Benjamin J. Matthews, Ph.D.

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Assistant Professor
Department of Zoology
University of British Columbia
Vancouver, BC V6T 1Z4 Canada

EMPLOYMENT

Assistant Professor (tenure-track), September 2019 to present
Department of Zoology, Comparative Physiology Group
University of British Columbia, Vancouver, BC Canada

Research Specialist, September 2017 to September 2019
Laboratory of Neurogenetics and Behavior
Howard Hughes Medical Institute and The Rockefeller University, New York, NY USA

EDUCATION AND TRAINING

Postdoctoral Scientist, 2010-2019. **Jane Coffin Childs Postdoctoral Fellow**, 2011-2014
Rockefeller University and Howard Hughes Medical Institute, New York, NY USA
Advisor: Leslie B. Vosshall, Laboratory of Neurogenetics and Behavior and Investigator, HHMI

Ph.D. with distinction in Neurobiology and Behavior, 2005-2010
Columbia University, New York, NY USA. Degree conferred Oct. 20, 2010
Advisor: Wesley B. Grueber, Departments of Physiology and Neuroscience

B.S. Biology, 2000-2004
California Institute of Technology, Pasadena, CA USA. Degree conferred June 11, 2004.

RESEARCH EXPERIENCE

Assistant Professor, Department of Zoology, UBC September 2019 to present.
The mosquito *Aedes aegypti* is a global, deadly vector of arboviral pathogens that cause Zika, Dengue fever, yellow fever, and Chikungunya. Our laboratory is broadly interested in how the genome of the mosquito encodes the capacity for adaptive behaviors such as blood-feeding on human hosts and identifying appropriate aquatic egg-laying sites. We draw on techniques from genome-editing, genomics, and neuroscience to dissect the genetic and neural circuit basis of mosquito behavior and coordinate changes in physiology that underly these deadly adaptations.

Postdoctoral Research, Laboratory of Neurogenetics and Behavior, The Rockefeller University and HHMI. 09/2010 to 08/2019; Research Specialist, 09/2017 to 08/2019.

PhD Research, Columbia University, Doctoral Program in Neurobiology and Behavior. January 2006 to September 2010, Ph.D. advisor: Wesley B. Grueber

Research Assistant, University of California, Irvine. July 2004 to August 2005
Laboratory of Susana Cohen-Cory. BDNF regulation of synaptogenesis and dendritogenesis.

Undergraduate Research, Caltech. September 2003 to July 2004. Laboratory of John Allman.
Functional imaging of the human brain in response to humorous art and language.

RESEARCH FUNDING AND AWARDS

- Michael Smith Foundation For Health Research Scholar Award (2021-2026), $450,000
- Sloan Research Fellowship (Neuroscience; 2021-2023), $90,000 USD
- Natural Sciences and Engineering Research Council (NSERC) Discovery Grant (2020-2025)
  Project title: “Molecular basis of egg-laying across mosquitoes”
  Summary and role: 5-year operating grant; principal investigator, $247,500
- Canada Foundation for Innovation, John R. Evans Leadership Fund (2020-2025)
  Project title: “The neurobiology and genetics of taste across disease-vectoring mosquitoes”
  Summary and role: Capital equipment grant; principal investigator, $482,125
- Jane Coffin Childs Memorial Fund for Medical Research, HHMI Fellow (2011-2014)
- Henry and Marie-Josée Kravis Postdoctoral Fellow, Rockefeller University (2010-2011)
- NIH/NINDS Ruth L. Kirschstein F31 Individual NRSA Predoctoral Fellowship (2007-2010)
- Kavli Award for Distinguished Research in Neuroscience, Columbia University (2010)
  Awarded each year to the best PhD dissertation in neuroscience at Columbia University

PEER-REVIEWED PUBLICATIONS AND PRE-PRINTS

16. Box, I.C.H., **Matthews B.J.**, Marshall K.E. Molecular evidence of intertidal habitats selecting for repeated ice-binding protein evolution in invertebrates. bioRxiv (2021) 10.1101/2021.08.30.458284

