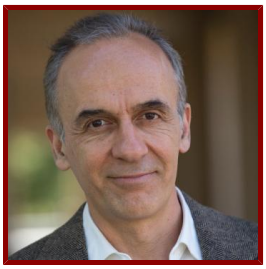
Stanford



E.J. Chichilnisky

John R. Adler Professor, Professor of Neurosurgery and of Ophthalmology and, by courtesy, of Electrical Engineering

Bio

BIO

E.J. Chichilnisky is the John R. Adler Professor of Neurosurgery, and Professor of Ophthalmology, at Stanford University, where he has worked since 2013. Previously, he worked at the Salk Institute for Biological Studies for 15 years. He received his B.A. in Mathematics from Princeton University, and his M.S. in mathematics and Ph.D. in neuroscience from Stanford University. His research has focused on understanding the spatiotemporal patterns of electrical activity in the retina that convey visual information to the brain, and their origins in retinal circuitry, using large-scale multi-electrode recordings. His ongoing work now focuses on using basic science knowledge along with electrical stimulation to develop a novel high-fidelity artificial retina for treating incurable blindness.

ACADEMIC APPOINTMENTS

- Professor, Neurosurgery
- Professor, Ophthalmology
- Professor (By courtesy), Electrical Engineering
- Member, Bio-X
- Member, Wu Tsai Human Performance Alliance
- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- Stein Innovation Award, Research to Prevent Blindness (2018)
- Sayer Vision Research Award, Foundation for the National Institutes of Health (2014)
- John R. Adler Endowed Chair, Department of Neurosurgery, Stanford University (2014)
- Ralph & Becky O'Connor Endowed Chair, Salk Institute for Biological Studies (2012)
- McKnight Technological Innovation in Neuroscience Award, McKnight Foundation (2004)
- Basic Sciences Teaching Award, UCSD School of Medicine (2001)
- McKnight Scholar's Award, McKnight Foundation (2001)
- Alfred P. Sloan Foundation Research Fellowship, Alfred P. Sloan Foundation (2000)

PROFESSIONAL EDUCATION

- A.B., Princeton University , Mathematics (1985)
- M.Sc., Stanford University , Mathematics (1992)
- Ph.D., Stanford University , Neuroscience (1995)

PATENTS

- B. Murmann, D. Muratore, E.J. Chichilnisky, P. Tandon. "United States Patent 2020082081 Data-compressive sensor array", Leland Stanford Junior University, Apr 23, 2020
- G. Silva, M.L. Kraiche, G. Cauwenberghs, Y. Lo, W.R. Freeman, S. Ha, Jing Y, E.J. Chichilnisky. "United States Patent 10,603,493 Integrated nanowire array devices for detecting and/or applying electrical signals to tissue", University of California, San Diego, Oct 10, 2018
- E.J. Chichilnisky, Martin Greschner, Lauren Jepson. "United States Patent US9990861B2 Smart prosthesis for facilitating artificial vision using scene abstraction", Pixium Vision SA, May 28, 2014
- E.J. Chichilnisky, Lauren Jepson, Martin Greschner. "United States Patent US9452289B2 Method for identification of retinal cell types intrinsic properties", Pixium Vision SA, University of California, Salk Institute for Biological Studies, Mar 19, 2012
- Robert J. Greenberg, Matthew J. McMahon, Chris Sekirnjak, E. J. Chichilnisky. "United States Patent US8712538B2 Method and apparatus for visual neural stimulation", Second Sight Medical Products Inc, Salk Institute for Biological Studies, May 27, 2010

LINKS

- Lab Site: http://neurosurgery.stanford.edu/research/chichilnisky/
- Stanford Artificial Retina Project: http://artificial-retina.stanford.edu

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

The goal of our research is to develop an artificial retina -- an electronic implant that will restore vision to people blinded by retinal degeneration. We focus on a combination of basic and applied research to develop an implant that can reproduce the electrical signals that the retina normally transmits to the brain. To accomplish this goal, we work closely with collaborators in fields spanning neurophysiology, electrical engineering, materials science, retinal surgery, visual behavior, and computational neuroscience. This collaboration constitutes the Stanford Artificial Retina Project, funded in part by the Stanford Neurotechnology Initiative.

The design of the implant is based on knowledge acquired in our unique laboratory setting. We use large-scale multi-electrode recording from the retina to study normal light-evoked activity in hundreds of retinal ganglion cells of multiple types simultaneously, and then evoke similar patterns of activity by electrical stimulation. This approach provides a laboratory prototype for the artificial retina. We focus on several questions:

• what visual signals are transmitted by the diverse ganglion cell types to the brain?
• what computational models can accurately reproduce these diverse retinal signals?
• how can we precisely electrically stimulate retinal ganglion cells using an implant?
• how can retinal cell types be recognized and separately targeted by the implant?
• what are the constraints and algorithms for the electronic circuitry in the implant?
• how faithfully can the implant reproduce normal visual sensations in blind patients?

