

Curriculum Vitae

Anton S. Arkhipov

Associate Investigator
Allen Institute for Brain Science
615 Westlake Ave N, Seattle, WA 98109

Telephone: (206) 548-8414
Email: antona@alleninstitute.org

EDUCATION

- 2008 Ph.D. in Physics, University of Illinois at Urbana-Champaign, Urbana, IL.
 Thesis advisor: Dr. Klaus Schulten.
- 2004 M.S. in Physics, Moscow Institute of Physics and Technology, Dolgoprudny,
 Moscow Region, Russia. Thesis advisor: Dr. Yu. Lozovik.
- 2002 B.S. in Physics, Moscow Institute of Physics and Technology, Dolgoprudny,
 Moscow Region, Russia. Thesis advisor: Dr. Yu. Lozovik.

PROFESSIONAL EXPERIENCE

August 2017 – present: Associate Investigator, Allen Institute, Seattle, WA.

April 2013 – August 2017: Assistant Investigator, Allen Institute, Seattle, WA.

August 2009 – April 2013: Postdoctoral Fellow, D. E. Shaw Research, New York, NY.

January 2009 – August 2009: Postdoctoral Associate, Theoretical and Computational Biophysics Group, Beckman Institute, University of Illinois at Urbana-Champaign.

August 2004 – December 2008: Graduate Student, Theoretical and Computational Biophysics Group, Beckman Institute and Department of Physics, University of Illinois at Urbana-Champaign.

Fall 2000 – Summer 2004: Research Assistant, Institute of Spectroscopy, Russian Academy of Science, Troitsk, Moscow Region, Russia.

RESEARCH INTERESTS

Computational neuroscience; theoretical and computational biophysics; high-performance computing.

HONORS AND AWARDS

Jordan S. Asketh Fellowship (2008), Department of Physics, University of Illinois at Urbana-Champaign.

L. S. Edelheit Fellowship (2007-2008), Department of Physics, University of Illinois at Urbana-Champaign.

Dynasty Foundation Scholarship (2002-2004).

REVIEWER

Nature Communications

PNAS

Cell Reports

Cerebral Cortex

PLOS Computational Biology

Biophysical Journal

Neuroinformatics

Journal of Physical Chemistry

Chemical Physics Letters

Langmuir

Journal of Molecular Graphics and Modeling

PUBLICATIONS

* - denotes equal contribution

Google Scholar Profile: <https://scholar.google.com/citations?user=apMaQzQAAAAJ>

JOURNAL ARTICLES

47. Jim Berg, [...], **Anton Arkhipov**, [...], and Ed S. Lein. “Human cortical expansion involves diversification of supragranular intratelencephalically-projecting neurons.”

Nature. In press.

46. Joshua H. Siegle, [...], **Anton Arkhipov**, [...], and Christof Koch. “Survey of spiking in the mouse visual system reveals functional hierarchy.” *Nature* (2021).

<https://doi.org/10.1038/s41586-020-03171-x>

45. Rohan Gala, Agata Budzillo, Fahimeh Baftizadeh, Jeremy Miller, Nathan Gouwens, **Anton Arkhipov**, Gabe Murphy, Bosiljka Tasic, Hongkui Zeng, Michael Hawrylycz, and Uygur Sümbül. “Consistent cross-modal identification of cortical neurons with coupled autoencoders.” *Nature Computational Science* **1**: 120–127 (2021).

44. Kael Dai, Sergey L. Gratiy, Yazan N. Billeh, Richard Xu, Binghuang Cai, Nicholas Cain, Atle E. Rimehaug, Alexander J. Stasik, Gaute T. Einevoll, Stefan Mihalas, Christof Koch, and **Anton Arkhipov**. “Brain Modeling ToolKit: an Open Source Software Suite for Multiscale Modeling of Brain Circuits.” *PLoS Computational Biology* **16**: e1008386 (2020).

