Edward S Boyden

List of Publications by Year
in descending order

149 papers	27,283 citations	15466 65 h-index	9311 143 g-index
188 all docs	188 docs citations	188 times ranked	26016 citing authors

#	Article	IF	Citations
1	Millisecond-timescale, genetically targeted optical control of neural activity. Nature Neuroscience, 2005, 8, 1263-1268.	7.1	4,110
2	Independent optical excitation of distinct neural populations. Nature Methods, 2014, 11, 338-346.	9.0	1,879
3	A toolbox of Cre-dependent optogenetic transgenic mice for light-induced activation and silencing. Nature Neuroscience, 2012, 15, 793-802.	7.1	1,153
4	Expansion microscopy. Science, 2015, 347, 543-548.	6.0	1,131
5	High-performance genetically targetable optical neural silencing by light-driven proton pumps. Nature, 2010, 463, 98-102.	13.7	1,075
6	Cell diversity and network dynamics in photosensitive human brain organoids. Nature, 2017, 545, 48-53.	13.7	933
7	Simultaneous whole-animal 3D imaging of neuronal activity using light-field microscopy. Nature Methods, 2014, 11, 727-730.	9.0	672
8	All-optical electrophysiology in mammalian neurons using engineered microbial rhodopsins. Nature Methods, 2014, 11, 825-833.	9.0	666
9	A Suite of Transgenic Driver and Reporter Mouse Lines with Enhanced Brain-Cell-Type Targeting and Functionality. Cell, 2018, 174, 465-480.e22.	13.5	571
10	Multiple-Color Optical Activation, Silencing, and Desynchronization of Neural Activity, with Single-Spike Temporal Resolution. PLoS ONE, 2007, 2, e299.	1.1	547
11	Noninvasive Deep Brain Stimulation via Temporally Interfering Electric Fields. Cell, 2017, 169, 1029-1041.e16.	13.5	536
12	Protein-retention expansion microscopy of cells and tissues labeled using standard fluorescent proteins and antibodies. Nature Biotechnology, 2016, 34, 987-992.	9.4	510
13	Noninvasive optical inhibition with a red-shifted microbial rhodopsin. Nature Neuroscience, 2014, 17, 1123-1129.	7.1	480
14	Millisecond-Timescale Optical Control of Neural Dynamics in the Nonhuman Primate Brain. Neuron, 2009, 62, 191-198.	3.8	460
15	Multi-sensory Gamma Stimulation Ameliorates Alzheimerâ€™s-Associated Pathology and Improves Cognition. Cell, 2019, 177, 256-271.e22.	13.5	423
16	A High-Light Sensitivity Optical Neural Silencer: Development and Application to Optogenetic Control of Non-Human Primate Cortex. Frontiers in Systems Neuroscience, 2011, 5, 18.	1.2	421
17	CEREBELLUM-DEPENDENT LEARNING: The Role of Multiple Plasticity Mechanisms. Annual Review of Neuroscience, 2004, 27, 581-609.	5.0	392
18	Imaging cellular ultrastructures using expansion microscopy (U-ExM). Nature Methods, 2019, 16, 71-74.	9.0	335