We anticipate that in addition to restoring vision, the artificial retina will allow us to transmit visual information to the brain in ways that are not possible with light stimulation, opening the door to visual augmentation -- creating visual sensations that were never before possible. It will also provide a unique and powerful research instrument for studying the diverse retinal pathways and how they contribute to vision. In the long run, our understanding of the retinal circuitry and how to interface to it effectively will be relevant for developing other interfaces to the brain – for treating disease, and for augmenting human capabilities.

PROJECTS

- retinal circuitry - Stanford University

- retinal prostheses - Stanford University

Teaching

COURSES

2024-25

- Experimental Immersion in Neuroscience: NSUR 249, STATS 249 (Aut)

2023-24

- Experimental Immersion in Neuroscience: NSUR 249, STATS 249 (Aut)
- NeuroTech Training Seminar: NSUR 239, STATS 242 (Aut)

2022-23

- Experimental Immersion in Neuroscience: NSUR 249, STATS 249 (Aut)
- NeuroTech Training Seminar: NSUR 239, STATS 242 (Aut)

STANFORD ADVISEES

Med Scholar Project Advisor

Leslie Ramos Cardenas

Doctoral Dissertation Reader (AC)

Amrith Lotlikar, Shreyas Muralidharan, Michael Sommeling

Postdoctoral Faculty Sponsor

Claire Baum, Aviv Sharon

Doctoral Dissertation Advisor (AC)

Madeline Hays, Bella Hofflich, AJ Phillips

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Neurosciences (Phd Program)

Publications

PUBLICATIONS

- **Leveraging current steering and the biophysics of spike generation for cellular-resolution electrical stimulation of neurons.** *Cell reports*
  Vasireddy, P. K., Vilkhu, R. S., Lotlikar, A., Brown, J. B., Phillips, A. J., Gogliettino, A. R., Hays, M. R., Baum, C., Kato, E. J., Sharon, A., Hottowy, P., Sher, A., Litke, et al
  2026; 45 (2): 116917
- **A Scalable 1024-Channel Ultra-Low-Power Spike Sorting Chip with Event-Driven Detection and Spatial Clustering.** *IEEE journal of solid-state circuits*
  Akhoundi, A., Yan, P., Landbrug, Y., Hays, M., Murmann, B., Chichilnisky, E. J., Muratore, D. G.
  2025; 60 (11): 3985-4001
- **A Scalable 1024-Channel Ultra-Low-Power Spike Sorting Chip With Event-Driven Detection and Spatial Clustering** *IEEE JOURNAL OF SOLID-STATE CIRCUITS*
  Akhoundi, A., Yan, P., Landbrug, Y., Hays, M., Murmann, B., Chichilnisky, E. J., Muratore, D. G.
  2025
- **A Framework for Compressive On-chip Action Potential Recording.** *IEEE transactions on bio-medical engineering*
  Yan, P., Muratore, D. G., Chichilnisky, E. J., Murmann, B., Weissman, T.

2025; PP

- **Cell-type specific repertoire of responses to natural scenes in primate retinal ganglion cells.** *Frontiers in cellular neuroscience*
  Kling, A., Brackbill, N., Rhoades, C., Gogliettino, A., Sher, A., Litke, A., Chichilnisky, E. J.
  2025; 19: 1600167

- **Decomposition of retinal ganglion cell electrical images for cell type and functional inference.** *Journal of neural engineering*
  Wu, E. G., Rudzite, A. M., Bohlen, M. O., Li, P. H., Kling, A., Cooler, S., Rhoades, C., Brackbill, N., Gogliettino, A. R., Shah, N. P., Madugula, S. S., Sher, A., Litke, et al
  2025

- **Unexpected ON-OFF Responses of Smooth Monostratified Ganglion Cells in the Primate Retina**
  Hofflich, B., Kling, A., Cooler, S., Raval, V., Rieke, F., Manookin, M. B., Sher, A., Litke, A., Chichilnisky, E. J.
  ASSOC RESEARCH VISION OPHTHALMOLOGY INC.2025

- **Ex vivo Model for Surgical Implantation and Functional Testing of Electronic Retinal Implants**
  Cardenas, L., Baum, C., Chichilnisky, E. J.
  ASSOC RESEARCH VISION OPHTHALMOLOGY INC.2025

- **Understanding responses to multi-electrode epiretinal stimulation using a biophysical model.** *Journal of neural engineering*
  Vilkhu, R., Vasireddy, P., Kish, K. E., Gogliettino, A. R., Lotlikar, A., Hottowy, P., Dabrowski, W., Sher, A., Litke, A. M., Mitra, S., Chichilnisky, E. J.
  2024

