

Nicholas Baird Holowka, Ph.D.

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SCHOLARLY PROFILE

I study the evolution of human bipedalism and the consequences of this process on musculoskeletal health. My research involves laboratory- and field-based investigations of the biomechanics of walking and running in humans and non-human primates. I use high-speed motion capture, inverse dynamics, ultrasound imaging and pedography, and apply my findings to interpreting hominin fossil morphology.

PROFESSIONAL APPOINTMENTS

- 2020-** **Assistant Professor of Anthropology**, University at Buffalo
- 2016-19** **Postdoctoral Fellow and Lecturer in Human Evolutionary Biology**, Harvard University
Faculty Advisor: Daniel Lieberman, Professor of Human Evolutionary Biology
Project: Evolution of the human foot and mismatch with modern environments.

EDUCATION

- 2015** **Ph.D. in Anthropology**, Stony Brook University, Stony Brook, NY.
Thesis: Kinematics of the chimpanzee foot during arboreal and terrestrial locomotion.
Advisor: Brigitte Demes, Ph.D.
- 2010** **M.A. in Human Skeletal Biology**, New York University, New York, NY.
Thesis: Primate locomotion and muscular mechanical advantage of the elbow.
Advisor: Terry Harrison, Ph.D.
- 2007** **B.A. in Anthropology**, Wesleyan University, Middletown, CT.

PUBLICATIONS

- 2020 Sighting F, **Holowka NB**, Hanson O, Lieberman DE. Effect of the upward curvature of toe springs on walking biomechanics in humans. *Scientific Reports*. Accepted.
- Sighting F, **Holowka NB**, Ebrecht F, Lieberman DE. Evolutionary anatomy of the plantar aponeurosis in primates, including humans. *Journal of Anatomy*. In press. DOI: 10.1111/joa.13173
- Lieberman DE, Mahaffey M, Quimare SC, **Holowka NB**, Wallace IJ, Baggish AL. Running in Tarahumara (Rarámuri) culture: persistence hunting, footracing, dancing, work, and the fallacy of the athletic savage. *Current Anthropology*. In press. DOI: 10.1086/708810

- 2019 **Holowka NB**, Wynands B, Drechsel TJ, Yegian AK, Tobolsky VA, Okutoyi P, Ojiambo Mang'eni R, Haile DW, Sigei TK, Zippenfennig C, Milani TL, Lieberman DE. Foot callus thickness does not trade off protection for tactile sensitivity during walking. *Nature* 571, 261-264. DOI: 10.1038/s41586-019-1345-6
- Callison WE, **Holowka NB**, Lieberman DE. Thoracic adaptations for ventilation during locomotion in humans and other mammals. *Journal of Experimental Biology*. 222, jeb189357 DOI: 10.1242/jeb.189357
- Wallace IJ, Bendele AM, Riew G, Frank EH, Hung H-H, **Holowka NB**, Bolze AS, Venable EM, Yegian AK, Dingwall HL, Carmody RN, Grodzinsky AJ, Lieberman DE. Physical inactivity and knee osteoarthritis in guinea pigs. *Osteoarthritis and Cartilage*. 27, 1721-1728. DOI: 10.1016/j.joca.2019.07.005
- 2018 **Holowka NB**, Lieberman DE. Rethinking the evolution of the human foot: Insights from experimental research. *Journal of Experimental Biology*. 221, jeb174425. DOI: 10.1242/jeb.174425
- Holowka NB**, Wallace IJ, Lieberman DE. Foot strength and stiffness are related to footwear use in a comparison of minimally- vs. conventionally-shod populations. *Scientific Reports* 8, 3679. DOI: 10.1038/s41598-018-21916-7
- Venkataraman VV, Yegian AK, Wallace IJ, **Holowka NB**, Tacey I, Gurven M, Kraft TS. Locomotor constraints favor the evolution of the human pygmy phenotype in tropical rainforests. *Proceedings of the Royal Society B* 285, 20181492. DOI: 10.1098/rspb.2018.1492
- Thompson NE, O'Neill MC, **Holowka NB**, Demes B. Step width and frontal plane motion in bipedal chimpanzee and human walking. *Journal of Human Evolution* 125, 27-37. DOI: 10.1016/j.jhevol.2018.09.006
- Wallace IJ, Koch E, **Holowka NB**, Lieberman DE. Heel impact forces during barefoot versus minimally shod walking among Tarahumara subsistence farmers and urban Americans. *Royal Society Open Science* 5, 180044. DOI: 10.1098/rsos.180044
- 2017 O'Neill MC, Umberger BR, **Holowka NB**, Larson SG, Reiser PJ. Chimpanzee super strength and human skeletal muscle evolution. *Proceedings of the National Academy of Sciences* 114, 7343-7348. DOI: 10.1073/pnas.1619071114
- Holowka NB**, O'Neill MC, Thompson NE, Demes B. Chimpanzee ankle and foot kinematics: Arboreal versus terrestrial locomotion. *American Journal of Physical Anthropology* 164, 131-147. DOI:10.1002/ajpa.23262
- Holowka NB**, O'Neill MC, Thompson NE, Demes B. Chimpanzee and human midfoot motion during bipedal walking and the evolution of the longitudinal arch of the foot. *Journal of Human Evolution* 104, 23-31. DOI: 10.1016/j.jhevol.2016.12.002

