Stanford

William Talbot

Senior Associate Dean, Graduate Education & Postdoctoral Affairs and Professor of Developmental Biology

Bio

ACADEMIC APPOINTMENTS

- Professor, Developmental Biology
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Wu Tsai Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Senior Associate Dean for Graduate Education and Postdoctoral Affairs, Stanford University School of Medicine, (2015- present)
- Chair, Department of Developmental Biology, Stanford University, (2012-2015)

HONORS AND AWARDS

- Pew Scholars Award in the Biomedical Sciences, Pew Charitable Trusts (1998-2002)
- Rita Allen Foundation Scholars Award, Rita Allen Foundation (2002-2004)
- Fellow, American Association for the Advancement of Science (2014)
- Catherine R. Kennedy and Daniel L. Grossman Fellow in Human Biology, Stanford University (2014-Present)
- Award for Excellence in Faculty Advising in Human Biology, Stanford University (2017)

PROFESSIONAL EDUCATION

- Ph.D., Stanford University , Biochemistry (1993)
- B.S., University of Florida , Microbiology (1987)

LINKS

- Talbot Lab Site: http://talbotlab.stanford.edu/

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Our research focuses on the development and function of glial cells in the vertebrate nervous system. Glia are non-neuronal cells with many essential functions, ranging from forming the myelin sheath to defending the brain against infection.

One of our goals is to use genetic approaches in zebrafish to discover new genes with essential functions in the glial cells that form the myelin sheath, which allows for rapid axonal conduction in vertebrates. Disruption of myelin underlies important human diseases, including Multiple Sclerosis and peripheral neuropathies. The

formation of myelin, which involves reciprocal signaling between neurons and glial cells, a dramatic morphological transformation of the glial cells, and organization of the axon into different specialized domains, is fascinating but nonetheless poorly understood.

In genetic screens, we have identified mutations in more than 15 different genes that have specific functions in the development of myelinated axons. Among these are a novel G-protein coupled receptor that instructs Schwann cells to make myelin in peripheral nerves, receptors that control migration of glial cells along growing axons, a kinesin motor protein that is essential for mRNA localization and normal membrane compaction in myelinating oligodendrocytes, and a transcription factor that regulates the migration of the cells that form myelin in the brain and spinal cord.

Another goal of our research is to identify new genes that regulate microglia, which are specialized macrophages that are dedicated to the immune defense of the brain. Microglia also have critical roles in regulating synaptic connectivity and engulfing dead neurons to maintain homeostasis in the brain. Microglial dysfunction has been implicated a wide array of disorders, including autism and Alzheimer disease.

Starting with screens for mutants with abnormal microglia, we have identified novel genes regulate microglial development and function. Examples include a NOD-like receptor that suppresses inappropriate inflammation, a phosphate exporter that functions specifically in microglia and other tissue macrophages, and a regulator of lysosomal action that allows microglia to digest material that they engulf.

These projects provide new insights into glial cell development and function, generate new animal models of human disease, define pathways that may be disrupted in disease, and may provide new avenues toward therapies for diseases of glia.

Teaching

COURSES

2019-20

- Genetics, Evolution, and Ecology: HUMBIO 2A (Aut)
- Preparation & Practice: Law: BIOS 290 (Aut)
- Preparation & Practice: Management Consulting: BIOS 291 (Spr)
- Writing Graduate Research Fellowships: BIOS 271 (Aut)

2018-19

- Genetics, Evolution, and Ecology: HUMBIO 2A (Aut)
- Writing Graduate Research Fellowships: BIOS 271 (Aut)

2017-18

- Ethics, Science, and Society: BIOS 258 (Win)
- Genetics, Evolution, and Ecology: HUMBIO 2A (Aut)
- Mini Proposal Bootcamp: BIOS 266 (Spr)
- Writing Compelling Fellowships and Career Development Awards: BIOS 242 (Aut)
- Writing Graduate Research Fellowships: BIOS 271 (Aut)
- Zebrafish as a Vertebrate Model Organism: BIOS 272 (Aut)

