# *Benjamin D. Umans*

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## Education

November 2019 — **Ph.D.**, *Biological and Biomedical Sciences*.
Harvard University, Cambridge, MA
Dissertation: "Vagal afferent pathways of laryngeal and gastric sensation"
Thesis advisor: Dr. Stephen Liberles

May 2014 — **MPhil**, *Biological Science*.
University of Cambridge, Cambridge, UK
Thesis: "An investigation of physical domains in the *Drosophila* genome"
Thesis advisor: Dr. Rob White

October 2012 — **MSc with Distinction**, *Applied Statistics*.
University of Oxford, Oxford, UK
Thesis: "Modelling bacterial evolution from sequence data"
Thesis advisor: Dr. Daniel Wilson

June 2010 — **BA with Honors**, *Biology and Economics*.
The University of Chicago, Chicago, IL

## Research Experience

2/2020–present — **Postdoctoral Scholar**, Section of Genetic Medicine, The University of Chicago.
Advisor: Dr. Yoav Gilad.
- Using human and non-human primate stem cell platforms to study neuronal gene regulation in development and disease

9/2014–11/2019 — **PhD Student**, Department of Cell Biology, Harvard Medical School, HHMI.
Advisor: Dr. Stephen Liberles.
- Used mouse genetic tools, optogenetics, advanced imaging techniques, behavioral experiments, single-cell transcriptional profiling, and electrophysiology to study *in vivo* functions of molecularly defined sensory neurons and receptors.
- Applied these tools to studies of autonomic sensory neurons in airway protection, gastrointestinal function, breathing, and neuroimmune regulation.

4/2014–6/2014 **PhD Student (rotation)**, Harvard Medical School, BWH, HHMI.
Advisor: Dr. Matthew Waldor.
- Used Tn-seq to identify genes that are essential for cell wall biogenesis and maintenance in *V. cholerae.*
- Generated mutant strains and characterized them by complementation, growth assays, and microscopic measures of membrane permeability.

1/2014–3/2014 **PhD Student (rotation)**, Harvard Medical School.
Advisor: Dr. Sandeep Robert Datta.
- Analyzed RNA-seq data generated from olfactory sensory neurons, implemented new single-cell RNA-seq protoccols, and prepared histological samples, to study the molecular mechanisms of mammalian olfaction.

10/2013–12/2013 **PhD Student (rotation)**, Harvard Medical School.
Advisor: Dr. Craig Hunter.
- Studied extracellular RNA transport in the *C. elegans* germline using molecular biology and *in vivo* techniques.

10/2012–8/2013 **MPhil Student**, University of Cambridge.
Advisor: Dr. Rob White.
- Investigated the relationship between chromatin state markers and genome architecture using HiC datasets

3/2012–9/2012 **MSc Student**, University of Oxford.
Advisor: Dr. Daniel Wilson.
- Developed models of evolution and natural selection to estimate species divergence times and substitution rates using whole-genome sequence data from human pathogens.

8/2011 **Visiting Researcher**, Texas Biomedical Research Institute.
Advisors: Drs. Anthony Comuzzie and V. Saroja Voruganti.
- Analyzed biomarker data and performed linkage analysis using data from two Native population cohort studies.

6/2009–6/2011 **Undergraduate/Postgraduate Research Assistant**, The University of Chicago.
Advisor: Dr. Jerrold Turner.
- Studied the role of intestinal permeability in graft-versus-host disease (GVHD) using mouse models.
- Characterized molecular interactions of a single domain of ZO-1, a key scaffolding protein of the epithelial tight junction, using molecular and biochemical techniques.

2007 **Undergraduate Research Assistant**, The University of Chicago.
Advisor: Dr. Rustem Ismagilov.
- Characterized a microfluidic device for providing controlled thermal and chemical stimuli to *C. elegans* for *in vivo* studies of protein aggregation.

## Awards and Fellowships

2022 **BSD CAP Award**, The University of Chicago.
Competitive travel award for conference presentation.

2016-2019 **NRSA F31 Fellowship**, NIH, F31 HL132645.

