJ, Turner ML, Brainerd EL, and Ryerson WG. *Society of Integrative and Comparative Biology Annual Meeting [virtual].*

2020 Intermetatarsal mobility and grades of foot contact in the American alligator: building a new perspective on archosaurian foot evolution. Turner ML and Gatesy SM. *Society of Vertebrate Paleontology Annual Meeting [virtual].*

2020 Dinosaurs in disguise: substrate flow accounts for unusual Early Jurassic tracks. Gatesy SM and Turner ML. *Society of Vertebrate Paleontology Annual Meeting [virtual].*

2020 Looking inside the sole: intermetatarsal mobility in the American alligator. Turner ML and Gatesy SM. *Society of Integrative and Comparative Biology Annual Meeting.*

2019 Cranial Kinesis During Prey Ingestion in the Reticulated Python. Capano JG, Brainerd EL, Turner ML, Ryerson WG. *Northeastern Regional Meeting of the Society of Integrative and Comparative Biology Division of Vertebrate Morphology and Comparative Biomechanics.*

2019 Generating and Testing Hypotheses of Dinosaur Foot Motions Using 3D-Digitized Tracks and Large-Scale Granular Simulations. Falkingham PL, Turner ML, Gatesy SM. *International Congress of Vertebrate Morphology.*

2018 Developing a Virtual Reality Application for Unsteady Flow Analysis in Dinosaur Track Creation. Novotny J, Tveite JJ, Turner ML, Gatesy SM, Falkingham PL, Laidlaw, DH. *IEEE VIS*. **Best Poster Award. ♦**

2018 Contrast-enhanced XROMM reveals in vivo soft tissue interaction in the hip of Alligator mississippiensis: implications for pseudosuchia. Tsai HP, Turner ML, Manafzadeh AR, Gatesy SM. *Society of Vertebrate Paleontology Annual Meeting.*

2018 Footfall Pattern of a Bottom-Walking Crocodile (Crocodylus acutus). Farlow JO, Robinson NJ, Turner ML, Black J, Gatesy SM. *Society of Vertebrate Paleontology Annual Meeting.*

2018 Intra-foot kinematics of the American alligator. Turner ML, Gatesy SM. *Northeastern Regional Meeting of the Society of Integrative and Comparative Biology Division of Vertebrate Morphology and Comparative Biomechanics.*

2018 Avian subsurface foot kinematics on deformable substrates. Turner ML, Falkingham PL, Gatesy SM. *Society for Integrative and Comparative Biology Annual Meeting.*

2018 CT Imaging of Dinosaur Footprints: Hidden Topography and the Origin of Track Diversity. Gatesy SM, Turner ML, Falkingham, PL. *Society for Integrative and Comparative Biology Annual Meeting.*

2018 In- and Ex-Vivo Analysis of the Kinematics and Function of the Tendon of Sutton in Alligator mississippiensis. Napoli JG, Tsai HP, Turner ML, Manafzadeh AR, Gatesy SM. *Society for Integrative and Comparative Biology Annual Meeting.*

2018 Significance of hip kinematics for interpreting articular soft tissue function in Alligator mississippiensis. Tsai HP, Turner ML, Manafzadeh AR, Gatesy SM. *Society for Integrative and Comparative Biology Annual Meeting.*

2017 Sub-Surface Foot-Trajectories and Fossil Dinosaur Tracks. Turner ML, Falkingham PL, Gatesy SM. *Last Days of Pangea Triassic-Jurassic Research Symposium.*

2017 Significance of hip kinematics for interpreting articular soft tissue function in Alligator mississippiensis: evolutionary and biomechanical implications for Saurischia. Tsai HP, Turner ML, Manafzadeh AR, Gatesy SM. *Last Days of Pangea Triassic-Jurassic Research Symposium.*

2016 The morphology of motion in sub-surface foot trajectories and fossil dinosaur tracks. Turner ML, Falkingham PL, Gatesy SM. *Northeastern Regional Meeting of the Society of Integrative and Comparative Biology Division of Vertebrate Morphology and Comparative Biomechanics.*