- **Direct-Print 3D Electrodes for Large-Scale, High-Density, and Customizable Neural Interfaces.** *Advanced science (Weinheim, Baden-Wurttemberg, Germany)*
  Wang, P., Wu, E. G., Uluşan, H., Zhao, E. T., Phillips, A. J., Kling, A., Hays, M. R., Vasireddy, P. K., Madugula, S., Vilkhu, R., Hierlemann, A., Hong, G., Chichilnisky, et al
  2024: e2408602

- **Precise control of neural activity using dynamically optimized electrical stimulation.** *eLife*
  Shah, N. P., Phillips, A. J., Madugula, S., Lotlikar, A., Gogliettino, A. R., Hays, M. R., Grosberg, L., Brown, J., Dusi, A., Tandon, P., Hottowy, P., Dabrowski, W., Sher, et al
  2024; 13

- **Fixational eye movements enhance the precision of visual information transmitted by the primate retina.** *Nature communications*
  Wu, E. G., Brackbill, N., Rhoades, C., Kling, A., Gogliettino, A. R., Shah, N. P., Sher, A., Litke, A. M., Simoncelli, E. P., Chichilnisky, E. J.
  2024; 15 (1): 7964

- **A 1024-Channel 268 nW/pixel 36×36 µm2/channel Data-Compressive Neural Recording IC for High-Bandwidth Brain-Computer Interfaces.** *IEEE journal of solid-state circuits*
  Jang, M., Hays, M., Yu, W. H., Lee, C., Caragiulo, P., Ramkaj, A., Wang, P., Phillips, A. J., Vitale, N., Tandon, P., Yan, P., Mak, P. I., Chae, et al
  2024; 59 (4): 1123-1136

- **A 1024-Channel 268-nW/Pixel 36 x 36 µm²/Channel Data-Compressive Neural Recording IC for High-Bandwidth Brain-Computer Interfaces** *IEEE JOURNAL OF SOLID-STATE CIRCUITS*
  Jang, M., Hays, M., Yu, W., Lee, C., Caragiulo, P., Ramkaj, A. T., Wang, P., Phillips, A. J., Vitale, N., Tandon, P., Yan, P., Mak, P., Chae, et al
  2023

- **Inferring light responses of primate retinal ganglion cells using intrinsic electrical signatures.** *Journal of neural engineering*
  Zaidi, M., Aggarwal, G., Shah, N. P., Karniol-Tambour, O., Goetz, G., Madugula, S. S., Gogliettino, A., Wu, E. G., Kling, A., Brackbill, N., Sher, A., Litke, A. M., Chichilnisky, et al
  2023

- **Data Compression Versus Signal Fidelity Tradeoff in Wired-OR Analog-to-Digital Compressive Arrays for Neural Recording.** *IEEE transactions on biomedical circuits and systems*
  Yan, P., Akhoundi, A., Shah, N. P., Tandon, P., Muratore, D. G., Chichilnisky, E. J., Murmann, B.
  2023; PP

- **Inference of Electrical Stimulation Sensitivity from Recorded Activity of Primate Retinal Ganglion Cells.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Madugula, S. S., Vilkhu, R., Shah, N. P., Grosberg, L. E., Kling, A., Gogliettino, A. R., Nguyen, H., Hottowy, P., Sher, A., Litke, A. M., Chichilnisky, E. J.

2023

- **High-fidelity reproduction of visual signals by electrical stimulation in the central primate retina.** *The Journal of neuroscience : the official journal of the Society for Neuroscience*
  Gogliettino, A. R., Madugula, S. S., Grosberg, L. E., Vilkhu, R. S., Brown, J., Nguyen, H., Kling, A., Hottowy, P., Dąbrowski, W., Sher, A., Litke, A. M., Chichilnisky, E. J.
  2023

- **Focal electrical stimulation of human retinal ganglion cells for vision restoration.** *Journal of neural engineering*
  Madugula, S. S., Gogliettino, A. R., Zaidi, M., Aggarwal, G., Kling, A., Shah, N. P., Brown, J. B., Vilkhu, R., Hays, M. R., Nguyen, H., Fan, V., Wu, E. G., Hottowy, et al
  2022; 19 (6)

- **An RF-Ultrasound Relay for Adaptive Wireless Powering Across Tissue Interfaces.** *IEEE journal of solid-state circuits*
  So, E., Yeon, P., Chichilnisky, E. J., Arbabian, A.
  2022; 57 (11): 3429-3441

- **An RF-Ultrasound Relay for Adaptive Wireless Powering Across Tissue Interfaces** *IEEE JOURNAL OF SOLID-STATE CIRCUITS*
  So, E., Yeon, P., Chichilnisky, E. J., Arbabian, A.
  2022

- **Maximum a posteriori natural scene reconstruction from retinal ganglion cells with deep denoiser priors**
  Wu, E. G., Brackbill, N., Sher, A., Litke, A. M., Simoncelli, E. P., Chichilnisky, E. J.
  edited by Koyejo, S., Mohamed, S., Agarwal, A., Belgrave, D., Cho, K., Oh, A.
  NEURAL INFORMATION PROCESSING SYSTEMS (NIPS).2022