43. Nathan W. Gouwens, Staci A. Sorensen, [...], **Anton Arkhipov**, [...], Gabe J. Murphy, and Hongkui Zeng. “Integrated morphoelectric and transcriptomic classification of cortical GABAergic cells.” *Cell*, **183**: 935-953.e19 (2020).
42. Yazan N. Billeh, Binghuang Cai, Sergey L. Grati, Kael Dai, Ramakrishnan Iyer, Nathan W. Gouwens, Reza Abbasi-Asl, Xiaoxuan Jia, Joshua H. Siegle, Shawn R. Olsen, Christof Koch, Stefan Mihalas, and **Anton Arkhipov**. “Systematic integration of structural and functional data into multi-scale models of mouse primary visual cortex.” *Neuron*, **106**: 388-403.e18 (2020).
41. Kael Dai, Juan Hernando, Yazan N. Billeh, Sergey L. Gratiy, Judit Planas, Andrew P. Davison, Salvador Dura-Bernal, Pdraig Gleeson, Adrien Devresse, Benjamin K. Dichter, Michael Gevaert, James G. King, Werner A. H. Van Geit, Arseny V. Povolotsky, Eilif Muller, Jean-Denis Courcol, and **Anton Arkhipov**. “The SONATA data format for efficient description of large-scale network models.” *PLoS Computational Biology*, **16**, e1007696 (2020).
40. Nathan W. Gouwens*, Staci A. Sorensen*, Jim Berg*, Changkyu Lee, Tim Jarsky, Jonathan Ting, Susan M. Sunkin, David Feng, Costas Anastassiou, Eliza Barkan, Kris Bickley, Nicole Blesie, Thomas Braun, Krissy Brouner, Agata Budzillo, Shiella Caldejon, Tamara Casper, Dan Casteli, Peter Chong, Kirsten Crichton, Christine Cuhaciyon, Tanya L. Daigle, Rachel Dalley, Nick Dee, Tsega Desta, Song-Lin Ding, Samuel Dingman, Alyse Doperalski, Nadezhda Dotson, Tom Egdorf, Michael Fisher, Rebecca A. de Frates, Emma Garren, Marissa Garwood, Amanda Gary, Nathalie Gaudreault, Keith Godfrey, Melissa Gorham, Hong Gu, Caroline Habel, Kristen Hadley, James Harrington, Julie Harris, Alex Henry, DiJon Hill, Sam Josephsen, Sara Kebede, Lisa Kim, Matthew Kroll, Brian Lee, Tracy Lemon, Katherine E. Link, Xiaoxiao Liu,

Brian Long, Rusty Mann, Medea McGraw, Stefan Mihalas, Alice Mukora, Gabe J. Murphy, Lindsay Ng, Kiet Ngo, Thuc Nghi Nguyen, Philip R. Nicovich, Aaron Oldre, Daniel Park, Sheana Parry, Jed Perkins, Lydia Potekhina, David Reid, Miranda Robertson, David Sandman, Martin Schroedter, Cliff Slaughterbeck, Gilberto Soler-Llavina, Josef Sulc, Aaron Szafer, Bosiljka Tasic, Naz Taskin, Corinne Teeter, Nivretta Thatra, Herman Tung, Wayne Wakeman, Grace Williams, Rob Young, Zhi Zhou, Colin Farrell, Hanchuan Peng, Michael J. Hawrylycz, Ed Lein, Lydia Ng, **Anton Arkhipov**, Amy Bernard, John W. Phillips, Hongkui Zeng, and Christof Koch. “Classification of electrophysiological and morphological types in mouse visual cortex.” *Nature Neuroscience*, **22**: 1182–1195 (2019).

39. **Anton Arkhipov**, Nathan W. Gouwens, Yazan N. Billeh, Sergey Gratiy, Ramakrishnan Iyer, Ziqiang Wei, Zihao Xu, Reza Abbasi-Asl, Jim Berg, Michael Buice, Nicholas Cain, Nuno da Costa, Saskia de Vries, Daniel Denman, Severine Durand, David Feng, Tim Jarsky, Jerome Lecoq, Brian Lee, Lu Li, Stefan Mihalas, Gabriel K. Ocker, Shawn R. Olsen, R. Clay Reid, Gilberto Soler-Llavina, Staci A. Sorensen, Quanxin Wang, Jack Waters, Massimo Scanziani, and Christof Koch. “Visual physiology of the Layer 4 cortical circuit in silico.” *PLoS Comput. Biol.*, **14**: e1006535 (2018).