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19	Expansion microscopy: principles and uses in biological research. Nature Methods, 2019, 16, 33-41.	9.0	330
20	Nanotools for Neuroscience and Brain Activity Mapping. ACS Nano, 2013, 7, 1850-1866.	7.3	323
21	Nanoscale imaging of RNA with expansion microscopy. Nature Methods, 2016, 13, 679-684.	9.0	314
22	Immuno-SABER enables highly multiplexed and amplified protein imaging in tissues. Nature Biotechnology, 2019, 37, 1080-1090.	9.4	301
23	Iterative expansion microscopy. Nature Methods, 2017, 14, 593-599.	9.0	279
24	Cortical column and whole-brain imaging with molecular contrast and nanoscale resolution. Science, 2019, 363, .	6.0	277
25	A robotic multidimensional directed evolution approach applied to fluorescent voltage reporters. Nature Chemical Biology, 2018, 14, 352-360.	3.9	264
26	Virally delivered Channelrhodopsin-2 Safely and Effectively Restores Visual Function in Multiple Mouse Models of Blindness. Molecular Therapy, 2011, 19, 1220-1229.	3.7	261
27	Gamma Entrainment Binds Higher-Order Brain Regions and Offers Neuroprotection. Neuron, 2019, 102, 929-943.e8.	3.8	252
28	Optogenetic tools for analyzing the neural circuits of behavior. Trends in Cognitive Sciences, 2011, 15, 592-600.	4.0	246
29	Acute Optogenetic Silencing of Orexin/Hypocretin Neurons Induces Slow-Wave Sleep in Mice. Journal of Neuroscience, 2011, 31, 10529-10539.	1.7	235
30	Temporally precise single-cell-resolution optogenetics. Nature Neuroscience, 2017, 20, 1796-1806.	7.1	227
31	A wirelessly powered and controlled device for optical neural control of freely-behaving animals. Journal of Neural Engineering, 2011, 8, 046021.	1.8	222
32	Physical principles for scalable neural recording. Frontiers in Computational Neuroscience, 2013, 7, 137.	1.2	215
33	Automated whole-cell patch-clamp electrophysiology of neurons in vivo. Nature Methods, 2012, 9, 585-587.	9.0	214
34	Glyoxal as an alternative fixative to formaldehyde in immunostaining and superâ€resolution microscopy. EMBO Journal, 2018, 37, 139-159.	3.5	206
35	Expansion sequencing: Spatially precise in situ transcriptomics in intact biological systems. Science, 2021, 371, .	6.0	197
36	Optogenetic astrocyte activation modulates response selectivity of visual cortex neurons in vivo. Nature Communications, 2014, 5, 3262.	5.8	195

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37	Population imaging of neural activity in awake behaving mice. Nature, 2019, 574, 413-417.	13.7	190
38	Nanoscale imaging of clinical specimens using pathology-optimized expansion microscopy. Nature Biotechnology, 2017, 35, 757-764.	9.4	182
39	Autism genes converge on asynchronous development of shared neuron classes. Nature, 2022, 602, 268-273.	13.7	180
40	Three-dimensional multiwaveguide probe array for light delivery to distributed brain circuits. Optics Letters, 2012, 37, 4841.	1.7	171
41	A history of optogenetics: the development of tools for controlling brain circuits with light. F1000 Biology Reports, 2011, 3, 11.	4.0	169
42	Optogenetics and thermogenetics: technologies for controlling the activity of targeted cells within intact neural circuits. Current Opinion in Neurobiology, 2012, 22, 61-71.	2.0	168
43	Close-Packed Silicon Microelectrodes for Scalable Spatially Oversampled Neural Recording. IEEE Transactions on Biomedical Engineering, 2016, 63, 120-130.	2.5	168
44	Multiwaveguide implantable probe for light delivery to sets of distributed brain targets. Optics Letters, 2010, 35, 4133.	1.7	160
45	A genetically encoded near-infrared fluorescent calcium ion indicator. Nature Methods, 2019, 16, 171-174.	9.0	154
46	Optogenetic and pharmacological suppression of spatial clusters of face neurons reveal their causal role in face gender discrimination. Proceedings of the National Academy of Sciences of the United States of America, 2015, 112, 6730-6735.	3.3	143
47	In situ genome sequencing resolves DNA sequence and structure in intact biological samples. Science, 2021, 371, .	6.0	141
48	Optogenetics and the future of neuroscience. Nature Neuroscience, 2015, 18, 1200-1201.	7.1	140
49	Expansion Microscopy: Protocols for Imaging Proteins and RNA in Cells and Tissues. Current Protocols in Cell Biology, 2018, 80, e56.	2.3	136
50	Selective Engagement of Plasticity Mechanisms for Motor Memory Storage. Neuron, 2006, 51, 823-834.	3.8	130
51	Functional and topological diversity of LOV domain photoreceptors. Proceedings of the National Academy of Sciences of the United States of America, 2016, 113, E1442-51.	3.3	125
52	All-Optical Electrophysiology Reveals the Role of Lateral Inhibition in Sensory Processing in Cortical Layer 1. Cell, 2020, 180, 521-535.e18.	13.5	124
53	Optogenetic Mimicry of the Transient Activation of Dopamine Neurons by Natural Reward Is Sufficient for Operant Reinforcement. PLoS ONE, 2012, 7, e33612.	1.1	118
54	Rapid Sequential in Situ Multiplexing with DNA Exchange Imaging in Neuronal Cells and Tissues. Nano Letters, 2017, 17, 6131-6139.	4.5	116