- **Individual variability of neural computations in the primate retina.** *Neuron*
  Shah, N. P., Brackbill, N., Samarakoon, R., Rhoades, C., Kling, A., Sher, A., Litke, A., Singer, Y., Shlens, J., Chichilnisky, E. J.
  1800

- **Nonlinear Decoding of Natural Images From Large-Scale Primate Retinal Ganglion Recordings.** *Neural computation*
  Kim, Y. J., Brackbill, N., Batty, E., Lee, J., Mitelut, C., Tong, W., Chichilnisky, E. J., Paninski, L.
  2021; 33 (7): 1719-1750

- **Spatially Patterned Bi-electrode Epiretinal Stimulation for Axon Avoidance at Cellular Resolution.** *Journal of neural engineering*
  Vilkhu, R. S., Madugula, S. S., Grosberg, L. E., Gogliettino, A. R., Hottowy, P., Dabrowski, W., Sher, A., Litke, A. M., Mitra, S., Chichilnisky, E. J.
  2021

- **Automatic Identification of Axon Bundle Activation for Epiretinal Prosthesis** *IEEE TRANSACTIONS ON NEURAL SYSTEMS AND REHABILITATION ENGINEERING*
  Tandon, P., Bhaskhar, N., Shah, N., Madugula, S., Grosberg, L., Fan, V. H., Hottowy, P., Sher, A., Litke, A. M., Chichilnisky, E. J., Mitra, S.
  2021; 29: 2496-2502

- **Computational challenges and opportunities for a bi-directional artificial retina.** *Journal of neural engineering*
  Shah, N. P., Chichilnisky, E. J.
  2020; 17 (5): 055002

- **Inference of nonlinear receptive field subunits with spike-triggered clustering.** *eLife*
  Shah, N. P., Brackbill, N., Rhoades, C., Kling, A., Goetz, G., Litke, A. M., Sher, A., Simoncelli, E., Chichilnisky, E. J.
  2020; 9

- **Reconstruction of natural images from responses of primate retinal ganglion cells.** *eLife*
  Brackbill, N. n., Rhoades, C. n., Kling, A. n., Shah, N. P., Sher, A. n., Litke, A. M., Chichilnisky, E. J.
  2020; 9

- **Massively parallel microwire arrays integrated with CMOS chips for neural recording.** *Science advances*
  Obaid, A. n., Hanna, M. E., Wu, Y. W., Kollo, M. n., Racz, R. n., Angle, M. R., Müller, J. n., Brackbill, N. n., Wray, W. n., Franke, F. n., Chichilnisky, E. J., Hierlemann, A. n., Ding, et al
  2020; 6 (12): eaay2789

- **A Data-Compressive Wired-OR Readout for Massively Parallel Neural Recording**

Muratore, D., Tandon, P., Wootters, M., Chichilnisky, E. J., Mitra, S., Murmann, B.
IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC.2019: 1128–40