38. Sergey L. Gratiy, Yazan N. Billeh, Kael Dai, Catalin Mitelut, David Feng, Nathan W. Gouwens, Nicholas Cain, Christof Koch, Costas A. Anastassiou, and **Anton Arkhipov**. “BioNet: A Python interface to NEURON for modeling large-scale networks.” *PLoS ONE*, **13**: e0201630, 2018.

37. Nathan W. Gouwens, Jim Berg, David Feng, Staci A. Sorensen, Hongkui Zeng, Michael J. Hawrylycz, Christof Koch, and **Anton Arkhipov**. “Systematic generation of

biophysically detailed models for diverse cortical neuron types.” *Nature Communications*, **9**: 710, 2018.

36. Sarah Needham, Selene Roberts, **Anton Arkhipov**, Venkatesh Mysore, Christopher Tynan, Laura Zanetti-Domingues, Eric Kim, Valeria Losasso, Dimitrios Korovesis, Michael Hirsch, Daniel Rolfe, David Clarke, Martyn Winn, Alireza Lajevardipour, Andrew Clayton, Linda Pike, Michela Perani, Peter Parker, Yibing Shan, David Shaw, and Marisa Martin-Fernandez. “EGFR oligomerization organizes kinase-active dimers into competent signaling platforms.” *Nature Communications*, **7**: 13307, 2016.

35. Michael Hawrylycz, Costas Anastassiou, **Anton Arkhipov**, Jim Berg, Michael Buice, Nicholas Cain, Nathan W. Gouwens, Sergey Gratiy, Ramakrishnan Iyer, Jung Hoon Lee, Stefan Mihalas, Catalin Mitelut, Shawn Olsen, R. Clay Reid, Corinne Teeter, Saskia de Vries, Jack Waters, Hongkui Zeng, Christof Koch, and MindScope. “Inferring cortical function in the mouse visual system through large-scale systems neuroscience.” *PNAS*, **113**: 7337–7344, 2016.

34. **Anton Arkhipov**, Yibing Shan, Eric T. Kim, and David E. Shaw. “Membrane interaction of bound ligands contributes to the negative binding cooperativity of the EGF receptor.” *PLoS Comput. Biol.*, **10**: e1003742, 2014.

33. **Anton Arkhipov**, Yibing Shan, Eric T. Kim, Ron O. Dror, and David E. Shaw. “Her2 Activation Mechanism Reflects Evolutionary Preservation of Asymmetric Ectodomain Dimers in the Human EGFR Family.” *eLife*, **2**: e00708, 2013.

32. Yibing Shan, **Anton Arkhipov**, Eric T. Kim, Albert C. Pan, and David E. Shaw. “Transitions to Catalytically Inactive Conformations in EGFR Kinase.” *PNAS*, **110**: 7270–7275, 2013.
31. **Anton Arkhipov**, Yibing Shan, Rahul Das, Nicholas F. Endres, Michael P. Eastwood, David E. Wemmer, John Kuriyan, and David E. Shaw. “Architecture and membrane interactions of the EGF receptor.” *Cell*, **152**: 557-569, 2013.
30. Nicholas F. Endres, Rahul Das, Adam W. Smith, **Anton Arkhipov**, Erika Kovacs, Yongjian Huang, Jeffrey G. Pelton, Yibing Shan, David E. Shaw, David E. Wemmer, Jay T. Groves, and John Kuriyan. “Conformational coupling across the plasma membrane in activation of the EGF receptor.” *Cell*, **152**: 543-556, 2013.
29. Yibing Shan, Michael P. Eastwood, Xuewu Zhang, Eric T. Kim, **Anton Arkhipov**, Ron O. Dror, John Jumper, John Kuriyan, and David E. Shaw. “Oncogenic mutations counteract intrinsic disorder in the EGFR kinase and promote receptor dimerization.” *Cell*, **149**: 860-870, 2012.
(Preview: M. J. Eck and W. C. Hahn. “EGFR in limbo.” *Cell*, **149**: 735-737, 2012.)
28. Wouter H. Roos, Melissa M. Gibbons, **Anton Arkhipov**, Charlotte Uetrecht, Norman Watts, Paul Wingfield, Alasdair C. Steven, Albert J.R. Heck, Klaus Schulten, William S. Klug, and Gijs J.L. Wuite. “Squeezing protein shells: how continuum elastic models, molecular dynamics simulations and experiments coalesce at the nanoscale.” *Biophysical Journal*, **99**:1175-1181, 2010.