2016-17

- Ethics, Science, and Society: BIOS 258 (Win, Sum)
- Genetics, Evolution, and Ecology: HUMBIO 2A (Aut)

- Interdisciplinary Drug Discovery: BIOS 250 (Aut)
- Writing Compelling Fellowships and Career Development Awards: BIOS 242 (Aut)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Heidi Chen, Trisha Chong, Ian Heller, Andrew Kennard, Garrett Kingman, Tawaun Lucas, Vy Nguyen, Amanda Papakyrikos, Julia Wucherpfennig

Postdoctoral Faculty Sponsor

Harini Iyer, Daniel Lysko, Mariapaola Sidoli

Doctoral Dissertation Advisor (AC)

Ellen Bouchard

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Developmental Biology (Phd Program)

Publications

PUBLICATIONS

- **The Lysosomal Transcription Factor TFEB Represses Myelination Downstream of the Rag-Ragulator Complex.** *Developmental cell*
  Meireles, A. M., Shen, K., Zoupi, L., Iyer, H., Bouchard, E. L., Williams, A., Talbot, W. S.
  2018; 47 (3): 319
- **An Anti-inflammatory NOD-like Receptor Is Required for Microglia Development** *CELL REPORTS*
  Shiau, C. E., Monk, K. R., Joo, W., Talbot, W. S.
  2013; 5 (5): 1342-1352
- **Gpr126 is essential for peripheral nerve development and myelination in mammals** *DEVELOPMENT*
  Monk, K. R., Oshima, K., Joers, S., Heller, S., Talbot, W. S.
  2011; 138 (13): 2673-2680
- **A G Protein-Coupled Receptor Is Essential for Schwann Cells to Initiate Myelination** *SCIENCE*
  Monk, K. R., Naylor, S. G., Glenn, T. D., Mercurio, S., Perlin, J. R., Dominguez, C., Moens, C. B., Talbot, W. S.
  2009; 325 (5946): 1402-1405
- **The Rag-Ragulator Complex Regulates Lysosome Function and Phagocytic Flux in Microglia.** *Cell reports*
  Shen, K., Sidik, H., Talbot, W. S.
  2016; 14 (3): 547-559
- **Mutations of GPR126 Are Responsible for Severe Arthrogryposis Multiplex Congenita** *AMERICAN JOURNAL OF HUMAN GENETICS*
  Ravenscroft, G., Nolent, F., Rajagopalan, S., Meireles, A. M., Paavola, K. J., Gaillard, D., Alanio, E., Buckland, M., Arbuckle, S., Krivanek, M., Maluenda, J., Pannell, S., Gooding, et al
  2015; 96 (6): 955-961
- **Glial Cell Development and Function in Zebrafish** *COLD SPRING HARBOR PERSPECTIVES IN BIOLOGY*
  Lyons, D. A., Talbot, W. S.
  2015; 7 (2)
- **Differential Requirement for irf8 in Formation of Embryonic and Adult Macrophages in Zebrafish.** *PloS one*
  Shiau, C. E., Kaufman, Z., Meireles, A. M., Talbot, W. S.
  2015; 10 (1)
- **The Phosphate Exporter xpr1b Is Required for Differentiation of Tissue-Resident Macrophages** *CELL REPORTS*
  Meireles, A. M., Shiau, C. E., Guenther, C. A., Sidik, H., Kingsley, D. M., Talbot, W. S.
  2014; 8 (6): 1659-1667