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55	3D nanofabrication by volumetric deposition and controlled shrinkage of patterned scaffolds. Science, 2018, 362, 1281-1285.	6.0	116
56	Active Reversal of Motor Memories Reveals Rules Governing Memory Encoding. Neuron, 2003, 39, 1031-1042.	3.8	112
57	Striosomeâ€“dendron bouquets highlight a unique striatonigral circuit targeting dopamine-containing neurons. Proceedings of the National Academy of Sciences of the United States of America, 2016, 113, 11318-11323.	3.3	112
58	Principles of designing interpretable optogenetic behavior experiments. Learning and Memory, 2015, 22, 232-238.	0.5	110
59	Influenza virus exploits tunneling nanotubes for cell-to-cell spread. Scientific Reports, 2017, 7, 40360.	1.6	110
60	Emerging Trends in Micro- and Nanoscale Technologies in Medicine: From Basic Discoveries to Translation. ACS Nano, 2017, 11, 5195-5214.	7.3	104
61	Submillisecond Optogenetic Control of Neuronal Firing with Two-Photon Holographic Photoactivation of Chronos. Journal of Neuroscience, 2017, 37, 10679-10689.	1.7	100
62	Optogenetics and Translational Medicine. Science Translational Medicine, 2013, 5, 177ps5.	5.8	99
63	Toward the Second Generation of Optogenetic Tools. Journal of Neuroscience, 2010, 30, 14998-15004.	1.7	95
64	Precision Calcium Imaging of Dense Neural Populations via a Cell-Body-Targeted Calcium Indicator. Neuron, 2020, 107, 470-486.e11.	3.8	87
65	Light sheet theta microscopy for rapid high-resolution imaging of large biological samples. BMC Biology, 2018, 16, 57.	1.7	86
66	A gene-fusion strategy for stoichiometric and co-localized expression of light-gated membrane proteins. Nature Methods, 2011, 8, 1083-1088.	9.0	79
67	Modulation of nitrogen vacancy charge state and fluorescence in nanodiamonds using electrochemical potential. Proceedings of the National Academy of Sciences of the United States of America, 2016, 113, 3938-3943.	3.3	77
68	Expansion microscopy of zebrafish for neuroscience and developmental biology studies. Proceedings of the National Academy of Sciences of the United States of America, 2017, 114, E10799-E10808.	3.3	73
69	Wide-field three-photon excitation in biological samples. Light: Science and Applications, 2017, 6, e16255-e16255.	7.7	67
70	Multiplexed and high-throughput neuronal fluorescence imaging with diffusible probes. Nature Communications, 2019, 10, 4377.	5.8	63
71	Improved genetically encoded near-infrared fluorescent calcium ion indicators for in vivo imaging. PLoS Biology, 2020, 18, e3000965.	2.6	62
72	Expansion microscopy of C. elegans. ELife, 2020, 9, .	2.8	59

