Stanford

Thomas Clandinin

Shooter Family Professor

Neurobiology

Bio

ACADEMIC APPOINTMENTS

- Professor, Neurobiology
- Member, Bio-X
- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- Alfred P. Sloan Fellow, Sloan Foundation (2003)
- Searle Scholar, Searle Foundation (2003)
- Burroughs-Wellcome Career Development Award, Burroughs-Wellcome Foundation (2000)
- Fellow, Klingenstein Foundation (2005)
- Scholar, McKnight Foundation (2006)
- Pioneer Awardee, NIH (2007)

PROFESSIONAL EDUCATION

- B.Sc., University of Alberta , Genetics (1990)
- M.Sc., University of Calgary , Medical Genetics (1992)
- Ph.D., Caltech , Biology (1998)

LINKS

- Clandinin Lab: http://clandininlab.stanford.edu/

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My research program is focused on three central questions in neurobiology. How do neuronal circuits assemble during development? How are the functions of these circuits maintained during adult life? How do such circuits mediate the complex computations essential to animal behavior? Our work exploits the interplay between the cells and genes that underpin these processes to define new molecular mechanisms that control neuronal connection specificity, synapse maintenance, and to characterize the computational roles of specific circuits. The long term goal of our program is to understand how the genome programs neural circuits across adult life to implement the computations that underpin innate behavior, using the visual system of the fruit fly as a model.

Teaching

COURSES

2026-27

- Advanced Neurobiology: Food, Sex, and Gaming: BIO 154 (Spr)

2024-25

- Advanced Neurobiology: Food, Sex, and Gaming: BIO 154 (Spr)
- Cellular/Molecular Neuroscience Laboratory: NEPR 288 (Aut)

2023-24

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

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Benyamin Abramovich Krasa, Matthew Bauer, Zoe Cook, Youssef Faragalla, Leonardi Gozali, Josh Head, Elizabeth Jun, Neil Khosla, Balint Kurgyis, Max Madrzyk, Kyrus Mama, Lavonna Mark, . Moses, Javier Weddington

Postdoctoral Faculty Sponsor

Chung-ha Davis, Jacob Simon, David Tadres

Doctoral Dissertation Advisor (AC)

Minseung Choi, Lorna Jayne, Emma Theisen, Yandan Wang, Mikaela Wilson, Manze Zhang

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Neurosciences (PhD Program)

Publications

PUBLICATIONS

- **Fly Cell Atlas: A single-nucleus transcriptomic atlas of the adult fruit fly.** *Science (New York, N.Y.)*
  Li, H., Janssens, J., De Waegeneer, M., Kolluru, S. S., Davie, K., Gardeux, V., Saelens, W., David, F. P., Brbic, M., Spanier, K., Leskovec, J., McLaughlin, C. N., Xie, et al
  2022; 375 (6584): eabk2432
- **Mechanosensory input during circuit formation shapes Drosophila motor behavior through patterned spontaneous network activity.** *Current biology : CB*
  Carreira-Rosario, A., York, R. A., Choi, M., Doe, C. Q., Clandinin, T. R.
  2021
- **Coupling of activity, metabolism and behaviour across the Drosophila brain.** *Nature*
  Mann, K., Deny, S., Ganguli, S., Clandinin, T. R.
  2021
- **The connectome predicts resting-state functional connectivity across the Drosophila brain.** *Current biology : CB*
  Turner, M. H., Mann, K., Clandinin, T. R.
  2021
- **Neuroscience: Convergence of biological and artificial networks.** *Current biology : CB*
  Turner, M. H., Clandinin, T. R.
  2021; 31 (18): R1079-R1081