2014-2015 **Cell and Developmental Biology Training Grant**, Harvard Medical School.
Selected for inclusion on training grant 5T32GM007226 (Harper).

2011-2013 **Marshall Scholarship**.
Selected as one of 33 American students funded to pursue graduate education in the U.K.

2010 **Phi Beta Kappa**, The University of Chicago.

2009-2010 **Student Marshal**, The University of Chicago.
Highest undergraduate award.

2007 **Humanities/Fine Arts Workshop**, National Endowment for the Arts.
Selected for summer intensive workshop in New York, France, Netherlands, and U.K. Subsequently invited by organizer Greg Wyatt to assist in planning proposed monument for Arlington National Cemetery.

2006-2010 **National Merit Scholar**.

## Publications

### *Journal Articles*

[1] **B. D. Umans** and Y. Gilad. "Oxygen-induced stress reveals context-specific gene regulatory effects in human brain organoids". In: *bioRxiv* (Sept. 2024). DOI: 10.1101/2024.09.03.611030. URL: https://www.biorxiv.org/content/10.1101/2024.09.03.611030v1.

[2] D. Yang, N. Almanzar, J. Xia, S. Udit, S. T. Yeung, C. Khairallah, D. A. Hoagland, **B. D. Umans**, N. Sarden, O. Erdogan, N. Baalbaki, A. Beekmayer-Dhillon, J. Lee, K. A. Meerschaert, S. D. Liberles, B. G. Yipp, R. A. Franklin, K. M. Khanna, P. Baral, A. L. Haber, and I. M. Chiu. "Vagal TRPV1+ sensory neurons regulate myeloid cell dynamics and protect against influenza virus infection". In: *bioRxiv* (Aug. 2024). URL: https://www.biorxiv.org/content/10.1101/2024.08.21.609013v1.

[3] **B. D. Umans**, A. Battle, and Y. Gilad. "Where Are the Disease-Associated eQTLs?" In: *Trends in Genetics* 37.2 (Feb. 2021), pp. 109–124.

[4] S. L. Prescott*, **B. D. Umans***, E. K. Williams, R. D. Brust, and S. D. Liberles. "An Airway Protection Program Revealed by Sweeping Genetic Control of Vagal Afferents." In: *Cell* 181.3 (Apr. 2020), 574–589.e14.

[5] **B. D. Umans** and S. D. Liberles. "Neural Sensing of Organ Volume." In: *Trends in Neurosciences* 41.12 (Dec. 2018), pp. 911–924.

[6] A. I. Weaver, S. G. Murphy, **B. D. Umans**, S. Tallavajhala, I. Onyekwere, S. Wittels, J.-H. Shin, M. VanNieuwenhze, M. K. Waldor, and T. Dörr. "Genetic Determinants of Penicillin Tolerance in Vibrio cholerae." In: *Antimicrobial Agents and Chemotherapy* 62.10 (Oct. 2018).

[7] P. Baral, **B. D. Umans**, L. Li, A. Wallrapp, M. Bist, T. Kirschbaum, Y. Wei, Y. Zhou, V. K. Kuchroo, P. R. Burkett, B. G. Yipp, S. D. Liberles, and I. M. Chiu. "Nociceptor sensory neurons suppress neutrophil and $\gamma\delta$ T cell responses in bacterial lung infections and lethal pneumonia." In: *Nature Medicine* 24.4 (May 2018), pp. 417–426.

[8] S. El-Sharnouby, B. Fischer, J. P. Magbanua, **B. Umans**, R. Flower, S. W. Choo, S. Russell, and R. White. "Regions of very low H3K27me3 partition the Drosophila genome into topological domains." In: *PLoS ONE* 12.3 (2017), e0172725.

[9] T. Dörr, F. Delgado, **B. D. Umans**, M. A. Gerding, B. M. Davis, and M. K. Waldor. "A Transposon Screen Identifies Genetic Determinants of Vibrio cholerae Resistance to High-Molecular-Weight Antibiotics." In: *Antimicrobial Agents and Chemotherapy* 60.8 (Aug. 2016), pp. 4757–4763.