15. Younger M.A., Herre M., Ehrlich A.R., Gong Z., Gilbert Z.N., Rahiel S., **Matthews B.J.**, Vosshall, L.B. Non-canonical odor coding ensures unbreakable mosquito attraction to humans. bioRxiv (2020) 10.1101/2020.11.07.368720

14. Zhao Z., Zung J.L., Kriete A.L., Iqbal A., Younger M.A., **Matthews B.J.**, Merhof D., Thiberge, S., Strauch M., McBride C.S. Chemical signatures of human odour generate a unique neural code in the brain of *Aedes aegypti* mosquitoes. bioRxiv (2020) 10.1101/2020.11.01.363861

13. Aguiar, E.R.G.R., Almeida, J.P.P., Queiroz L.R., Oliveira L.S., Olmo R.P., Faria I.J.S., Imler J-L., Gruber A., **Matthews B.J.**, and Marques J.T. A single unidirectional piRNA cluster similar to the flamenco locus is the major source of EVE-derived transcription and small RNAs in *Aedes aegypti* mosquitoes. RNA (2020) 10.1261/rna.073965.119

12. Peach D.A.H., and **Matthews B.J.** Modelling the putative ancient distribution of the coastal rock pool mosquito *Aedes togoi*. Journal of Insect Science (2020) 20(3): 7 bioRxiv (2019)

11. **Matthews B.J.*,** Younger M.A.*, and Vosshall L.B. The ion channel *ppk301* controls freshwater egg-laying in the mosquito *Aedes aegypti*. eLife (2019) 8:e43963 bioRxiv (2018) (* denotes equal contribution)

10. **Matthews B.J.*§,** Dudchenko O.*, Kingan, S.*, (et al., 68 middle authors) and Vosshall, L.B. Improved reference genome of *Aedes aegypti* informs arbovirus vector control. Nature (2018) 563:501-507. bioRxiv (2017) (* denotes equal contribution; § denotes corresponding)

9. Trible W., Olivos-Cisneros L., McKenzie S.K., Saragosti J., Chang, N.C., **Matthews B.J.**, Oxley P.R., and Kronauer, D.J.C. *orco* mutagenesis causes loss of antennal lobe glomeruli and impaired social behavior in ants. Cell (2017) 170:727-735.e10. bioRxiv (2017)

8. **Matthews B.J.**, McBride C.S., DeGennaro, M., Despo O. and Vosshall, L.B. The neurotranscriptome of the *Aedes aegypti* mosquito. BMC Genomics (2016) 17:32. bioRxiv (2015)

7. Kistler K.E., Vosshall L.B., and **Matthews B.J.§** Genome-engineering with CRISPR-Cas9 in the mosquito *Aedes aegypti*. Cell Reports (2015) 11:51-60. bioRxiv (2014) (§ denotes corresponding)

6. McMeniman C.J., Corfas R.A., **Matthews B.J.**, Ritchie S.A., Vosshall L.B. Multimodal integration of carbon dioxide and other sensory cues drives mosquito attraction to humans. Cell (2014) 156:1060-1071

5. **Matthews B.J.** and Grueber W.B. Dscam1-mediated self-avoidance counters Netrin-dependent targeting of dendrites in Drosophila. Current Biology (2011) 21:1480-1487

4. Hattori, D., Chen, Y., **Matthews, B.J.**, Salwinski, L., Sabatti, C., Grueber, W.B., and Zipursky S.L. Robust discrimination between self and non-self neurites requires thousands of Dscam1 isoforms. Nature (2009) 461:644-648

3. **Matthews B.J.**, Kim, M.E., Flanagan, J.J., Hattori, D., Clemens, J.C., Zipursky S.L., and Grueber, W.B. Dendrite self-avoidance is controlled by Dscam. Cell (2007) 129: 593-604