27. **Anton Arkhipov***, Ying Yin*, and Klaus Schulten. “Membrane-bending mechanism of amphiphysin N-BAR domains.” *Biophysical Journal*, **97**:2727-2735, 2009.
26. **Anton Arkhipov**, Wouter H. Roos, Gijs J. L. Wuite, and Klaus Schulten. “Elucidating the mechanism behind irreversible deformation of viral capsids.” *Biophysical Journal*, **97**:2061-2069, 2009.
25. Ying Yin*, **Anton Arkhipov***, and Klaus Schulten. “Simulations of membrane tubulation by lattices of amphiphysin N-BAR domains.” *Structure*, **17**:882-892, 2009.
24. **Anton Arkhipov** and Klaus Schulten. “Limits for reduction of effective focal volume in multiple-beam light microscopy.” *Optics Express*, **17**:2861-2870, 2009.
23. Jen Hsin, **Anton Arkhipov**, Ying Yin, John Stone, and Klaus Schulten. “Using VMD – and introductory tutorial.” *Current Protocols – Bioinformatics*, **5**:Unit 5.7, 2008.
22. **Anton Arkhipov***, Ying Yin*, and Klaus Schulten. “Four-scale description of membrane sculpting by BAR domains.” *Biophysical Journal*, **95**:2806-2821, 2008. (Perspective: M. L. Klein and W. Shinoda. “Large-scale molecular dynamics simulations of self-assembling systems.” *Science*, **321**: 798-800, 2008.)
21. **Anton Arkhipov**, Jana Hüve, Martin Kahms, Reiner Peters, and Klaus Schulten. “Continuous fluorescence microphotolysis and correlation spectroscopy using 4Pi microscopy.” *Biophysical Journal*, **93**:4006-4017, 2007.

20. Amy Y. Shih, **Anton Arkhipov**, Peter L. Freddolino, Stephen G. Sligar, and Klaus Schulten. “Assembly of lipids and proteins into lipoprotein particles.” *Journal of Physical Chemistry B*, **111**:11095-11104, 2007.
(Cover image for *Journal of Physical Chemistry B*, **111**, 38, 2007.)
19. Amy Y. Shih, Peter L. Freddolino, **Anton Arkhipov**, and Klaus Schulten. “Assembly of lipoprotein particles revealed by coarse-grained molecular dynamics simulations.” *Journal of Structural Biology*, **157**:579-592, 2007.
(Cover image for *Journal of Structural Biology*, **157**, 3, 2007.
News: C. Brodie. “Fat enough for two belts.” *American Scientist*, **95**, 2007.)
18. **Anton Arkhipov**, Peter L. Freddolino, and Klaus Schulten. “Stability and dynamics of virus capsids described by coarse-grained modeling.” *Structure*, **14**:1767-1777, 2006.
(Cover image for *Structure*, **14**, 12, 2006.)
17. **Anton Arkhipov***, Peter L. Freddolino*, Katsumi Imada, Keiichi Namba, and Klaus Schulten. “Coarse-grained molecular dynamics simulations of a rotating bacterial flagellum.” *Biophysical Journal*, **91**:4589-4597, 2006.
16. Jordi Cohen, **Anton Arkhipov**, Rosemary Braun, and Klaus Schulten. “Imaging the migration pathways for O₂, CO, NO, and Xe inside myoglobin.” *Biophysical Journal*, **91**:1844-1857, 2006.
15. Deyu Lu, Aleksei Aksimentiev, Amy Y. Shih, Eduardo Cruz-Chu, Peter L. Freddolino, **Anton Arkhipov**, and Klaus Schulten. “The role of molecular modeling in bionanotechnology.” *Physical Biology*, **3**:S40-S53, 2006.
(Cover image for *Physical Biology*, **3**, 1, 2006.)