- 2016 Fernández PJ*, **Holowka NB***, Demes B, Jungers WL. Form and function of the human and chimpanzee forefoot: implications for early hominin bipedalism. *Scientific Reports* 6, 30532. DOI: 10.1038/srep30532 *Co-first authors.
- 2015 Thompson NE, Demes B, O'Neill MC, **Holowka NB**, Larson SG. Surprising trunk rotational capabilities in chimpanzees and implications for bipedal walking proficiency in early hominins. *Nature Communications* 6, 8416. DOI: 10.1038/ncomms9416
- 2014 Thompson NE, **Holowka NB**, O'Neill MC, Larson SG. Brief Communication: Cineradiographic analysis of the chimpanzee (*Pan troglodytes*) talonavicular and calcaneocuboid joints. *American Journal of Physical Anthropology* 154, 604-608. DOI: 10.1002/ajpa.22529
- 2013 **Holowka NB**, O'Neill MC. Three-dimensional moment arms and architecture of chimpanzee (*Pan troglodytes*) leg musculature. *Journal of Anatomy* 223, 610-628. DOI: 10.1111/joa.12121
- Poire X, Moser BK, Gallagher RE, Laumann K, Bloomfield CD, Powell BL, Koval G, Gulati K, **Holowka N**, Larson RA, Tallmann MS, Appelbaum FR, Sher D, Willman C, Paietta E, Stock W. Arsenic trioxide in front-line therapy of acute promyelocytic leukemia (C9710): Prognostic significance of FLT3 mutations and complex karyotype. *Leukemia & Lymphoma* 55, 1523-1532 DOI: 10.3109/10428194.2013.842985.

PRESENTATIONS

Conference Talks

- 2020 Cousins CC, O'Neill MC, Callison WE, **Holowka NB**. Heel strike and the metabolic cost of human walking. Los Angeles, CA. *American Journal of Physical Anthropology* 70.
- 2019 **Holowka NB**, Wynands B, Drechsel TJ, Haile DW, Ojiambo Mang'eni R, Okutoyi P, Sigei TK, Tobolsky VA, Yegian AK, Zippenfennig C, Milani TL, Lieberman DE. Walking before footwear: plantar calluses protect the foot without trading-off tactile sensitivity. Cleveland, OH. *American Journal of Physical Anthropology* 68S: 106.
- Holowka NB**, Wynands B, Drechsel TJ, Haile DW, Ojiambo R, Okutoyi P, Tobolsky VA, Yegian AK, Zippenfennig C, Milani TL, Lieberman DE. Plantar calluses provide protection without trading off the sensitivity of fast-adapting mechanoreceptors. Tampa, FL. Society for Integrative Comparative Biologists annual meeting.
- 2017 **Holowka NB**, Koch EF, Ruiz M, Wallace IJ, Lieberman DE. Foot muscle size and longitudinal arch biomechanics in a minimally shod, non-industrial population. New Orleans, LA. *American Journal of Physical Anthropology* 64S: 221.
- Holowka NB**, Bhandal V, Lam O, Thompson NE, Demes B. Chimpanzee impact forces during walking and implications for the evolution of bipedalism. New Orleans, LA. Society for Integrative Comparative Biologists annual meeting.

- 2016 **Holowka NB**, Fernández PJ. Functional morphology of the metatarsophalangeal joints in chimpanzees and humans: a kinematic and morphometric approach. Atlanta, GA. *American Journal of Physical Anthropology* 62S: 176.
- 2015 **Holowka NB**, Demes B, O’Neill MC, Thompson NE. Chimpanzee foot and ankle joint motion during vertical climbing. St. Louis, MO. *American Journal of Physical Anthropology* 60S: 169.
- 2014 **Holowka NB**, Demes B, O’Neill MC. Three-dimensional foot kinematics of chimpanzees and humans during bipedal locomotion. Calgary, AB. *American Journal of Physical Anthropology* 58S: 144.