[10] R. L. Umans, **B. D. Umans**, H. Umans, and E. Elsinger. "Predictive MRI correlates of lesser metatarsophalangeal joint plantar plate tear." In: *Skeletal Radiology* 45.7 (July 2016), pp. 969–975.

[11] E. K. Williams, R. B. Chang, D. E. Strochlic, **B. D. Umans**, B. B. Lowell, and S. D. Liberles. "Sensory Neurons that Detect Stretch and Nutrients in the Digestive System." In: *Cell* 166.1 (June 2016), pp. 209–221.

[12] R. B. Chang, D. E. Strochlic, E. K. Williams, **B. D. Umans**, and S. D. Liberles. "Vagal Sensory Neuron Subtypes that Differentially Control Breathing." In: *Cell* 161.3 (Apr. 2015), pp. 622–633.

[13] S. O. E. Ebbesson, V. S. Voruganti, P. B. Higgins, R. R. Fabsitz, L. O. Ebbesson, S. Laston, W. S. Harris, J. Kennish, **B. D. Umans**, H. Wang, R. B. Devereux, P. M. Okin, N. J. Weissman, J. W. MacCluer, J. G. Umans, and B. V. Howard. "Fatty acids linked to cardiovascular mortality are associated with risk factors." In: *International Journal of Circumpolar Health* 74.1 (Jan. 2015), p. 28055.

## Presentations

### *Oral Presentations*

[1] **B. D. Umans**. "Genetic variation influencing brain oxygen stress responses contributes to disease risk." Midwest Society for Developmental Biology. Madison, Aug. 2024.

[2] **B. D. Umans**. "Sensory neuron populations contributing to airway protection." Massachusetts Eye and Ear Infirmary Laryngology Research Rounds. Boston, Mar. 2019.

[3] **B. D. Umans** and S. D. Liberles. "Deciphering sensory signals of the vagus nerve." Dissecting microbiome-gut-brain circuits for microbial modulation of host cognition in response to diet and stress. Pasadena: MURI (Army Research Office), Feb. 2018.

[4] **B. D. Umans**. "Mapping Chromatin Interactions in the Drosophila Genome." Department of Physiology, Development and Neuroscience Graduate Symposium. Cambridge, 2013.

### *Oral Presentations presented by colleagues*

[1] R. L. Umans, **B. D. Umans**, H. Umans, and E. Elsinger. "Predictive MRI Correlates of Lesser Metatarsophalangeal Joint (MPJ) Plantar Plate (PP) Tear." Society of Skeletal Radiology. Scottsdale, 2015.

[2] H. Umans, W. Rennie, **B. D. Umans**, M. Shah, and H. Levy. "MRI Diagnosis of Glenoid Labral Tear Using the Biceps Labral Oblique (BLO) Sequence." Society of Skeletal Radiology. San Diego, 2014.

[3] R. L. Umans, **B. D. Umans**, H. Umans, and E. Elsinger. "Predictive MRI Correlates of Lesser Metatarsophalangeal Plantar Plate Tear." Radiological Society of North America. Chicago, 2014.

[4] R. L. Umans, **B. D. Umans**, H. Umans, and E. Elsinger. "Predictive MRI Correlates of Lesser Metatarsophalangeal Plantar Plate Tear." International Skeletal Society. Edinburgh, 2014.

### *Poster Presentations*

[1] **B. D. Umans**, O. Allen, and Y. Gilad. "Mapping genetic contributions to individual- and cell type-specific brain oxidative stress responses". American Society of Human Genetics. Washington, DC, Nov. 2023.

[2] **B. D. Umans**, O. Allen, and Y. Gilad. "Mapping genetic contributions to individual- and cell type-specific brain oxidative stress responses". Development & 3D Modeling of the Human Brain. Cold Spring Harbor Laboratory, Dec. 2022.

[3] **B. D. Umans**, N. Joshi, E. K. Williams, S. L. Prescott, and S. D. Liberles. "Molecular diversity of vagal sensory neurons controlling airway protection." Society for Neuroscience. Chicago, Oct. 2019.

[4] **B. D. Umans**, S. L. Prescott, and S. D. Liberles. "Sensory innervation of the upper airway by Piezo2$^+$ neurons." Department of Cell Biology Retreat. Falmouth, Oct. 2018.