- **Type IV collagen is an activating ligand for the adhesion G protein-coupled receptor GPR126.** *Science signaling*
  Paavola, K. J., Sidik, H., Zuchero, J. B., Eckart, M., Talbot, W. S.
  2014; 7 (338): ra76-?
- **Glial cell development and function in zebrafish.** *Cold Spring Harbor perspectives in biology*
  Lyons, D. A., Talbot, W. S.
  2014; 7 (2)
- **Signals regulating myelination in peripheral nerves and the Schwann cell response to injury.** *Current opinion in neurobiology*
  Glenn, T. D., Talbot, W. S.
  2013; 23 (6): 1041-1048
- **Analysis of Gpr126 function defines distinct mechanisms controlling the initiation and maturation of myelin** *DEVELOPMENT*
  Glenn, T. D., Talbot, W. S.
  2013; 140 (15): 3167-3175
- **Mutation of sec63 in zebrafish causes defects in myelinated axons and liver pathology** *DISEASE MODELS & MECHANISMS*
  Monk, K. R., Voas, M. G., Franzini-Armstrong, C., Hakkinen, I. S., Talbot, W. S.
  2013; 6 (1): 135-145
- **Scube/You activity mediates release of dually lipid-modified Hedgehog signal in soluble form** *GENES & DEVELOPMENT*
  Creanga, A., Glenn, T. D., Mann, R. K., Saunders, A. M., Talbot, W. S., Beachy, P. A.
  2012; 26 (12): 1312-1325
- **Neuronal Neuregulin 1 type III directs Schwann cell migration** *DEVELOPMENT*
  Perlin, J. R., Lush, M. E., Stephens, W. Z., Piotrowski, T., Talbot, W. S.
  2011; 138 (21): 4639-4648
- **ErbB Signaling Has a Role in Radial Sorting Independent of Schwann Cell Number** *GLIA*
  Raphael, A. R., Lyons, D. A., Talbot, W. S.
  2011; 59 (7): 1047-1055
- **Schwann cells reposition a peripheral nerve to isolate it from postembryonic remodeling of its targets** *DEVELOPMENT*
  Raphael, A. R., Perlin, J. R., Talbot, W. S.
  2010; 137 (21): 3643-3649
- **Schwann Cells Inhibit Ectopic Clustering of Axonal Sodium Channels** *JOURNAL OF NEUROSCIENCE*
  Voas, M. G., Glenn, T. D., Raphael, A. R., Talbot, W. S.
  2009; 29 (46): 14408-14414
- **Genetic dissection of myellinated axons in zebrafish** *CURRENT OPINION IN NEUROBIOLOGY*
  Monk, K. R., Talbot, W. S.
  2009; 19 (5): 486-490
- **Kif1b is essential for mRNA localization in oligodendrocytes and development of myelinated axons** *NATURE GENETICS*
  Lyons, D. A., Naylor, S. G., Scholze, A., Talbot, W. S.
  2009; 41 (7): 854-U121
- **Axonal domains: Role for paranodal junction in node of Ranvier assembly** *CURRENT BIOLOGY*
  Lyons, D. A., Talbot, W. S.
  2008; 18 (18): R876-R879
- **KBP is essential for axonal structure, outgrowth and maintenance in zebrafish, providing insight into the cellular basis of Goldberg-Shprintzen syndrome** *DEVELOPMENT*
  Lyons, D. A., Naylor, S. G., Mercurio, S., Dominguez, C., Talbot, W. S.
  2008; 135 (3): 599-608
- **Zebrafish bmp4 functions during late gastrulation to specify ventroposterior cell fates** *DEVELOPMENTAL BIOLOGY*
  Stickney, H. L., Imai, Y., Draper, B., Moens, C., Talbot, W. S.
  2007; 310 (1): 71-84

- **Signals on the move: chemokine receptors and organogenesis in zebrafish.** *Science's STKE : signal transduction knowledge environment*
  Perlin, J. R., Talbot, W. S.
  2007; 2007 (400): pe45-?