- **SPARC enables genetic manipulation of precise proportions of cells.** *Nature neuroscience*
  Isaacman-Beck, J., Paik, K. C., Wienecke, C. F., Yang, H. H., Fisher, Y. E., Wang, I. E., Ishida, I. G., Maimon, G., Wilson, R. I., Clandinin, T. R.
  2020
- **Drosophila Vision: An Eye for Change.** *Current biology : CB*
  Wienecke, C. F., Clandinin, T. R.
  2020; 30 (2): R66–R68
- **Transcriptional Feedback Links Lipid Synthesis to Synaptic Vesicle Pools in Drosophila Photoreceptors.** *Neuron*
  Tsai, J. W., Kostyleva, R., Chen, P., Rivas-Serna, I. M., Clandinin, M. T., Meinertzhagen, I. A., Clandinin, T. R.
  2019
- **Sequential Nonlinear Filtering of Local Motion Cues by Global Motion Circuits.** *Neuron*
  Barnhart, E. L., Wang, I. E., Wei, H., Desplan, C., Clandinin, T. R.
  2018
- **Linear Summation Underlies Direction Selectivity in Drosophila.** *Neuron*
  Wienecke, C. F., Leong, J. C., Clandinin, T. R.
  2018
- **Elementary Motion Detection in Drosophila: Algorithms and Mechanisms.** *Annual review of vision science*
  Yang, H. H., Clandinin, T. R.
  2018
- **Developmental Biology: Neurons That Divide Together Wire Together.** *Current biology : CB*
  Pang, M. M., Clandinin, T. R.
  2018; 28 (12): R715–R717
- **Ben Barres (1954-2017) Obituary** *NEURON*
  Liddelow, S. A., Eroglu, C., Clandinin, T. R.
  2018; 97 (6): 1211–13
- **Ben Barres (1954-2017).** *Neuron*
  Liddelow, S. A., Eroglu, C., Clandinin, T. R.
  2018; 97 (6): 1211-1213
- **Glia put visual map in sync.** *Science (New York, N.Y.)*
  Isaacman-Beck, J., Clandinin, T. R.
  2017; 357 (6354): 867-868
- **Whole-Brain Calcium Imaging Reveals an Intrinsic Functional Network in Drosophila.** *Current biology : CB*
  Mann, K., Gallen, C. L., Clandinin, T. R.
  2017; 27 (15): 2389-2396.e4
- **Dynamic structure of locomotor behavior in walking fruit flies** *ELIFE*
  Katsov, A. Y., Freifeld, L., Horowitz, M., Kuehn, S., Clandinin, T. R.
  2017; 6
- **How Does Familiarity Breed Contempt?** *Cell*
  Mann, K., Clandinin, T. R.
  2017; 169 (5): 775-776
- **.** *eLife*
  Fisher, Y. E., Yang, H. H., Isaacman-Beck, J., Xie, M., Gohl, D. M., Clandinin, T. R.
  2017; 6
- **FlpStop, a tool for conditional gene control in Drosophila** *ELIFE*
  Fisher, Y. E., Yang, H. H., Isaacman-Beck, J., Xie, M., Gohl, D. M., Clandinin, T. R.
  2017; 6

- **Fast two-photon imaging of subcellular voltage dynamics in neuronal tissue with genetically encoded indicators.** *eLife*
  Chamberland, S. n., Yang, H. H., Pan, M. M., Evans, S. W., Guan, S. n., Chavarha, M. n., Yang, Y. n., Salesse, C. n., Wu, H. n., Wu, J. C., Clandinin, T. R., Toth, K. n., Lin, et al
  2017; 6
- **Drosophila Connectomics: Mapping the Larval Eye's Mind.** *Current biology : CB*
  Friedrich-Reed Wienecke, C. n., Clandinin, T. R.
  2017; 27 (21): R1161–R1163
- **Editorial overview: Microcircuit evolution and computation 2016.** *Current opinion in neurobiology*
  Clandinin, T. R., Marder, E.
  2016; 41: 188-190
- **The Influence of Wiring Economy on Nervous System Evolution.** *Current biology*
  Wang, I. E., Clandinin, T. R.
  2016; 26 (20): R1101-R1108
- **Hedgehog signaling regulates gene expression in planarian glia.** *eLife*
  Wang, I. E., Lapan, S. W., Scimone, M. L., Clandinin, T. R., Reddien, P. W.
  2016; 5
- **Direction Selectivity in Drosophila Emerges from Preferred-Direction Enhancement and Null-Direction Suppression.** *journal of neuroscience*
  Leong, J. C., Esch, J. J., Poole, B., Ganguli, S., Clandinin, T. R.
  2016; 36 (31): 8078-8092
- **Subcellular Imaging of Voltage and Calcium Signals Reveals Neural Processing In Vivo** *CELL*
  Yang, H. H., St-Pierre, F., Sun, X., Ding, X., Lin, M. Z., Clandinin, T. R.
  2016; 166 (1): 245-257
- **Grabbing brain activity on the go.** *Proceedings of the National Academy of Sciences of the United States of America*
  Clandinin, T. R., Goodman, M. B.
  2016; 113 (8): 1965-7
- **Can You Hear Me Now?** *Neuron*
  Barnhart, E. L., Clandinin, T. R.
  2016; 89 (3): 425-427
- **A Class of Visual Neurons with Wide-Field Properties Is Required for Local Motion Detection** *CURRENT BIOLOGY*
  Fisher, Y. E., Leong, J. C., Sporar, K., Ketkar, M. D., Gohl, D. M., Clandinin, T. R., Silies, M.
  2015; 25 (24): 3178-3189
- **Orientation Selectivity Sharpens Motion Detection in Drosophila.** *Neuron*
  Fisher, Y. E., Silies, M., Clandinin, T. R.
  2015; 88 (2): 390-402
- **Neurons Rho to Get in Shape for the Day.** *Cell*
  Mann, K., Clandinin, T. R.
  2015; 162 (4): 699-700
- **A transcriptional reporter of intracellular Ca(2+) in Drosophila.** *Nature neuroscience*
  Gao, X. J., Riabinina, O., Li, J., Potter, C. J., Clandinin, T. R., Luo, L.
  2015; 18 (6): 917-925
- **A transcriptional reporter of intracellular Ca2+ in Drosophila** *NATURE NEUROSCIENCE*
  Gao, X. J., Riabinina, O., Li, J., Potter, C. J., Clandinin, T. R., Luo, L.
  2015; 18 (6): 917-U373
- **Neuroscience: Internal compass puts flies in their place.** *Nature*
  Clandinin, T. R., Giocomo, L. M.
  2015; 521 (7551): 165-166