2016 Hip joint kinematics of Alligator mississippiensis: Significance of articular soft tissues for interpreting hind limb function. Tsai HP, Turner ML, Manafzadeh AR, Gatesy SM. *Northeastern Regional Meeting of the Society of Integrative and Comparative Biology Division of Vertebrate Morphology and Comparative Biomechanics.*

2016 The morphology of motion in sub-surface foot trajectories and fossil dinosaur tracks. Turner ML, Falkingham PL, Gatesy SM. *Society of Vertebrate Paleontology Annual Meeting.*

2016 The morphology of motion: sub-surface foot trajectories and fossil tracks. Turner ML, Falkingham PL, Gatesy SM. *Society of Vertebrate Paleontology Annual Meeting.*

2015 Removing assumptions of anatomical orientation from cladistic characters: an example from pareiasaurs. Turner ML, Sidor CA, Tsuji LA. *Society of Vertebrate Paleontology Annual Meeting.*

2014 Evidence for the earliest evolution of a fully parasagittal quadruped. Turner ML, Tsuji LA, Sidor CA. *Society of Vertebrate Paleontology Annual Meeting.*

2013 The Ontogeny of the Scapulocoracoid of the Pareiasaur Bunostegos akokanensis (Amniota: Parareptilia) from the Permian of Niger. Turner ML, Tsuji LA, Sidor CA. *Undergraduate Research Symposium, University of Washington.*

Teaching

Teaching Development, Training, and Certificates

2022 Equity and Diversity Certificate, University of Minnesota.

2022 Postdoctoral Leadership Development Certificate, University of Minnesota.

2020 Course Design Certificate, Sheridan Center for Teaching and Learning, Brown University.

2017 Reflective Teaching Certificate, Sheridan Center for Teaching and Learning, Brown University.

University of Minnesota

Visualization (CSCI5609)

S22 Guest Lecturer and Domain Science Contributor. Provided scientific visualization problem and data for student final projects, focusing on techniques to address domain user needs in exploring multidimensional time-varying alligator foot skeletal animations. Engaged in student project critiques at sketch and implementation phases.

Warren Alpert Medical School of Brown University

Human Anatomy I + II (BIOL3644 + BIOL3655)

F18, S19 Special Projects TA. Organized and led teaching staff meetings; documented course progress and evaluation; developed post-dissection formative assessments which integrated course objectives, lecture material, and key lab concepts.

F17, S18 TA. Lectured on lower limb anatomy and function as well as on the abdomen, co-led review sessions on extremities and the abdomen, taught via extensive hands-on cadaver dissections and integration with imaging, prepared prosections, prepared and graded evaluations.

F16, S17 TA. Taught via extensive hands-on cadaver dissections and integration with imaging, prepared prosections, prepared and graded evaluations.

Brown University + Rhode Island School of Design

Virtual Reality Design for Science (CSCI1370 / ILLUS3340)

F15, F17 Guest Lecturer and Domain Science Contributor. Provided scientific visualization problem and data for student projects, lectured on scientific visualization needs in domain area of foot kinematics and dinosaur footprint formation, created and led a 2-week long assignment, attended and engaged in student project critiques at sketch, mock-up, and implementation phases. Collaborations formed in this course resulted in two peer-reviewed publications (numbers 4 and 9 in Publications).

University of Washington

Evolution of Mammals and their Ancestors (BIOL 443)

S14 Peer TA. Assisted in preparation, teaching, and evaluation of labs focused on anatomy and evolutionary relationships of skeletal and fossil specimens.

Comparative Anatomy of Vertebrates (BIOL 453)

F13 Peer TA. Assisted in preparation, teaching, and evaluation of labs focused on hands-on cadaver dissection of lamprey, dogfish sharks, and cats.

Advising

fall 2022 Julia Pan. University of Minnesota. Project: interactive presentations in a planetarium setting.

fall 2021 Kevin Bradt. University of Minnesota. Project: linked 2D-3D biomechanics visualizations.

summer 2021 Rea Yoh. Brown University. Project: Bat wing interossei illustrations.

summer 2021 Cheyenne Deibert. Vanderbilt University. Project: linked 2D-3D biomechanics visualizations.