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73	Prosthetic systems for therapeutic optical activation and silencing of genetically targeted neurons. Proceedings of SPIE, 2008, 6854, 68540H.	0.8	57
74	Programmable RNA-binding protein composed of repeats of a single modular unit. Proceedings of the National Academy of Sciences of the United States of America, 2016, 113, E2579-88.	3.3	56
75	A fully genetically encoded protein architecture for optical control of peptide ligand concentration. Nature Communications, 2014, 5, 3019.	5.8	55
76	Measuring Cation Dependent DNA Polymerase Fidelity Landscapes by Deep Sequencing. PLoS ONE, 2012, 7, e43876.	1.1	54
77	Superior temporal resolution of Chronos versus channelrhodopsin-2 in an optogenetic model of the auditory brainstem implant. Hearing Research, 2015, 322, 235-241.	0.9	53
78	Assembly and operation of the autopatcher for automated intracellular neural recording in vivo. Nature Protocols, 2016, 11, 634-654.	5.5	53
79	Stress Enables Reinforcement-Elicited Serotonergic Consolidation of Fear Memory. Biological Psychiatry, 2016, 79, 814-822.	0.7	50
80	New observations in neuroscience using superresolution microscopy. Journal of Neuroscience, 2018, 38, 9459-9467.	1.7	50
81	Q&A: Expansion microscopy. BMC Biology, 2017, 15, 50.	1.7	49
82	Transient optogenetic inactivation of the medial entorhinal cortex biases the active population of hippocampal neurons. Hippocampus, 2016, 26, 246-260.	0.9	45
83	Closed-Loop Real-Time Imaging Enables Fully Automated Cell-Targeted Patch-Clamp Neural Recording InÂVivo. Neuron, 2017, 95, 1037-1047.e11.	3.8	45
84	Advances in the automation of whole-cell patch clamp technology. Journal of Neuroscience Methods, 2019, 326, 108357.	1.3	45
85	Hybrid Microscopy: Enabling Inexpensive High-Performance Imaging through Combined Physical and Optical Magnifications. Scientific Reports, 2016, 6, 22691.	1.6	44
86	Genetically encoded molecular tools for light-driven silencing of targeted neurons. Progress in Brain Research, 2012, 196, 49-61.	0.9	43
87	Expansion microscopy: development and neuroscience applications. Current Opinion in Neurobiology, 2018, 50, 56-63.	2.0	43
88	A highly homogeneous polymer composed of tetrahedron-like monomers for high-isotropy expansion microscopy. Nature Nanotechnology, 2021, 16, 698-707.	15.6	43
89	Sparse decomposition light-field microscopy for high speed imaging of neuronal activity. Optica, 2020, 7, 1457.	4.8	43
90	Hearing the light: neural and perceptual encoding of optogenetic stimulation in the central auditory pathway. Scientific Reports, 2015, 5, 10319.	1.6	42

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91	Near-Infrared Fluorescent Proteins Engineered from Bacterial Phytochromes in Neuroimaging. Biophysical Journal, 2017, 113, 2299-2309.	0.2	42
92	Multi-neuron intracellular recording in vivo via interacting autopatching robots. ELife, 2018, 7, .	2.8	40
93	Integrated Neurophotonics: Toward Dense Volumetric Interrogation of Brain Circuit Activityâ€"at Depth and in Real Time. Neuron, 2020, 108, 66-92.	3.8	40
94	Integration of autopatching with automated pipette and cell detection in vitro. Journal of Neurophysiology, 2016, 116, 1564-1578.	0.9	39
95	Barcoded oligonucleotides ligated on RNA amplified for multiplexed and parallel <i>in situ</i> analyses. Nucleic Acids Research, 2021, 49, e58-e58.	6.5	39
96	Spatial Multiplexing of Fluorescent Reporters for Imaging Signaling Network Dynamics. Cell, 2020, 183, 1682-1698.e24.	13.5	38
97	RNA timestamps identify the age of single molecules in RNA sequencing. Nature Biotechnology, 2021, 39, 320-325.	9.4	35
98	Novel Genetically Encoded Bright Positive Calcium Indicator NCaMP7 Based on the mNeonGreen Fluorescent Protein. International Journal of Molecular Sciences, 2020, 21, 1644.	1.8	33
99	PatcherBot: a single-cell electrophysiology robot for adherent cells and brain slices. Journal of Neural Engineering, 2019, 16, 046003.	1.8	32
100	Light microscopy based approach for mapping connectivity with molecular specificity. Nature Communications, 2020, 11, 4632.	5.8	32
101	Closed-loop, ultraprecise, automated craniotomies. Journal of Neurophysiology, 2015, 113, 3943-3953.	0.9	31
102	Expansion microscopy: enabling single cell analysis in intact biological systems. FEBS Journal, 2019, 286, 1482-1494.	2.2	31
103	Neuronal activity drives pathway-specific depolarization of peripheral astrocyte processes. Nature Neuroscience, 2022, 25, 607-616.	7.1	30
104	Translating Temporal Interference Brain Stimulation to Treat Neurological and Psychiatric Conditions. JAMA Neurology, 2018, 75, 1307.	4.5	29
105	Informational Lesions: Optical Perturbation of Spike Timing and Neural Synchrony Via Microbial Opsin Gene Fusions. Frontiers in Molecular Neuroscience, 2009, 2, 12.	1.4	28
106	Nanoscale imaging of clinical specimens using conventional and rapid-expansion pathology. Nature Protocols, 2020, 15, 1649-1672.	5.5	28
107	Silencing cortical activity during sound-localization training impairs auditory perceptual learning. Nature Communications, 2019, 10, 3075.	5.8	26
108	Autonomous patch-clamp robot for functional characterization of neurons in vivo: development and application to mouse visual cortex. Journal of Neurophysiology, 2019, 121, 2341-2357.	0.9	26