- **Unusual Physiological Properties of Smooth Monostratified Ganglion Cell Types in Primate Retina.** *Neuron*
  Rhoades, C. E., Shah, N. P., Manookin, M. B., Brackbill, N., Kling, A., Goetz, G., Sher, A., Litke, A. M., Chichilnisky, E. J.
  2019
- **Simulation of visual perception and learning with a retinal prosthesis** *JOURNAL OF NEURAL ENGINEERING*
  Golden, J. R., Erickson-Davis, C., Cottaris, N. P., Parthasarathy, N., Rieke, F., Brainard, D. H., Wandell, B. A., Chichilnisky, E. J.
  2019; 16 (2)
- **Epiretinal stimulation with local returns enhances selectivity at cellular resolution** *JOURNAL OF NEURAL ENGINEERING*
  Fan, V. H., Grosberg, L. E., Madugula, S. S., Hottowy, P., Dabrowski, W., Sher, A., Litke, A. M., Chichilnisky, E. J.
  2019; 16 (2)
- **Probing Computation in the Primate Visual System at Single-Cone Resolution.** *Annual review of neuroscience*
  Kling, A., Field, G. D., Brainard, D. H., Chichilnisky, E. J.
  2019
- **Efficient characterization of electrically evoked responses for neural interfaces**
  Shah, N. P., Madugula, S., Hottowy, P., Sher, A., Litke, A., Paninski, L., Chichilnisky, E. J.
  edited by Wallach, H., Larochelle, H., Beygelzimer, A., d'Alche-Buc, F., Fox, E., Garnett, R.
  NEURAL INFORMATION PROCESSING SYSTEMS (NIPS).2019
- **Probing Computation in the Primate Visual System at Single-Cone Resolution** *ANNUAL REVIEW OF NEUROSCIENCE, VOL 42*
  Kling, A., Field, G. D., Brainard, D. H., Chichilnisky, E. J.
  edited by Roska, B., Zoghbi, H. Y.
  2019; 42: 169–86
- **Temporal resolution of single photon responses in primate rod photoreceptors and limits imposed by cellular noise.** *Journal of neurophysiology*
  Field, G. D., Uzzell, V., Chichilnisky, E. J., Rieke, F.
  2018
- **Simulation of visual perception and learning with a retinal prosthesis.** *Journal of neural engineering*
  Golden, J. R., Erickson-Davis, C., Cottaris, N. P., Parthasarathy, N., Rieke, F., Brainard, D., Wandell, B., Chichilnisky, E. J.
  2018
- **Epiretinal stimulation with local returns enhances selectivity at cellular resolution.** *Journal of neural engineering*
  Fan, V. H., Grosberg, L. E., Madugula, S. S., Hottowy, P., Dabrowski, W., Sher, A., Litke, A. M., Chichilnisky, E. J.
  2018
- **Pathway-Specific Asymmetries between ON and OFF Visual Signals** *JOURNAL OF NEUROSCIENCE*
  Ravi, S., Ahn, D., Greschner, M., Chichilnisky, E. J., Field, G. D.
  2018; 38 (45): 9728–40
- **Electrical stimulus artifact cancellation and neural spike detection on large multi-electrode arrays** *PLOS COMPUTATIONAL BIOLOGY*
  Mena, G. E., Grosberg, L. E., Madugula, S., Hottowy, P., Litke, A., Cunningham, J., Chichilnisky, E. J., Paninski, L.
  2017; 13 (11): e1005842
- **Activation of ganglion cells and axon bundles using epiretinal electrical stimulation.** *Journal of neurophysiology*
  Grosberg, L. E., Ganesan, K., Goetz, G. A., Madugula, S. S., Bhaskhar, N., Fan, V., Li, P., Hottowy, P., Dabrowski, W., Sher, A., Litke, A. M., Mitra, S., Chichilnisky, et al
  2017: jn 00750 2016-?
- **YASS: Yet Another Spike Sorter**
  Lee, J., Carlson, D., Shokri, H., Yao, W., Goetz, G., Hagen, E., Batty, E., Chichilnisky, E. J., Einevoll, G., Paninski, L.
  edited by Guyon, Luxburg, U. V., Bengio, S., Wallach, H., Fergus, R., Vishwanathan, S., Garnett, R.
  NEURAL INFORMATION PROCESSING SYSTEMS (NIPS).2017

- **Neural Networks for Efficient Bayesian Decoding of Natural Images from Retinal Neurons**
  Parthasarathy, N., Batty, E., Falcon, W., Rutten, T., Rajpal, M., Chichilnisky, E. J., Paninski, L.
  edited by Guyon, Luxburg, U. V., Bengio, S., Wallach, H., Fergus, R., Vishwanathan, S., Garnett, R.
  NEURAL INFORMATION PROCESSING SYSTEMS (NIPS).2017

- **Identification of a Retinal Circuit for Recurrent Suppression Using Indirect Electrical Imaging.** *Current biology*
  Greschner, M., Heitman, A. K., Field, G. D., Li, P. H., Ahn, D., Sher, A., Litke, A. M., Chichilnisky, E. J.
  2016; 26 (15): 1935-1942

- **Anatomical Identification of Extracellularly Recorded Cells in Large-Scale Multielectrode Recordings** *JOURNAL OF NEUROSCIENCE*
  Li, P. H., Gauthier, J. L., Schiff, M., Sher, A., Ahn, D., Field, G. D., Greschner, M., Callaway, E. M., Litke, A. M., Chichilnisky, E. J.
  2015; 35 (11): 4663-4675

- **Mapping nonlinear receptive field structure in primate retina at single cone resolution.** *eLife*
  Freeman, J., Field, G. D., Li, P. H., Greschner, M., Gunning, D. E., Mathieson, K., Sher, A., Litke, A. M., Paninski, L., Simoncelli, E. P., Chichilnisky, E. J.
  2015; 4

- **Recognizing retinal ganglion cells in the dark**
  Richard, E., Goetz, G., Chichilnisky, E. J.
  edited by Cortes, C., Lawrence, N. D., Lee, D. D., Sugiyama, M., Garnett, R.
  NEURAL INFORMATION PROCESSING SYSTEMS (NIPS).2015

- **High-fidelity reproduction of spatiotemporal visual signals for retinal prosthesis.** *Neuron*
  Jepson, L. H., Hottowy, P., Weiner, G. A., Dabrowski, W., Litke, A. M., Chichilnisky, E. J.
  2014; 83 (1): 87-92

- **Retinal Representation of the Elementary Visual Signal (vol 81, pg 130, 2014)** *NEURON*
  Li, P. H., Field, G. D., Greschner, M., Ahn, D., Gunning, D. E., Mathieson, K., Sher, A., Litke, A. M., Chichilnisky, E. J.
  2014; 82 (2): 500