- **Putting the glue in glia: Necls mediate Schwann cell-axon adhesion** *JOURNAL OF CELL BIOLOGY*
  Perlin, J. R., Talbot, W. S.
  2007; 178 (5): 721-723

- **alpha II-spectrin is essential for assembly of the nodes of Ranvier in myelinated axons** *CURRENT BIOLOGY*
  Voas, M. G., Lyons, D. A., Naylor, S. G., Arana, N., Rasband, M. N., Talbot, W. S.
  2007; 17 (6): 562-568

- **A genetic screen identifies genes essential for development of myelinated axons in zebrafish** *DEVELOPMENTAL BIOLOGY*
  Pogoda, H., Sternheim, N., Lyons, D. A., Diamond, B., Hawkins, T. A., Woods, I. G., Bhatt, D. H., Franzini-Armstrong, C., Dominguez, C., Arana, N., Jacobs, J., Nix, R., Fetcho, et al
  2006; 298 (1): 118-131

- **nsf is essential for organization of myelinated axons in zebrafish** *CURRENT BIOLOGY*
  Woods, I. G., Lyons, D. A., Voas, M. G., Pogoda, H. M., Talbot, W. S.
  2006; 16 (7): 636-648

- **The zebrafish gene map defines ancestral vertebrate chromosomes** *GENOME RESEARCH*
  Woods, I. G., Wilson, C., Friedlander, B., Chang, P., Reyes, D. K., Nix, R., Kelly, P. D., Chu, F., Postlethwait, J. H., Talbot, W. S.
  2005; 15 (9): 1307-1314

- **erbb3 and erbb2 are essential for Schwann cell migration and myelination in zebrafish** *CURRENT BIOLOGY*
  Lyons, D. A., Pogoda, H. M., Voas, M. G., Woods, I. G., Diamond, B., Nix, R., Arana, N., Jacobs, J., Talbot, W. S.
  2005; 15 (6): 513-524

- **The you gene encodes an EGF-CUB protein essential for hedgehog signaling in zebrafish** *PLOS BIOLOGY*
  Woods, I. G., Talbot, W. S.
  2005; 3 (3): 476-487

- **Molecular genetics of axis formation in zebrafish** *ANNUAL REVIEW OF GENETICS*
  Schier, A. F., Talbot, W. S.
  2005; 39: 561-613

- **The role of the zebrafish nodal-related genes squint and cyclops in patterning of mesendoderm** *DEVELOPMENT*
  Dougan, S. T., Warga, R. M., Kane, D. A., Schier, A. F., Talbot, W. S.
  2003; 130 (9): 1837-1851

- **fast1 is required for the development of dorsal axial structures in zebrafish** *CURRENT BIOLOGY*
  Sirotkin, H. I., GATES, M. A., Kelly, P. D., Schier, A. F., Talbot, W. S.
  2000; 10 (17): 1051-1054

- **Bozozok and squint act in parallel to specify dorsal mesoderm and anterior neuroectoderm in zebrafish** *DEVELOPMENT*
  Sirotkin, H. I., Dougan, S. T., Schier, A. F., Talbot, W. S.
  2000; 127 (12): 2583-2592

- **Analysis of chromosomal rearrangements induced by postmeiotic mutagenesis with ethylnitrosourea in zebrafish** *GENETICS*
  Imai, Y., Feldman, B., Schier, A. F., Talbot, W. S.
  2000; 155 (1): 261-272

- **Genetic linkage mapping of zebrafish genes and ESTs** *GENOME RESEARCH*
  Kelly, P. D., Chu, F., Woods, I. G., Ngo-Hazelett, P., Cardozo, T., Huang, H., Kimm, F., Liao, L. Y., Yan, Y. L., Zhou, Y. Y., Johnson, S. L., Abagyan, R., Schier, et al
  2000; 10 (4): 558-567

- **Zebrafish organizer development and germ-layer formation require nodal-related signals** *NATURE*
  Feldman, B., GATES, M. A., Egan, E. S., Dougan, S. T., Rennebeck, G., Sirotkin, H. I., Schier, A. F., Talbot, W. S.

1998; 395 (6698): 181-185