2018 - 2019 Eli Mitnik. Brown University. Project: track indenter experiments and analysis in R.

Service

Organized Conference Panels

Oct 2021 Chair, "Navigating Interdisciplinary Careers in Visualization", IEEE VIS.

Reviewing

ACM Conference on Human Factors in Computing Systems (CHI) 2021.

Anatomical Record.

Bulletin of the Peabody Museum of Natural History.

Frontiers in Zoology.

IEEE Visualization Conference (VIS) 2021. 2022.

Integrative and Organismal Biology.

Journal of Anatomy.

Vertebrate Anatomy Morphology Palaeontology.

Zoological Journal of the Linnean Society.

Departmental and Institutional Service

2022 - 2022 Diversity Community of Practice Liaison, Postdoctoral Association, University of Minnesota.

2022 - 2022 College of Science and Engineering Delegate, Postdoctoral Association, University of Minnesota.

2021 - 2022 Inclusiveness, Diversity, Equity, and Advocacy Committee (CS-IDEA) Member, Department of Computer Science and Engineering, University of Minnesota.

2018 - 2020 Vice President, Ecology and Evolutionary Biology Grad Student Association, Brown University.

2017 Graduate Student Council Representative, Brown University.

2009 - 2012 Volunteer Fossil Preparator, Burke Museum of Natural History and Culture, WA.

Public Engagement

Demos, Museum Exhibit Development, and Hands-on Interaction

Jan 2023 Video contribution of dinosaur footprint formation research for permanent exhibit display at the American Museum of Natural History, NY.

summer/fall 2022 Interactive planetarium exhibit design at the Bell Museum, MN.

Nov 2021 *Fossil Bites* public talk and interactive stereoscopic z-Space demonstration. Talk: *"X-rays, Animation, and Fossil Feet: Looking at how dinosaurs and crocodylians walked from the ground up."* Science Museum of Minnesota, MN.

Dec 2020 The Great Greenfield DinoFest Jurassic Roadshow [virtual]. Pocumtuck Valley Memorial Association and Memorial Hall Museum, Deerfeeld, MA.

2019 - 2020 Custom museum exhibit and website on fossil dinosaur track formation created for permanent display at the Beneski Museum of Natural History at Amherst College, MA. `www.amherst.edu/museums/naturalhistory/dinosaur-tracks`

May 2017 Discover: A Conversation Between Art and Science. Rhode Island School of Design and Brown University collaboration show, RI.

Feb, 2014 Behind the Scenes Night. Burke Museum of Natural History and Culture, WA.

Feb, 2014 Dinosaurs and Cavemen Science Expo. Department of Pathology and Anatomical Sciences and the Department of Anthropology, University of Missouri, MO.

2012 - 2015 Dino Day. Burke Museum of Natural History and Culture, WA.

Elementary and High School Programs

2019 - 2020 Brown Junior Researcher Program at the Francis J Varieur Elementary, Pawtucket, RI.

2019 Judge, Rhode Island Science and Engineering Fair, Warwick, RI.

2018 Virtual Reality demonstrations, Brown University, RI.

2018 Scientist Guest Interview, Wild Ones, Providence, RI.

2017 - 2018 Brown Junior Researcher Program at the Boys and Girls Club, East Providence, RI.

Other Professional Activities

Additional Training and Certificates

2021 Python Data Wrangling Boot Camp, Colombia University.

2016 X-ray Reconstruction of Moving Morphology (XROMM) short course, Brown University.

2013 Natural Science Illustration Certificate, University of Washington.

2009, 2012 Forensic Art for Fine Artists; Drawing from Observation, Gage Academy of Art.

Membership in Professional Organizations

2020 - International Women in Biomechanics.

2016 - International Society of Vertebrate Morphology.

2015 - Society for Integrative and Comparative Biology.

2014 - Society for Vertebrate Paleontology.