2. Watson, K. K., **Matthews, B. J.**, and Allman, J. M. Brain activation during sight gags and language-dependent humor. Cerebral Cortex (2007) 17:314-324

1. Sanchez, A. L.*, **Matthews, B. J.***, Meynard, M. M.*, Hu, B.*, Javed, S., and Cohen-Cory, S. C. BDNF increases synapse density in dendrites of developing tectal neurons in vivo. Development (2006) 133:2477-2486 (* denotes equal contribution)

INVITED REVIEWS

4. **Matthews B.J.**[§] and Vosshall L.B. How to turn an organism into a model organism in 10 'easy' steps. Journal of Experimental Biology (2020) 233(supp1):jeb218198
([§] denotes corresponding)
3. **Matthews B.J.** *Aedes aegypti*. Trends in Genetics (2019) 35(6):470-471
2. Corty, M.M.*, **Matthews B.J.***, and Grueber W.B. Molecules and mechanisms of dendrite development in *Drosophila*. Development (2009) 136:1049-1061
(* denotes equal contribution)
1. **Matthews B.J.**, Corty M.M., and Grueber W.B. Of cartridges and columns: new roles for cadherins in visual system development. Neuron (2008) 58:1-3

DIRECT MENTORSHIP

As PI (2019-present):

Postdocs: Daniel A.H. Peach* (2020 MSFHR Research Trainee 3-year fellowship), Yunusa Garba Mohammed (2020 MSFHR Research Trainee 3-year fellowship; HFSP Long-term Fellowship)
Graduate Students: Leisl Brewster (M.Sc. Zoology), Orna Phelan (M.Sc. Zoology), Britya Ghosh (M.Sc. in Michael Gordon lab), Tahnee Ames (M.Sc. Zoology), Elsa Cyr (M.Sc. Zoology), Ivan Lo (M.Sc. Zoology)
Honours students: Aleksandra Anoshina, Ivan Lo, Ana Parra, Joshua Chen, Maryann Rogers
NSERC USRA awardee: Aleksandra Anoshina (2020)
UBC SURE awardee: Joshua Chen, Lauren Semkow
Directed Studies: Jonathan Chiang, Weison Chu, Quinn Kelley, Andrew Oh, Smit Patel, Kevin Poon, Kunwar Puri, Atbeen Rezazadah, Madhurya Sekhar, Lauren Semkow, Parsa Seyfourian, Shruti Swami, Annie Zeng

As postdoc (2010-2019):

Graduate Students: Stephanie Marcus, Margaret Herre*, Krithika Venkataraman, Joshua Zeng, Molly Liu, Emily Dennis
Research Assistants: Zachary Gilbert, Kathryn Kistler*
Undergraduate Students: Julia Canick, Eva Shrestha, Nicholas Schwartz
High School Students: Solomon Dworkin, Russell Shephard, Orion Despo*
* indicates authorship on publications resulting from mentored projects

SERVICE

Committee Service:

Neuroscience graduate program awards committee

Trainee committee service:

Jinfang Li (Ph.D. Neuroscience, PI Michael Gordon, 2020-present)
Ardalan Hendi (M.Sc. and Ph.D. Zoology, PI Kota Mizumoto, 2019-present)
Sasha McDowell (Ph.D. and M.Sc. Zoology, PI Michael Gordon, 2019-present)

Departmental examiner:

Sarina Azargoon (M.Sc. Zoology, PI Doug Altshuler, 2021)
Tormod Rowe (M.Sc. Zoology, PI Phil Matthews, 2020)
Celia Lau (M.Sc. Zoology, PI Michael Gordon, 2020)
Ethan Fortes (M.Sc. Zoology, PI Kota Mizumoto, 2019)

External committee service:

Antinéa Babarit (Ph.D. Institut de Biologie Moléculaire et Cellulaire, 2020-present)
Université de Strasbourg, Strasbourg, France. Supervisor: João Marques

Symposium and seminar organizer:

Symposium co-organizer, Pacific Branch meeting, Entomological Society of America (2020)
Series co-organizer, UBC Comparative Physiology Wednesday Seminars (2019-present)