- **Spatially patterned electrical stimulation to enhance resolution of retinal prostheses.** *journal of neuroscience*
  Jepson, L. H., Hottowy, P., Mathieson, K., Gunning, D. E., Dabrowski, W., Litke, A. M., Chichilnisky, E. J.
  2014; 34 (14): 4871-4881

- **A polyaxonal amacrine cell population in the primate retina.** *journal of neuroscience*
  Greschner, M., Field, G. D., Li, P. H., Schiff, M. L., Gauthier, J. L., Ahn, D., Sher, A., Litke, A. M., Chichilnisky, E. J.
  2014; 34 (10): 3597-3606

- **Retinal representation of the elementary visual signal.** *Neuron*
  Li, P. H., Field, G. D., Greschner, M., Ahn, D., Gunning, D. E., Mathieson, K., Sher, A., Litke, A. M., Chichilnisky, E. J.
  2014; 81 (1): 130-139

- **Inferring synaptic conductances from spike trains under a biophysically inspired point process model**
  Latimer, K. W., Chichilnisky, E. J., Rieke, F., Pillow, J. W.
  edited by Ghahramani, Z., Welling, M., Cortes, C., Lawrence, N. D., Weinberger, K. Q.
  NEURAL INFORMATION PROCESSING SYSTEMS (NIPS).2014

- **Focal Electrical Stimulation of Major Ganglion Cell Types in the Primate Retina for the Design of Visual Prostheses** *JOURNAL OF NEUROSCIENCE*
  Jepson, L. H., Hottowy, P., Mathieson, K., Gunning, D. E., Dabrowski, W., Litke, A. M., Chichilnisky, E. J.
  2013; 33 (17): 7194-7205

- **Efficient Coding of Spatial Information in the Primate Retina** *JOURNAL OF NEUROSCIENCE*
  Doi, E., Gauthier, J. L., Field, G. D., Shlens, J., Sher, A., Greschner, M., Machado, T. A., Jepson, L. H., Mathieson, K., Gunning, D. E., Litke, A. M., Paninski, L., Chichilnisky, et al
  2012; 32 (46): 16256-16264

- **Modeling the impact of common noise inputs on the network activity of retinal ganglion cells** *JOURNAL OF COMPUTATIONAL NEUROSCIENCE*

Vidne, M., Ahmadian, Y., Shlens, J., Pillow, J. W., Kulkarni, J., Litke, A. M., Chichilnisky, E. J., Simoncelli, E., Paninski, L.
2012; 33 (1): 97-121

- **Cone photoreceptor contributions to noise and correlations in the retinal output** *NATURE NEUROSCIENCE*
  Ala-Laurila, P., Greschner, M., Chichilnisky, E. J., Rieke, F.
  2011; 14 (10): 1309-U127
- **Changes in physiological properties of rat ganglion cells during retinal degeneration** *JOURNAL OF NEUROPHYSIOLOGY*
  Sekirnjak, C., Jepson, L. H., Hottowy, P., Sher, A., Dabrowski, W., Litke, A. M., Chichilnisky, E. J.
  2011; 105 (5): 2560-2571
- **Correlated firing among major ganglion cell types in primate retina** *JOURNAL OF PHYSIOLOGY-LONDON*
  Greschner, M., Shlens, J., Bakolitsa, C., Field, G. D., Gauthier, J. L., Jepson, L. H., Sher, A., Litke, A. M., Chichilnisky, E. J.
  2011; 589 (1): 75-86
- **Functional connectivity in the retina at the resolution of photoreceptors** *NATURE*
  Field, G. D., Gauthier, J. L., Sher, A., Greschner, M., Machado, T. A., Jepson, L. H., Shlens, J., Gunning, D. E., Mathieson, K., Dabrowski, W., Paninski, L., Litke, A. M., Chichilnisky, et al
  2010; 467 (7316): 673-U54
- **Receptive Field Mosaics of Retinal Ganglion Cells Are Established Without Visual Experience** *JOURNAL OF NEUROPHYSIOLOGY*
  Anishchenko, A., Greschner, M., Elstrott, J., Sher, A., Litke, A. M., Feller, M. B., Chichilnisky, E. J.
  2010; 103 (4): 1856-1864
- **Loss of Responses to Visual But Not Electrical Stimulation in Ganglion Cells of Rats With Severe Photoreceptor Degeneration** *JOURNAL OF NEUROPHYSIOLOGY*
  Sekirnjak, C., Hulse, C., Jepson, L. H., Hottowy, P., Sher, A., Dabrowski, W., Litke, A. M., Chichilnisky, E. J.
  2009; 102 (6): 3260-3269
- **High-sensitivity rod photoreceptor input to the blue-yellow color opponent pathway in macaque retina** *NATURE NEUROSCIENCE*
  Field, G. D., Greschner, M., Gauthier, J. L., Rangel, C., Shlens, J., Sher, A., Marshak, D. W., Litke, A. M., Chichilnisky, E. J.
  2009; 12 (9): 1159-U20
- **The Structure of Large-Scale Synchronized Firing in Primate Retina** *JOURNAL OF NEUROSCIENCE*
  Shlens, J., Field, G. D., Gauthier, J. L., Greschner, M., Sher, A., Litke, A. M., Chichilnisky, E. J.
  2009; 29 (15): 5022-5031
- **Uniform Signal Redundancy of Parasol and Midget Ganglion Cells in Primate Retina** *JOURNAL OF NEUROSCIENCE*
  Gauthier, J. L., Field, G. D., Sher, A., Shlens, J., Greschner, M., Litke, A. M., Chichilnisky, E. J.
  2009; 29 (14): 4675-4680
- **Receptive Fields in Primate Retina Are Coordinated to Sample Visual Space More Uniformly** *PLOS BIOLOGY*
  Gauthier, J. L., Field, G. D., Sher, A., Greschner, M., Shlens, J., Litke, A. M., Chichilnisky, E. J.
  2009; 7 (4): 747-755
- **Spatio-temporal correlations and visual signalling in a complete neuronal population** *NATURE*
  Pillow, J. W., Shlens, J., Paninski, L., Sher, A., Litke, A. M., Chichilnisky, E. J., Simoncelli, E. P.
  2008; 454 (7207): 995-U37
- **Synchronized firing in the retina** *CURRENT OPINION IN NEUROBIOLOGY*
  Shlens, J., Rieke, F., Chichilnisky, E. J.
  2008; 18 (4): 396-402
- **Direction selectivity in the retina is established independent of visual experience and cholinergic retinal waves** *NEURON*
  Elstrott, J., Anishchenko, A., Greschner, M., Sher, A., Litke, A. M., Chichilnisky, E. J., Feller, M. B.
  2008; 58 (4): 499-506
- **High-resolution electrical stimulation of primate retina for epiretinal implant design** *JOURNAL OF NEUROSCIENCE*
  Sekirnjak, C., Hottowy, P., Sher, A., Dabrowski, W., Litke, A. M., Chichilnisky, E. J.
  2008; 28 (17): 4446-4456