- **Extremely Sparse Olfactory Inputs Are Sufficient to Mediate Innate Aversion in Drosophila** *PLOS ONE*
  Gao, X. J., Clandinin, T. R., Luo, L.
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- **Extremely sparse olfactory inputs are sufficient to mediate innate aversion in Drosophila.** *PloS one*
  Gao, X. J., Clandinin, T. R., Luo, L.
  2015; 10 (4)
- **A Drosophila Toolkit for the Visualization and Quantification of Viral Replication Launched from Transgenic Genomes** *PLOS ONE*
  Wernet, M. F., Klovstad, M., Clandinin, T. R.
  2014; 9 (11)
- **Differences in Neural Circuitry Guiding Behavioral Responses to Polarized light Presented to Either the Dorsal or Ventral Retina in Drosophila** *JOURNAL OF NEUROGENETICS*
  Velez, M. M., Gohl, D., Clandinin, T. R., Wernet, M. F.
  2014; 28 (3-4): 348-360
- **Differences in neural circuitry guiding behavioral responses to polarized light presented to either the dorsal or ventral retina in Drosophila.** *Journal of neurogenetics*
  Velez, M. M., Gohl, D., Clandinin, T. R., Wernet, M. F.
  2014; 28 (3-4): 348-360
- **Processing properties of ON and OFF pathways for Drosophila motion detection.** *Nature*
  Behnia, R., Clark, D. A., Carter, A. G., Clandinin, T. R., Desplan, C.
  2014; 512 (7515): 427-430
- **Identifying Functional Connections of the Inner Photoreceptors in Drosophila using Tango-Trace.** *Neuron*
  Jagadish, S., Barnea, G., Clandinin, T. R., Axel, R.
  2014; 83 (3): 630-644
- **Motion-detecting circuits in flies: coming into view.** *Annual review of neuroscience*
  Silies, M., Gohl, D. M., Clandinin, T. R.
  2014; 37: 307-327
- **Differential Adhesion Determines the Organization of Synaptic Fascicles in the Drosophila Visual System** *CURRENT BIOLOGY*
  Schwabe, T., Borycz, J. A., Meinertzhagen, I. A., Clandinin, T. R.
  2014; 24 (12): 1304-1313
- **Differential adhesion determines the organization of synaptic fascicles in the Drosophila visual system.** *Current biology*
  Schwabe, T., Borycz, J. A., Meinertzhagen, I. A., Clandinin, T. R.
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- **Walking Drosophila align with the e-vector of linearly polarized light through directed modulation of angular acceleration.** *Journal of comparative physiology. A, Neuroethology, sensory, neural, and behavioral physiology*
  Velez, M. M., Wernet, M. F., Clark, D. A., Clandinin, T. R.
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- **Vision: EM-erging motion-detecting circuits.** *Current biology*
  Silies, M., Clandinin, T. R.
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- **Large-scale mapping of transposable element insertion sites using digital encoding of sample identity.** *Genetics*
  Gohl, D. M., Freifeld, L., Silies, M., Hwa, J. J., Horowitz, M., Clandinin, T. R.
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- **Large-scale mapping of transposable element insertion sites using digital encoding of sample identity.** *Genetics*
  Gohl, D. M., Freifeld, L., Silies, M., Hwa, J. J., Horowitz, M., Clandinin, T. R.
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- **Generation of infectious virus particles from inducible transgenic genomes.** *Current biology : CB*