Ad hoc grant review (selected):

NIH NIAID (Microbiology and Infectious Disease), Israel Science Foundation, Wellcome Trust

Ad hoc journal review (selected):
Applied Sciences, Cell Reports Methods, Developmental Biology, eLife, eNeuro, G3, Genome Research, iScience, Insect Science, Journal of Experimental Biology, Molecular Ecology, PLoS Computational Biology, PLoS Neglected Tropical Diseases, Scientific Reports

TEACHING AND COURSE DEVELOPMENT

- Course leader, University of British Columbia, Vancouver, BC, Canada. 2020-present
  Principles of Neurobiology II, BIOL372. Co-developed and taught a third-year undergraduate course in sensory and systems neurobiology, first offering 2020 Winter Term 2.
- Course leader University of British Columbia, Vancouver, BC, Canada. 2019-present
  Comparative Animal Physiology, ZOOL503. Co-leader of graduate seminar, 8-12 students.
- Guest Lecturer New York University, New York, NY. November 2014-2018
  Guest lectures on genome engineering, mosquito behavior, and other topics to 10-20 advanced undergraduate students as part of "302.002: Neurogenetics and Behavior"
- Technical Workshop on Insect Genetic Modification, University of Maryland. 2017 and 2018
  Practical and theoretical considerations of CRISPR-based gene-editing, 20-25 trainees
- 5th TReND/ISN School on Insect Neuroscience and *Drosophila* Neurogenetics
  Dar es Salaam, Tanzania. September 2015
  Intensive lecture and laboratory-based course for 15 students from African institutions.
- Visiting Assistant Professor, Bard College, Annandale-on-Hudson, NY. Spring 2013
  Bard-Rockefeller Semester in Science.

SELECTED ORAL PRESENTATIONS

- York University Biology Seminar Series, online (2020)
- Arthropod Genomics Symposium, online (2020)
- Annual Meeting of the Pacific Branch of the Entomological Society of America, online (2020)
- Life Sciences Institute Seminar, University of British Columbia, Vancouver, Canada (2020)
- Comparative Physiology Seminar, University of British Columbia, Vancouver, Canada (2019)
- Plant and Animal Genomes, San Diego, CA (2019)
- Department of Zoology, University of British Columbia, Vancouver, Canada (2019)
- Neuroscience Institute, New York University, New York, NY (2019)
- School of Biological Sciences, University of Utah, Salt Lake City, UT (2018)
- Department of Entomology, Cornell University, Ithaca, NY (2018)
- SMRT Scientific Symposium Leiden, Netherlands (2018) Keynote Speaker
- Department of Biology, University of Pennsylvania, Philadelphia, PA (2018)
- "Rockefeller's Talking Science: The World's Most Dangerous Animal," New York, NY (2018)
- Bioethical Issues Committee Symposium series, NYC Bar Association, New York, NY (2017)
- Plant and Animal Genomes, San Diego, CA (2017)
- International Congress of Entomology, Orlando, FL (2016)
- Rockefeller University Summer Science Research Program, New York, NY (2016)
- World Science Festival, New York, NY (2016)
- International Behavioural and Neural Genetics Society, Uppsala, Sweden (2015)
- New Jersey Mosquito Control Association Annual Meeting, Atlantic City, NJ (2015)
- Memorial Sloan Kettering Cancer Center, "The Genome Editing Revolution," NY, NY (2014)
- HHMI-Janelia Farm Research Conference "High Throughput Sequencing for Neuroscience," Ashburn, VA (2014)
- Montclair University "Partners of the Americas," Montclair, NJ (2014)
- FASEB Science Research Conference: Genome Engineering, Nassau, Bahamas (2014)
- Jane Coffin Childs Memorial Fund 2014 Fellows' Symposium, Lakeville, CT (2014)
- American Society of Tropical Medicine and Hygiene, Annual Meeting, Washington DC (2013)