Stanford



Teresa Nicolson, PhD

Edward C. and Amy H. Sewall Professor

Otolaryngology (Head and Neck Surgery)

Bio

BIO

After receiving her B.S. in Biochemistry at Western Washington University, Teresa Nicolson was a graduate student in Dr. William Wickner's laboratory and received her Ph.D. in Biological Chemistry in 1995 from the University of California, Los Angeles. She then trained as a post-doctoral fellow in Dr. Christiane Nuesslein-Volhard's laboratory at the Max Planck Institute for Developmental Biology in Tuebingen, Germany. In 1999, Teresa became an independent Group Leader at the same institute. In 2003, she was appointed as an assistant professor to the Oregon Hearing Research Center (OHRC) at OHSU with a joint appointment in the Vollum Institute. She was promoted to associate professor in 2005 and professor in 2014. Teresa was an HHMI Investigator from 2005 to 2013. In 2019 she then joined the Research Division of Otolaryngology - Head & Neck Surgery as a professor at Stanford University.

ACADEMIC APPOINTMENTS

- Professor, Otolaryngology (Head and Neck Surgery)
- Member, Bio-X

HONORS AND AWARDS

- Howard Hughes Medical Institute Investigator, HHMI (2005-2013)
- Presidential Early Career Award for Scientists and Engineers, NIH (2004)
- Howard Hughes Medical Institute Biomedical Research Support Start Up Award, HHMI (2003)
- Ruth L. Kirschstein National Research Service Award, NIH (1993)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Scientific Advisory Committee, Usher Syndrome Society (2021 - present)
- Member, Neurosciences PhD Program Admissions Committee, Stanford University (2019 - present)
- Member, ARO Scientific Program Committee, Association for Research in Otolaryngology (2019 - 2021)
- Editorial board, Journal of Neurogenetics (2017 - present)
- Ad hoc reviewer, NHGRI Board of Scientific Counselors, NHGRI (2017 - 2017)
- Ad hoc reviewer, NIDCD Board of Scientific Counselors, NIDCD (2015 - 2019)
- Auditory System Study Section (AUD), member, NIDCD (2014 - 2018)
- Scientific advisory board, Graduate School of Neuroscience and Molecular Biosciences, University of Göttingen (2008 - 2016)
- Advisory board, Zebrafish Model Organism Database, Zebrafish Information Network (2006 - 2016)
- Ad hoc member, NIH study sections (AUD, ZIRG1-CB-Z, MNG), NIH (2005 - 2020)

- Editorial board, Journal for the Association for Research in Otolaryngology (2005 - 2008)

PROFESSIONAL EDUCATION

- Postdoctoral Fellow, Max Planck Institute for Developmental Biology , Genetics (2000)
- Ph.D., University of California, Los Angeles , Biological Chemistry (1995)
- B.S., Western Washington University , Biochemistry (1987)

LINKS

- Nicolson lab site: https://med.stanford.edu/ohns/research/labs/teresa-nicolson-lab.html
- ZFIN: https://zfin.org/ZDB-PERS-971209-49
- ResearchGate: https://www.researchgate.net/profile/Teresa_Nicolson
- Google Scholar: https://scholar.google.com/citations?user=8czT5DYAAAAJ

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Our aim is to understand the molecular basis of hearing and balance. We use zebrafish as our model system, which offers distinct advantages for imaging auditory/vestibular and lateral line hair cells in intact animals. Our experiments focus on the function of deafness genes isolated from forward genetic screens and developmental aspects of sensory hair-cell activity and synaptogenesis.

Teaching

COURSES

2024-25

- Cellular/Molecular Neuroscience Laboratory: NEPR 288 (Aut)

2023-24

- Cellullar/Molecular Neuroscience Laboratory: NEPR 288 (Aut)
- Neuroscience Journal Club and Professional Development Series: NEPR 280 (Aut, Win, Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Wagner Nors