- **Spatial properties and functional organization of small bistratified ganglion cells in primate retina** *JOURNAL OF NEUROSCIENCE*
  Field, G. D., Sher, A., Gauthier, J. L., Greschner, M., Shlens, J., Litke, A. M., Chichilnisky, E. J.
  2007; 27 (48): 13261-13272

- **Identification and characterization of a Y-like primate retinal ganglion cell type** *JOURNAL OF NEUROSCIENCE*
  Petrusca, D., Grivich, M. I., Sher, A., Field, G. D., Gauthier, J. L., Greschner, M., Shlens, J., Chichilnisky, E. J., Litke, A. M.
  2007; 27 (41): 11019-11027

- **Cone inputs to simple and complex cells in V1 of awake macaque** *JOURNAL OF NEUROPHYSIOLOGY*
  Horwitz, G. D., Chichilnisky, E. J., Albright, T. D.
  2007; 97 (4): 3070-3081

- **Information processing in the primate retina: Circuitry and coding** *ANNUAL REVIEW OF NEUROSCIENCE*
  Field, G. D., Chichilnisky, E. J.
  2007; 30: 1-30

- **The structure of multi-neuron firing patterns in primate retina** *JOURNAL OF NEUROSCIENCE*
  Shlens, J., Field, G. D., Gauthier, J. L., Grivich, M. I., Petrusca, D., Sher, A., Litke, A. M., Chichilnisky, E. J.
  2006; 26 (32): 8254-8266

- **Fidelity of the ensemble code for visual motion in primate retina (vol 94, pg 119, 2005)** *JOURNAL OF NEUROPHYSIOLOGY*
  Frechette, E. S., Sher, A., Grivich, M., Petrusca, D., Litke, A. M., Chichilnisky, E. J.
  2006; 96 (2): 963

- **Electrical stimulation of mammalian retinal ganglion cells with multielectrode arrays** *JOURNAL OF NEUROPHYSIOLOGY*
  Sekirnjak, C., Hottowy, P., Sher, A., Dabrowski, W., Litke, A. M., Chichilnisky, E. J.
  2006; 95 (6): 3311-3327

- **Prediction and decoding of retinal ganglion cell responses with a probabilistic spiking model** *JOURNAL OF NEUROSCIENCE*
  Pillow, J. W., Paninski, L., Uzzell, V. J., Simoncelli, E. P., Chichilnisky, E. J.
  2005; 25 (47): 11003-11013

- **Fidelity of the ensemble code for visual motion in primate retina** *JOURNAL OF NEUROPHYSIOLOGY*
  Frechette, E. S., Sher, A., Grivich, M. I., Petrusca, D., Litke, A. M., Chichilnisky, E. J.
  2005; 94 (1): 119-135