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- **Flies and humans share a motion estimation strategy that exploits natural scene statistics.** *Nature neuroscience*
  Clark, D. A., Fitzgerald, J. E., Ales, J. M., Gohl, D. M., Silies, M. A., Norcia, A. M., Clandinin, T. R.
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- **A Drosophila toolkit for the visualization and quantification of viral replication launched from transgenic genomes.** *PloS one*
  Wernet, M. F., Klovstad, M., Clandinin, T. R.
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- **What can fruit flies teach us about karate?** *eLife*
  Yang, H. H., Clandinin, T. R.
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- **A Network of Cadherin-Mediated Interactions Polarizes Growth Cones to Determine Targeting Specificity** *CELL*
  Schwabe, T., Neuert, H., Clandinin, T. R.
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- **Modular Use of Peripheral Input Channels Tunes Motion-Detecting Circuitry** *NEURON*
  Silies, M., Gohl, D. M., Fisher, Y. E., Freifeld, L., Clark, D. A., Clandinin, T. R.
  2013; 79 (1): 111-127
- **Specific Kinematics and Motor-Related Neurons for Aversive Chemotaxis in Drosophila** *CURRENT BIOLOGY*
  Gao, X. J., Potter, C. J., Gohl, D. M., Silies, M., Katsov, A. Y., Clandinin, T. R., Luo, L.
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- **GABAergic Lateral Interactions Tune the Early Stages of Visual Processing in Drosophila** *NEURON*
  Freifeld, L., Clark, D. A., Schnitzer, M. J., Horowitz, M. A., Clandinin, T. R.
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- **Mapping and cracking sensorimotor circuits in genetic model organisms.** *Neuron*
  Clark, D. A., Freifeld, L., Clandinin, T. R.
  2013; 78 (4): 583-595
- **Mapping and Cracking Sensorimotor Circuits in Genetic Model Organisms** *NEURON*
  Clark, D. A., Freifeld, L., Clandininz, T. R.
  2013; 78 (4): 583-595
- **Optogenetic Stimulation of Escape Behavior in Drosophila melanogaster** *JOVE-JOURNAL OF VISUALIZED EXPERIMENTS*
  de Vries, S. E., Clandinin, T.
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- **Apical-Basal Polarity Proteins Are Required Cell-Type Specifically to Direct Photoreceptor Morphogenesis** *CURRENT BIOLOGY*
  Hwa, J. J., Clandinin, T. R.
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- **Loom-Sensitive Neurons Link Computation to Action in the Drosophila Visual System** *CURRENT BIOLOGY*
  de Vries, S. E., Clandinin, T. R.
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- **Genetic Dissection Reveals Two Separate Retinal Substrates for Polarization Vision in Drosophila** *CURRENT BIOLOGY*
  Wernet, M. F., Velez, M. M., Clark, D. A., Baumann-Klausener, F., Brown, J. R., Klovstad, M., Labhart, T., Clandinin, T. R.
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- **The cytoskeletal regulator Genghis khan is required for columnar target specificity in the Drosophila visual system** *DEVELOPMENT*
  Gontang, A. C., Hwa, J. J., Mast, J. D., Schwabe, T., Clandinin, T. R.
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  Clark, D. A., Bursztyn, L., Horowitz, M. A., Schnitzer, M. J., Clandinin, T. R.
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- **A versatile in vivo system for directed dissection of gene expression patterns** *NATURE METHODS*
  Gohl, D. M., Silies, M. A., Gao, X. J., Bhalerao, S., Luongo, F. J., Lin, C., Potter, C. J., Clandinin, T. R.
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- **Making a visual map: mechanisms and molecules** *CURRENT OPINION IN NEUROBIOLOGY*
  Clandinin, T. R., Feldheim, D. A.
  2009; 19 (2): 174-180
- **More than just glue The diverse roles of cell adhesion molecules in the Drosophila nervous system** *CELL ADHESION & MIGRATION*
  Schwabe, T., Gontang, A. C., Clandinin, T. R.
  2009; 3 (1): 36-42
- **Reactive oxygen species act remotely to cause synapse loss in a Drosophila model of developmental mitochondrial encephalopathy** *DEVELOPMENT*
  Mast, J. D., Tomalty, K. M., Vogel, H., Clandinin, T. R.
  2008; 135 (15): 2669-2679
- **Motion processing streams in Drosophila are behaviorally specialized** *NEURON*
  Katsov, A. Y., Clandinin, T. R.
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- **Neural circuitry: Seeing the parts that make the picture** *CURRENT BIOLOGY*
  Velez, M. M., Clandinin, T. R.
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- **The cadherin flamingo mediates level-dependent interactions that guide photoreceptor target choice in Drosophila** *NEURON*
  Chen, P., Clandinin, T. R.
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- **The agrin/perlecan-related protein eyes shut is essential for epithelial lumen formation in the Drosophila retina** *DEVELOPMENTAL CELL*
  Husain, N., Pellikka, M., Hong, H., Klimentova, T., Choe, K., Clandinin, T. R., Tepass, U.
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- **Activity-independent prespecification of synaptic partners in the visual map of Drosophila** *CURRENT BIOLOGY*
  Hiesinger, P. R., Zhai, R. G., Zhou, Y., Koh, T., Mehta, S. Q., Schulze, K. L., Cao, Y., Verstreken, P., Clandinin, T. R., Fischbach, K., Meinertzhagen, I. A., Bellen, H. J.
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- **Liprin-alpha is required for photoreceptor target selection in Drosophila** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Choe, K., Prakash, S., Bright, A., Clandinin, T. R.
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- **Insect vision: Remembering the shape of things** *CURRENT BIOLOGY*
  Katsov, A., Clandinin, T. R.
  2006; 16 (10): R369-R371
- **The mechanisms and molecules that connect photoreceptor axons to their targets in Drosophila** *SEMINARS IN CELL & DEVELOPMENTAL BIOLOGY*