Postdoctoral Faculty Sponsor

Zhi Feng, Peng Sun, Na Zhang

Publications

PUBLICATIONS

- **Inhibition of aberrant astrocyte activity restores auditory sensorimotor function in zebrafish spen mutants** *SCIENCE ADVANCES*
  Gao, Y., Shipman, A., Sun, P., Zhang, N., Smith, E. T., Pacentine, I., Nechiporuk, A., Nicolson, T.
  2026; 12 (46): eaeg8139
- **Defects in exosome biogenesis are associated with sensorimotor defects in zebrafish vps4a mutants.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Shipman, A., Gao, Y., Liu, D., Sun, S., Zang, J., Sun, P., Syed, Z., Bhagavathi, A., Smith, E., Erickson, T., Hill, M., Neuhauss, S., Sui, et al
  2024

- **Differential expression of mechanotransduction complex genes in auditory/vestibular hair cells in zebrafish.** *Frontiers in molecular neuroscience*
  Smith, E. T., Sun, P., Yu, S. K., Raible, D. W., Nicolson, T.
  2023; 16: 1274822
- **Transmembrane channel-like (Tmc) subunits contribute to frequency sensitivity in the zebrafish utricle.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Sun, P., Smith, E., Nicolson, T.
  2023
- **Sensory deficit screen identifies nsf mutation that differentially affects SNARE recycling and quality control.** *Cell reports*
  Gao, Y., Khan, Y. A., Mo, W., White, K. I., Perkins, M., Pfuetzner, R. A., Trapani, J. G., Brunger, A. T., Nicolson, T.
  2023; 42 (4): 112345
- **Putting the Pieces Together: the Hair Cell Transduction Complex.** *Journal of the Association for Research in Otolaryngology : JARO*
  Holt, J. R., Tobin, M., Elferich, J., Gouaux, E., Ballesteros, A., Yan, Z., Ahmed, Z. M., Nicolson, T.
  2021
- **Navigating Hereditary Hearing Loss: Pathology of the Inner Ear.** *Frontiers in cellular neuroscience*
  Nicolson, T.
  2021; 15: 660812
- **Disruption of tmc1/2a/2b genes in zebrafish reveals subunit requirements in subtypes of inner ear hair cells.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Smith, E. T., Pacentine, I., Shipman, A., Hill, M., Nicolson, T.
  2020
- **The lhfpl5 Ohnologs lhfpl5a and lhfpl5b Are Required for Mechanotransduction in Distinct Populations of Sensory Hair Cells in Zebrafish** *FRONTIERS IN MOLECULAR NEUROSCIENCE*
  Erickson, T., Pacentine, I. V., Venuto, A., Clemens, R., Nicolson, T.
  2020; 12: 320
- **Temporal Vestibular Deficits in synaptojanin 1 (synj1) Mutants.** *Frontiers in molecular neuroscience*
  Gao, Y., Nicolson, T.
  2020; 13: 604189
- **Subunits of the mechano-electrical transduction channel, Tmc1/2b, require Tmie to localize in zebrafish sensory hair cells** *PLOS GENETICS*
  Pacentine, I. V., Nicolson, T.
  2019; 15 (2): e1007635
- **Subunits of the mechano-electrical transduction channel, Tmc1/2b, require Tmie to localize in zebrafish sensory hair cells.** *PlosGenetics*
  Pacentine, I. V., Nicolson, T.
  2019
- **Zebrafish: from genes and neurons to circuits, behavior and disease.** *Journal of neurogenetics*
  Chandrasekhar, A., Guo, S., Masai, I., Nicolson, T., Wu, C. F.
  2017; 31 (3): 59-60
- **The genetics of hair-cell function in zebrafish.** *Journal of neurogenetics*
  Nicolson, T.
  2017; 31 (3): 102-112
- **Enlargement of Ribbons in Zebrafish Hair Cells Increases Calcium Currents But Disrupts Afferent Spontaneous Activity and Timing of Stimulus Onset.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Sheets, L., He, X. J., Olt, J., Schreck, M., Petralia, R. S., Wang, Y. X., Zhang, Q., Beirl, A., Nicolson, T., Marcotti, W., Trapani, J. G., Kindt, K. S.
  2017; 37 (26): 6299-6313
- **Integration of Tmc1/2 into the mechanotransduction complex in zebrafish hair cells is regulated by Transmembrane O-methyltransferase (Tomt).** *eLife*

Erickson, T., Morgan, C. P., Olt, J., Hardy, K., Busch-Nentwich, E., Maeda, R., Clemens, R., Krey, J. F., Nechiporuk, A., Barr-Gillespie, P. G., Marcotti, W., Nicolson, T.
2017; 6