[5] E. K. Williams, R. B. Chang, D. E. Strochlic, **B. D. Umans**, R. D. Brust, B. B. Lowell, and S. D. Liberles. "Sensory Mechanisms of Intestinal Vagal Afferents." Giovanni Armenise-Harvard Foundation Symposium Symposium: From Molecular Mechanisms to Precision Medicine. Gubbio, June 2016.

### *Poster Presentations presented by colleagues*

[1] E. McIntire, K. Rhodes, K. Barr, M. DeMille, **B. Umans**, J. Burnett, Gonzales Natalia, and Y. Gilad. "Modeling cardiac cell developmental trajectories at high temporal resolution; (PB1534)." American Society of Human Genetics. Los Angeles, Oct. 2022.

[2] V. S. Voruganti, **B. D. Umans**, K. Haack, S. Laston, R. R. Fabsitz, S. O. E. Ebbesson, J. W. MacCluer, B. V. Howard, J. G. Umans, A. G. Comuzzie, and S. A. Cole. "Genetic variants of SLC22A12 are associated in a population-specific manner with serum uric acid and CKD phenotypes." American Society of Nephrology. Atlanta, 2013.

[3] M. E. Bush, **B. D. Umans**, D. Choi, C. Voisine, D. Czyz, R. I. Morimoto, and R. F. Ismagilov. "A Microfluidic Platform for Local Thermal and Chemical Stimulation of C. elegans." 13th Annual Midwest Stress Response and Molecular Chaperone Meeting. Evanston, 2008.

## Teaching Experience

2020-present **Section of Genetic Medicine**.
- Mentored two graduate students and one technician.

2014-2019 **Department of Cell Biology**.
- Mentored one graduate student and two technicians, as well as training new postdoctoral fellows in surgical and physiological measurement techniques.
- Trained researchers from the laboratories of Elaine Hsiao (UCLA) and Tom Rapoport (Harvard Medical School, HHMI) in experimental techniques, and provided ongoing technical guidance to researchers at UCLA and the Institut Pasteur.

2016–2017 **Introduction to Histology for Graduate Students**, *Guest Lecturer*.
Primary instructors: Drs. Gerald Greenhouse and Everett Anderson

9/2013-5/2015 **Pforzheimer House**, *Tutor in Statistics and Biology*.
- Held weekly office hours and helped undergraduate students with course material and thesis research.

2014 **CURE Program, Dana-Farber Cancer Institute**, *Instructor*.
- Taught students to read primary and secondary scientific literature related to clinical basic studies in cancer as part of the Continuing Umbrella of Research Experience Program.

## Professional and Entrepreneurial Activities

2021 **Leadership and Management in Action Program for Postdocs**.
- Selected as a participant in a Chicago-wide leadership and management training course for postdoctoral scientists. The course was developed by Washington University in St. Louis and the Burroughs Wellcome Fund and spanned six weeks.

2021 **Entrepreneurship for Science and Medicine**, *Booth School of Business*.
- Selected to participate in a month-long course sponsored by the Booth School of Business and the Polsky Center for Entrepreneurship. The course, specifically for graduate students, postdocs, and faculty in the sciences, covered key aspects of technology commercialization and involved members of the University's commercialization teams as well as members of the Chicago biotechnology community.

2017-present **Digitalis Ventures (Samuel Bjork)**.

- Provide advisory input during evaluation of new research, client company technologies, and market potential.

2018 **NanoSurface Biomedical**.

- Performed product testing during development of CytoStretcher device.

## Service

2023-present Reviewer. *Cell Reports*

2021-present Reviewer. *Annals of the American Thoracic Society*

2021-present Department of Human Genetics Postdoctoral Liaison. *The University of Chicago*

2014-2019 Cell Biology/BCMP Journal Club. *Harvard Medical School*

2015-2017 Admissions Committee. *Biological and Biomedical Sciences PhD Program*

10/2016 HMS Discovery Council. *Harvard Medical School*

2015 Conduct of Science Steering Committee. *Division of Medical Sciences*