- **Blue-yellow signals are enhanced by spatiotemporal luminance contrast in macaque V1** *JOURNAL OF NEUROPHYSIOLOGY*
  Horwitz, G. D., Chichilinisky, E. J., Albright, T. D.
  2005; 93 (4): 2263-2278

- **Detection sensitivity and temporal resolution of visual signals near absolute threshold in the salamander retina** *JOURNAL OF NEUROSCIENCE*
  Chichilnisky, E. J., Rieke, F.
  2005; 25 (2): 318-330

- **Precision of spike trains in primate retinal ganglion cells** *JOURNAL OF NEUROPHYSIOLOGY*
  Uzzell, V. J., Chichilnisky, E. J.
  2004; 92 (2): 780-789

- **What does the eye tell the brain?: Development of a system for the large-scale recording of retinal output activity** *IEEE-Nuclear-Science Symposium/Medical Imaging Conference*
  Litke, A. M., Bezayiff, N., Chichilnisky, E. J., Cunningham, W., Dabrowski, W., Grillo, A. A., Grivich, M., Grybos, P., Hottowy, P., Kachiguine, S., Kalmar, R. S., Mathieson, K., Petrusca, et al
  IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC.2004: 1434–40

- **What does the eye tell the brain?: Development of a system for the large scale recording of retinal output activity**
  Litke, A. A., Bezayiff, N., Chichilinsky, E. J., Cunningham, W., Dabrowski, W., Grillo, A. A., Grivich, M., Grybos, P., Hottowy, P., Kachiguine, S., Kalmar, R. S., Mathieson, K., Petrusca, et al
  edited by Metzler, S. D.
  IEEE.2004: 951-955

- **Temporal resolution of ensemble visual motion signals in primate retina** *JOURNAL OF NEUROSCIENCE*
  Chichilnisky, E. J., Kalmar, R. S.
  2003; 23 (17): 6681-6689
- **Functional asymmetries in ON and OFF ganglion cells of primate retina** *JOURNAL OF NEUROSCIENCE*
  Chichilnisky, E. J., Kalmar, R. S.
  2002; 22 (7): 2737-2747
- **Characterizing neural gain control using spike-triggered covariance** *15th Annual Conference on Neural Information Processing Systems (NIPS)*
  Schwartz, O., Chichilnisky, E. J., Simoncelli, E. P.
  M I T PRESS.2002: 269–276
- **Adaptation to temporal contrast in primate and salamander retina** *JOURNAL OF NEUROSCIENCE*
  Chander, D., Chichilnisky, E. J.
  2001; 21 (24): 9904-9916
- **A simple white noise analysis of neuronal light responses** *NETWORK-COMPUTATION IN NEURAL SYSTEMS*
  Chichilnisky, E. J.
  2001; 12 (2): 199-213
- **Receptive-field microstructure of blue-yellow ganglion cells in primate retina** *NATURE NEUROSCIENCE*
  Chichilnisky, E. J., Baylor, D. A.
  1999; 2 (10): 889-893
- **Trichromatic opponent color classification** *VISION RESEARCH*
  Chichilnisky, E. J., Wandell, B. A.
  1999; 39 (20): 3444-3458
- **Increment-decrement asymmetry in adaptation** *VISION RESEARCH*
  Chichilnisky, E. J., Wandell, B. A.
  1997; 37 (5): 616
- **Seeing gray through the ON and OFF pathways** *VISUAL NEUROSCIENCE*
  Chichilnisky, E. J., Wandell, B. A.
  1996; 13 (3): 591-596
- **PHOTORECEPTOR SENSITIVITY CHANGES EXPLAIN COLOR APPEARANCE SHIFTS INDUCED BY LARGE UNIFORM BACKGROUNDS IN DICHOPTIC MATCHING** *VISION RESEARCH*
  Chichilnisky, E. J., Wandell, B. A.
  1995; 35 (2): 239-254
- **FMRI OF HUMAN VISUAL-CORTEX** *NATURE*
  Engel, S. A., Rumelhart, D. E., Wandell, B. A., Lee, A. T., Glover, G. H., Chichilnisky, E. J., Shadlen, M. N.
  1994; 369 (6481): 525-525
- **CONE SENSITIVITY CHANGES EXPLAIN COLOR MATCHES UNDER DICHOPTIC CHROMATIC ADAPTATION**
  WANDELL, B. A., CHICHILNISKY, E. J.
  LIPPINCOTT-RAVEN PUBL.1994: 1836
- **FUNCTIONAL SEGREGATION OF COLOR AND MOTION PERCEPTION EXAMINED IN MOTION NULLING** *VISION RESEARCH*
  Chichilnisky, E. J., Heeger, D., Wandell, B. A.
  1993; 33 (15): 2113-2125
- **A MATHEMATICAL-MODEL OF PATTERN-FORMATION** *JOURNAL OF THEORETICAL BIOLOGY*
  CHICHILNISKY, E. J.
  1986; 123 (1): 81-101