- **Functional Analysis of the Transmembrane and Cytoplasmic Domains of Pcdh15a in Zebrafish Hair Cells.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Maeda, R., Pacentine, I. V., Erickson, T., Nicolson, T.
  2017; 37 (12): 3231-3245
- **Cell type-specific transcriptomic analysis by thiouracil tagging in zebrafish.** *Methods in cell biology*
  Erickson, T., Nicolson, T.
  2016; 135: 309-28
- **Dopamine Modulates the Activity of Sensory Hair Cells.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Toro, C., Trapani, J. G., Pacentine, I., Maeda, R., Sheets, L., Mo, W., Nicolson, T.
  2015; 35 (50): 16494-503
- **Ribbon synapses in zebrafish hair cells.** *Hearing research*
  Nicolson, T.
  2015; 330 (Pt B): 170-7
- **Identification of sensory hair-cell transcripts by thiouracil-tagging in zebrafish.** *BMC genomics*
  Erickson, T., Nicolson, T.
  2015; 16: 842
- **Characterization of Ribeye subunits in zebrafish hair cells reveals that exogenous Ribeye B-domain and CtBP1 localize to the basal ends of synaptic ribbons.** *PloS one*
  Sheets, L., Hagen, M. W., Nicolson, T.
  2014; 9 (9): e107256
- **Tip-link protein protocadherin 15 interacts with transmembrane channel-like proteins TMC1 and TMC2.** *Proceedings of the National Academy of Sciences of the United States of America*
  Maeda, R., Kindt, K. S., Mo, W., Morgan, C. P., Erickson, T., Zhao, H., Clemens-Grisham, R., Barr-Gillespie, P. G., Nicolson, T.
  2014; 111 (35): 12907-12
- **Mutations in ap1b1 cause mistargeting of the Na(+)/K(+)-ATPase pump in sensory hair cells.** *PloS one*
  Clemens Grisham, R., Kindt, K., Finger-Baier, K., Schmid, B., Nicolson, T.
  2013; 8 (4): e60866
- **Towards a Comprehensive Catalog of Zebrafish Behavior 1.0 and Beyond** *ZEBRAFISH*
  Kalueff, A. V., Gebhardt, M., Stewart, A. M., Cachat, J. M., Brimmer, M., Chawla, J. S., Craddock, C., Kyzar, E. J., Roth, A., Landsman, S., Gaikwad, S., Robinson, K., Baatrup, et al
  2013; 10 (1): 70-86
- **Presynaptic CaV1.3 channels regulate synaptic ribbon size and are required for synaptic maintenance in sensory hair cells.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Sheets, L., Kindt, K. S., Nicolson, T.
  2012; 32 (48): 17273-86
- **Rapid positional cloning of zebrafish mutations by linkage and homozygosity mapping using whole-genome sequencing.** *Development (Cambridge, England)*
  Obholzer, N., Swinburne, I. A., Schwab, E., Nechiporuk, A. V., Nicolson, T., Megason, S. G.
  2012; 139 (22): 4280-90
- **The Usher gene cadherin 23 is expressed in the zebrafish brain and a subset of retinal amacrine cells.** *Molecular vision*
  Glover, G., Mueller, K. P., Söllner, C., Neuhauss, S. C., Nicolson, T.
  2012; 18: 2309-22
- **Kinocilia mediate mechanosensitivity in developing zebrafish hair cells.** *Developmental cell*
  Kindt, K. S., Finch, G., Nicolson, T.
  2012; 23 (2): 329-41