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109	Multidimensional screening yields channelrhodopsin variants having improved photocurrent and order-of-magnitude reductions in calcium and proton currents. Journal of Biological Chemistry, 2019, 294, 3806-3821.	1.6	25
110	Optogenetic stimulation of the cochlear nucleus using channelrhodopsin-2 evokes activity in the central auditory pathways. Brain Research, 2015, 1599, 44-56.	1.1	23
111	Restoration of breathing after opioid overdose and spinal cord injury using temporal interference stimulation. Communications Biology, 2021, 4, 107.	2.0	21
112	Large-scale voltage imaging in behaving mice using targeted illumination. IScience, 2021, 24, 103263.	1.9	21
113	Automated in vivo patch-clamp evaluation of extracellular multielectrode array spike recording capability. Journal of Neurophysiology, 2018, 120, 2182-2200.	0.9	19
114	Expansion Microscopy for Beginners: Visualizing Microtubules in Expanded Cultured HeLa Cells. Current Protocols in Neuroscience, 2020, 92, e96.	2.6	18
115	Tuning the Sensitivity of Genetically Encoded Fluorescent Potassium Indicators through Structure-Guided and Genome Mining Strategies. ACS Sensors, 2022, 7, 1336-1346.	4.0	17
116	A direct-to-drive neural data acquisition system. Frontiers in Neural Circuits, 2015, 9, 46.	1.4	16
117	Microchip amplifier for in vitro, in vivo, and automated whole cell patch-clamp recording. Journal of Neurophysiology, 2015, 113, 1275-1282.	0.9	16
118	Feasibility of 3D Reconstruction of Neural Morphology Using Expansion Microscopy and Barcode-Guided Agglomeration. Frontiers in Computational Neuroscience, 2017, 11, 97.	1.2	16
119	Tetra-gel enables superior accuracy in combined super-resolution imaging and expansion microscopy. Scientific Reports, 2021, 11, 16944.	1.6	16
120	Inhibition of LRRK2 kinase activity promotes anterograde axonal transport and presynaptic targeting of Î±-synuclein. Acta Neuropathologica Communications, 2021, 9, 180.	2.4	16
121	A theoretical analysis of single molecule protein sequencing via weak binding spectra. PLoS ONE, 2019, 14, e0212868.	1.1	15
122	Investigating the feasibility of channelrhodopsin variants for nanoscale optogenetics. Neurophotonics, 2019, 6, 1.	1.7	15
123	Processes for design, construction and utilisation of arrays of lightâ€emitting diodes and lightâ€emitting diodeâ€coupled optical fibres for multiâ€site brain light delivery. Journal of Engineering, 2015, 2015, 177-184.	0.6	11
124	Expansion mini-microscopy: An enabling alternative in point-of-care diagnostics. Current Opinion in Biomedical Engineering, 2017, 1, 45-53.	1.8	11
125	Inhibiting the Activity of CA1 Hippocampal Neurons Prevents the Recall of Contextual Fear Memory in Inducible ArchT Transgenic Mice. PLoS ONE, 2015, 10, e0130163.	1.1	11
126	Rapid directed molecular evolution of fluorescent proteins in mammalian cells. Protein Science, 2022, 31, 728-751.	3.1	11