14. Peter L. Freddolino*, **Anton Arkhipov***, Steven B. Larson, Alexander McPherson, and Klaus Schulten. “Molecular dynamics simulations of the complete satellite tobacco mosaic virus.” *Structure*, **14**:437-449, 2006.
(News: H. Pearson. “Supercomputer builds a virus.” *Nature News*, published online 14 March 2006.)
13. Amy Y. Shih, **Anton Arkhipov**, Peter L. Freddolino, and Klaus Schulten. “Coarse grained protein-lipid model with application to lipoprotein particles.” *Journal of Physical Chemistry B*, **110**:3674-3684, 2006.
12. **A. S. Arkhipov**, G. E. Astrakharchik, A. V. Belikov, and Y. E. Lozovik. “Ground-state properties of a one-dimensional system of dipoles.” *JETP Letters*, **82**:39-43, 2005.
11. **A. S. Arkhipov**, Yu. E. Lozovik, V. I. Man'ko, and V. A. Sharapov. “Center-of-mass tomography and probability representation of quantum states for tunneling.” *Theoretical and Mathematical Physics*, **142**:311-323, 2005.
10. **A. S. Arkhipov** and V. I. Manko. “Quantum transitions in the center-of-mass tomographic probability representation.” *Physical Review A*, **71**:012101, 2005.
9. **A. S. Arkhipov**, E. A. Burovski, and I. Ya. Polishchuk. “A self-consistent modeling of the leakage current through thin oxides.” *Proc. SPIE Int. Soc. Opt. Eng.*, **5401**:620-628, 2004.
8. **A. S. Arkhipov** and V. I. Man'ko. “Relativistic Systems and Their Evolution in Quantum Tomography.” *Journal of Russian Laser Research*, **25**:468-476, 2004.

7. **A. S. Arkhipov**, Yu. E. Lozovik, and V.I. Man'ko. "Center of mass tomography for reconstructing quantum states of multipartite systems." *Physics Letters A*, **328**:419-431, 2004.
6. Yu. E. Lozovik, V. A. Sharapov, and **A. S. Arkhipov**. "Simulation of tunneling in the quantum tomography approach." *Physical Review A*, **69**:022116, 2004.
5. **A. S. Arkhipov** and Yu. E. Lozovik. "Quantum tomography as a new approach to simulating quantum processes." *JETP*, **98**:231-239, 2004.
4. **A. S. Arkhipov** and Yu. E. Lozovik. "New method of quantum dynamics simulation based on the quantum tomography." *Physics Letters A*, **319**:217-224, 2003.
3. **A. S. Arkhipov**, Yu. E. Lozovik, and V. I. Man'ko. "Tomography for several particles with one random variable." *Journal of Russian Laser Research*, **24**:237-255, 2003.
2. Yu. E. Lozovik, A.V. Filinov, and **A. S. Arkhipov**. "Tunneling of interacting particles through the potential barriers: computer simulation by quantum molecular dynamics method." *Mathematical Modeling*, **15**:18-36, 2003 (in Russian).
1. Yu. E. Lozovik, A.V. Filinov, and **A. S. Arkhipov**. "Simulation of wave packet tunneling of interacting identical particles." *Physical Review E*, **67**:026707, 2003.

BOOK CHAPTERS

4. Ying Yin*, **Anton Arkhipov***, and Klaus Schulten. “Multi-scale simulations of membrane sculpting by N-BAR domains.” In *Molecular Simulations and Biomembranes: From Biophysics to Function*, chapter 6, pp. 146-176, ed. by Philip Biggin and Mark Sansom. Royal Society of Chemistry, 2010.

3. Peter L. Freddolino*, **Anton Arkhipov***, Amy Y. Shih, Ying Yin, Zhongzhou Chen, and Klaus Schulten. “Application of residue-based and shape-based coarse graining to biomolecular simulations.” In *Coarse-Graining of Condensed Phase and Biomolecular Systems*, chapter 20, pp. 299-315, ed. by Gregory A. Voth. Chapman and Hall/CRC Press, Taylor and Francis Group, 2008.

2. Amy Y. Shih, Peter L. Freddolino, **Anton Arkhipov**, Stephen G. Sligar, and Klaus Schulten. “Molecular modeling of the structural properties and formation of high-density lipoprotein particles.” In *Current Topics in Membranes: Computational Modeling of Membrane Bilayers*, chapter 11, pp. 313-342, ed. by Scott Feller. Elsevier, 2008.

1. Yu. E. Lozovik, A.V. Filinov, and **A. S. Arkhipov**. “Tunneling of interacting identical particles.” In *Progress in Nonequilibrium Greens functions*, volume 2, ed. by M. Bonitz. World Scientific, Singapore, 2003.