Mast, J. D., Prakash, S., Chen, P. L., Clandinin, T. R.
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- **An isoform-specific allele of Drosophila N-cadherin disrupts a late step of R7 targeting** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Nern, A., Nguyen, L. V., Herman, T., Prakash, S., Clandinin, T. R., Zipursky, S. L.
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- **Surprising twists to exocyst function** *NEURON*
  Clandinin, T. R.
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- **Drosophila N-cadherin mediates an attractive interaction between photoreceptor axons and their targets** *NATURE NEUROSCIENCE*
  Prakash, S., Caldwell, J. C., Eberl, D. F., Clandinin, T. R.
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- **Thinking about visual behavior; Learning about photoreceptor function** *CURRENT TOPICS IN DEVELOPMENTAL BIOLOGY, VOL 69*
  Choe, K. M., Clandinin, T. R.
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- **The protocadherin Flamingo is required for axon target selection in the Drosophila visual system** *NATURE NEUROSCIENCE*
  Lee, R. C., Clandinin, T. R., Lee, C. H., Chen, P. L., Meinertzhagen, I. A., Zipursky, S. L.
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- **Making connections in the fly visual system** *NEURON*
  Clandinin, T. R., Zipursky, S. L.
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  Clandinin, T. R., Lee, C. H., Herman, T., Lee, R. C., Yang, A. Y., Ovasapyan, S., Zipursky, S. L.
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- **N-cadherin regulates target specificity in the Drosophila visual system** *NEURON*
  Lee, C. H., Herman, T., Clandinin, T. R., LEE, R., Zipursky, S. L.
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- **Afferent growth cone interactions control synaptic specificity in the Drosophila visual system** *NEURON*
  Clandinin, T. R., Zipursky, S. L.
  2000; 28 (2): 427-436
- **Hedgehog and spitz: Making a match between photoreceptor axons and their targets** *CELL*
  Salecker, I., Clandinin, T. R., Zipursky, S. L.
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