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127	Synthetic Physiology. Methods in Enzymology, 2011, 497, 425-443.	0.4	10
128	Scalable Fluidic Injector Arrays for Viral Targeting of Intact 3-D Brain Circuits. Journal of Visualized Experiments, 2010, , .	0.2	8
129	<i>In vivo</i> robotics: the automation of neuroscience and other intactâ€system biological fields. Annals of the New York Academy of Sciences, 2013, 1305, 63-71.	1.8	8
130	Spatial information in large-scale neural recordings. Frontiers in Computational Neuroscience, 2014, 8, 172.	1.2	7
131	Towards optogenetic sensory replacement. , 2011, 2011, 3139-41.		6
132	Heterogeneous neural amplifier integration for scalable extracellular microelectrodes. , 2016, 2016, 2789-2793.		6
133	Evidence for Long-Timescale Patterns of Synaptic Inputs in CA1 of Awake Behaving Mice. Journal of Neuroscience, 2018, 38, 1821-1834.	1.7	6
134	Mesoscale-duration activated states gate spiking in response to fast rises in membrane voltage in the awake brain. Journal of Neurophysiology, 2017, 118, 1270-1291.	0.9	6
135	Abstract 4229: Physical expansion of tissue microarrays for high-resolution imaging of normal and cancer samples with conventional microscopy. , 2016, , .		6
136	Designing Tools for Assumption-Proof Brain Mapping. Neuron, 2014, 83, 1239-1241.	3.8	5
137	Optogenetics: using light to control the brain. Cerebrum: the Dana Forum on Brain Science, 2011, 2011, 16.	0.1	5
138	Sonofragmentation of Ultrathin 1D Nanomaterials. Particle and Particle Systems Characterization, 2017, 34, 1600339.	1.2	4
139	Scalable, Modular Three-Dimensional Silicon Microelectrode Assembly via Electroless Plating. Micromachines, 2018, 9, 436.	1.4	4
140	Multiplexed neural recording along a single optical fiber via optical reflectometry. Journal of Biomedical Optics, 2016, 21, 057003.	1.4	3
141	Large Volume, Behaviorally-relevant Illumination for Optogenetics in Non-human Primates. Journal of Visualized Experiments, 2017, , .	0.2	2
142	ExCel: Super-Resolution Imaging of C. elegans with Expansion Microscopy. Methods in Molecular Biology, 2022, 2468, 141-203.	0.4	2
143	Light-Activated Ion Pumps and Channels for Temporally Precise Optical Control of Activity in Genetically Targeted Neurons. Neuromethods, 2011, , 99-132.	0.2	1
144	Optogenetics: Molecular and Optical Tools for Controlling Life with Light. , 2013, , .		0

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145	Physical magnification of objects. Materials Horizons, 2019, 6, 11-13.	6.4	0
146	Architecting Discovery: A Model for How Engineers Can Help Invent Tools for Neuroscience. Neuron, 2019, 102, 523-525.	3.8	0
147	Optogenetics: Tools for Controlling Brain Cells with Light. Molecular Frontiers Journal, 2019, 03, 129-137.	0.9	0
148	Implosion Fabrication as a Platform for Three-Dimensional Nanophotonics. , 2021, , .		0
149	Abstract PD6-03: Spatio-molecular dissection of the breast cancer metastatic microenvironment. Cancer Research, 2022, 82, PD6-03-PD6-03.	0.4	0