Posters and abstracts

- 2020 **Holowka NB**, Richards A, Sibson BE, Lieberman DE. The spring in the arch of the human foot, revisited. Los Angeles, CA. *American Journal of Physical Anthropology*. 70S.
- 2018 **Holowka NB**, Hatala KG, Demes B, Thompson NE, Wunderlich RE. Chimpanzee plantar pressure distributions and the evolution of bipedal plantigrady. Austin, TX. *American Journal of Physical Anthropology*. 66S: 124.
- 2013 **Holowka NB**, O’Neill MC. Three-dimensional moment arms and architecture of chimpanzee (*Pan troglodytes*) leg musculature. Knoxville, TN. *American Journal of Physical Anthropology* 56S: 151.
- 2011 **Holowka, N**. A comparative study of the anatomical mechanical advantage of the elbow flexor and extensor muscles in anthropoid primates. Minneapolis, MN. *American Journal of Physical Anthropology* 52S: 166.
- 2008 Stock W, Najib K, Moser BK, Powell BL, **Holowka N**, Gulati K, Bloomfield CD, Larson RA, Sher D. High incidence of FLT3 mutations in adults with Acute Promyelocytic Leukemia (APL): Correlation with diagnostic features and treatment outcome. *Journal of Clinical Oncology* 26 (15S): 7002.

TEACHING & ADVISING EXPERIENCE

Instructor – University at Buffalo

Course design, lecturing, seminar, project advising, paper grading.

- Human Evolution and Human Health (undergraduate course). Fall 2020. Enrollment: 13 students.
- Graduate Survey in Biological Anthropology (graduate course). Fall 2020. Enrollment: 11 students.
- Biomechanics of Human Evolution (graduate course). Spring 2020. Enrollment: 4 students.

Lecturer – Harvard University

Course design, lecturing, laboratory demonstration, project advising, paper/presentation grading.

- Evolution of Human Locomotion. Fall 2019. Enrollment: 5 students.
- Research in Human Biomechanics and Physiology. Spring 2016, 2017, 2018, 2019. Enrollment: 4-12 students.
- Senior Honors Thesis Tutorial. Fall-Spring 2016-2018. Enrollment: 11-13 students.

Teaching Assistant – Stony Brook University Medical Center

Guiding medical students in cadaver dissection labs, writing and grading exams.

- The Body. Fall, 2013. Enrollment: 120 students.
- Regional Human Anatomy. Summer, 2012. Enrollment: 140 students.

Teaching Assistant – Stony Brook University

Lecturing in model-based anatomy labs and biological anthropology labs, designing laboratory activities, writing and grading quizzes and exams.

- Human Anatomy. Fall-Spring 2011-2015. Enrollment: 32 students/semester.
- Introduction to Biological Anthropology. Fall 2011. Enrollment: 80 students.
- African People and Cultures. Fall 2010. Enrollment: 50 students.

Advising Experience

Harvard University

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| 2018-19 | Two undergraduates. Honors thesis advisor. |
| 2017-18 | Two undergraduates. Honors thesis co-advisor. |
| 2016-17 | Undergraduate. Honors thesis co-advisor. |
| 2016 | Undergraduate. Research course (HEB 91r) mentor. |

Stony Brook University

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| 2015-16 | Undergraduate, Stony Brook University. Sigma Xi Undergraduate Research Award winner. |
| 2014-16 | Undergraduate, Stony Brook University. Sigma Xi Undergraduate Research Award winner. |

AWARDS & GRANTS

Research Grants

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| 2014-2016 | L.S.B. Leakey Foundation: 'Kinematics of the Chimpanzee Foot During Terrestrial and Arboreal Locomotion.' \$9,291 (\$4,748 accepted) |
| 2014-2016 | Wenner-Gren Foundation: 'Kinematics of the Chimpanzee Foot During Terrestrial and Arboreal Locomotion.' \$14,925 (\$10,380 accepted) |

Travel Awards

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| 2011-14 | American Association of Physical Anthropologists, William S. Pollitzer Student Travel Award. \$2,000 (cumulative). |
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Fellowships

2017 Postdoctoral Awards for Professional Development. Harvard University. \$750.
2008-10 NYU Departmental Fellowship for Graduate Study in Anthropology. \$8,000
(cumulative).

Presentation Awards

2015 American Association of Physical Anthropologists, Student Presentation Award,
Honorable Mention.

Teaching Awards

2016 Bok Center Certificate of Teaching Excellence, Harvard University.

PROFESSIONAL SERVICE

University at Buffalo Policy Committee

Department of Anthropology faculty representative. 2020-present.

Committee Experience

Graduate student representative to Anthropology Department executive committee, Stony Brook
University, 2013-14.

Graduate Student Organization Senate representative for Anthropology Department, Stony Brook
University, 2012-14.

Educational Outreach

“Meet A Scientist” event, Cambridge Science Festival. Harvard Museum of Natural History,
Cambridge, MA. 2018.

I Heart Science Festival demonstration. Harvard Museum of Natural History, Cambridge, MA. 2018.

AAAS Science Days: In the Classroom. Ferryway Middle School, Malden, MA. 2017.

“What is a Scientist?” Outreach Program. Madisonville Junior High School, Madisonville, LA. 2017

Professional Memberships

American Association of Physical Anthropologists, 2010-2018.

Society for Integrative Comparative Biologists, 2016-2019.