- **Both pre- and postsynaptic activity of Nsf prevents degeneration of hair-cell synapses.** *PloS one*
  Mo, W., Nicolson, T.
  2011; 6 (11): e27146
- **Ribeye is required for presynaptic Ca(V)1.3a channel localization and afferent innervation of sensory hair cells.** *Development (Cambridge, England)*
  Sheets, L., Trapani, J. G., Mo, W., Obholzer, N., Nicolson, T.
  2011; 138 (7): 1309-19
- **Mechanism of spontaneous activity in afferent neurons of the zebrafish lateral-line organ.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Trapani, J. G., Nicolson, T.
  2011; 31 (5): 1614-23
- **Physiological recordings from zebrafish lateral-line hair cells and afferent neurons.** *Methods in cell biology*
  Trapani, J. G., Nicolson, T.
  2010; 100: 219-31
- **Quantification of vestibular-induced eye movements in zebrafish larvae.** *BMC neuroscience*
  Mo, W., Chen, F., Nechiporuk, A., Nicolson, T.
  2010; 11: 110
- **In vivo evidence for transdifferentiation of peripheral neurons.** *Development (Cambridge, England)*
  Wright, M. A., Mo, W., Nicolson, T., Ribera, A. B.
  2010; 137 (18): 3047-56
- **Synaptojanin1 is required for temporal fidelity of synaptic transmission in hair cells.** *PLoS genetics*
  Trapani, J. G., Obholzer, N., Mo, W., Brockerhoff, S. E., Nicolson, T.
  2009; 5 (5): e1000480
- **Vesicular glutamate transporter 3 is required for synaptic transmission in zebrafish hair cells.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Obholzer, N., Wolfson, S., Trapani, J. G., Mo, W., Nechiporuk, A., Busch-Nentwich, E., Seiler, C., Sidi, S., Söllner, C., Duncan, R. N., Boehland, A., Nicolson, T.
  2008; 28 (9): 2110-8
- **The genetics of hearing and balance in zebrafish.** *Annual review of genetics*
  Nicolson, T.
  2005; 39: 9-22
- **Mutated otopetrin 1 affects the genesis of otoliths and the localization of Starmaker in zebrafish.** *Development genes and evolution*
  Söllner, C., Schwarz, H., Geisler, R., Nicolson, T.
  2004; 214 (12): 582-90
- **Molecules and mechanisms of mechanotransduction** *34th Annual Meeting of the Society-for-Neuroscience*
  Goodman, M. B., Lumpkin, E. A., Ricci, A., Tracey, W. D., Kernan, M., Nicolson, T.
  SOC NEUROSCIENCE.2004: 9220–22
- **Myosin VI is required for structural integrity of the apical surface of sensory hair cells in zebrafish.** *Developmental biology*
  Seiler, C., Ben-David, O., Sidi, S., Hendrich, O., Rusch, A., Burnside, B., Avraham, K. B., Nicolson, T.
  2004; 272 (2): 328-38
- **Mutations in cadherin 23 affect tip links in zebrafish sensory hair cells.** *Nature*
  Söllner, C., Rauch, G. J., Siemens, J., Geisler, R., Schuster, S. C., Müller, U., Nicolson, T.
  2004; 428 (6986): 955-9
- **gemini encodes a zebrafish L-type calcium channel that localizes at sensory hair cell ribbon synapses.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
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  2004; 24 (17): 4213-23

- **Control of crystal size and lattice formation by starmaker in otolith biomineralization.** *Science (New York, N.Y.)*
  Söllner, C., Burghammer, M., Busch-Nentwich, E., Berger, J., Schwarz, H., Riekel, C., Nicolson, T.
  2003; 302 (5643): 282-6
- **NompC TRP channel required for vertebrate sensory hair cell mechanotransduction.** *Science (New York, N.Y.)*
  Sidi, S., Friedrich, R. W., Nicolson, T.
  2003; 301 (5629): 96-9
- **Mariner is defective in myosin VIIA: a zebrafish model for human hereditary deafness.** *Human molecular genetics*
  Ernest, S., Rauch, G. J., Haffter, P., Geisler, R., Petit, C., Nicolson, T.
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- **Defective calmodulin-dependent rapid apical endocytosis in zebrafish sensory hair cell mutants.** *Journal of neurobiology*
  Seiler, C., Nicolson, T.
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- **A radiation hybrid map of the zebrafish genome** *NATURE GENETICS*
  Geisler, R., Rauch, G. J., Baier, H., van Bebber, F., Bross, L., Dekens, M. P., Finger, K., Fricke, C., GATES, M. A., Geiger, H., Geiger-Rudolph, S., Gilmour, D., Glaser, et al
  1999; 23 (1): 86-89
- **Genetic analysis of vertebrate sensory hair cell mechanosensation: the zebrafish circler mutants.** *Neuron*
  Nicolson, T., Rüsch, A., Friedrich, R. W., Granato, M., Ruppersberg, J. P., Nüsslein-Volhard, C.
  1998; 20 (2): 271-83