

Botond Roska MD PhD
Bibliography

List of publications (selected, reverse chronological order)

Munz M, Bharioke A, Kosche G, Moreno-Juan V, Brignall A, Rodrigues TM, Graff-Meyer A, Ulmer T, Haeuselmann S, Pavlinic D, Ledergerber N, Gross-Scherf B, Rózsa B, Krol J, Picelli S, Cowan CS, Roska B. Pyramidal neurons form active, transient, multilayered circuits perturbed by autism-associated mutations at the inception of neocortex. *Cell.* 2023 Apr 27;186(9):1930-1949.e31.

Bharioke A, Munz M, Brignall A, Kosche G, Eizinger MF, Ledergerber N, Hillier D, Gross-Scherf B, Conzelmann KK, Macé E, Roska B. General anesthesia globally synchronizes activity selectively in layer 5 cortical pyramidal neurons. *Neuron.* 2022 Jun 15;110(12):2024-2040.e10.

Sahel JA, Boulanger-Scemama E, Pagot C, Arleo A, Galluppi F, Martel JN, Degli Esposti S, Delaux A, de Saint Aubert JB, de Montleau C, Gutman E, Audo I, Duebel J, Picaud S, Dalkara D, Blouin L, Taiel M, Roska B. Partial recovery of visual function in a blind patient after optogenetic therapy. *Nature Medicine.* 2021 Jul;27(7):1223-1229

Cowan CS, Renner M, De Gennaro M, Gross-Scherf B, Goldblum D, Hou Y, Munz M, Rodrigues TM, Krol J, Szikra T, Cuttat R, Waldt A, Papasaikas P, Diggemann R, Patino-Alvarez CP, Galliker P, Spirig SE, Pavlinic D, Gerber-Hollbach N, Schuierer S, Srđanović A, Balogh M, Panero R, Kusnyerik A, Szabo A, Stadler MB, Orgül S, Picelli S, Hasler PW, Hierlemann A, Scholl HPN, Roma G*, Nigsch F*, Roska B* Cell types of the human retina and its organoids at single-cell resolution (*shared corresponding authors). *Cell.* 2020 Sept 17; 182,6:1623-1640

Nelidova D, Morikawa RK, Cowan CS, Raics Z, Goldblum D, Scholl H, Szikra T, Szabo A, Hillier D*, Roska B* Restoring light sensitivity using tunable near-infrared sensors (*shared corresponding authors) *Science.* 2020 Jun 5;368(6495):1108-1113

Jüttner J, Szabo A, Gross-Scherf B, Morikawa R, Rompani S, Hantz P, Szikra T, Esposti E, Cowan C, Bharioke A, Patino-Alvarez C, Keles Ö, Kusnyerik A, Azoulay T, Hartl D, Krebs A, Schübeler D, Hajdu R, Lukats A, Nemeth J, Nagy Z, Wu KC, Wu RH, Xiang L, Fang XL, Jin ZB, Goldblum D, Hasler P, Scholl H, Krol J*, Roska B* Targeting neuronal and glial cell types with synthetic promoter AAVs in mice, non-human primates, and humans (*shared corresponding authors) *Nature Neuroscience* 2019 Aug; 22(8):1345-1356

Macé E, Montaldo G, Trenholm S, Cowan C, Brignall A, Urban, Roska B Whole-brain functional ultrasound imaging reveals brain modules for visuomotor integration. *Neuron.* 2018; 100(5):1241-1251

Drinnenberg A, Franke F, Morikawa RK, Jüttner J, Hillier D, Hantz P, Hierlemann A, da Silveira RA*, Roska B* How diverse retinal functions arise from feedback at the first visual synapse. (*shared corresponding authors) *Neuron.* 2018 Jul 11;99(1):117-134

Schubert R, Trenholm S, Balint K, Kosche G, Cowan CS, Mohr MA, Munz M, Martinez-Martin D, Fläschner G, Newton R, Krol J, Scherf BG, Yonehara K, Wertz A, Ponti A, Ghanem A, Hillier D, Conzelmann KK, Müller DJ*, Roska B*. Virus stamping for targeted single-cell infection in vitro and in vivo. (*shared corresponding authors) *Nature Biotechnology* 2018 Jan; 36(1):81-88

Daum JM, Keles Ö, Holwerda SJ, Kohler H, Rijli FM, Stadler M, Roska B. The formation of the light-sensing compartment of cone photoreceptors coincides with a transcriptional switch. *Elife.* 2017 Nov 6;6. pii: e31437.

Hillier D, Fiscella M, Drinnenberg A, Trenholm S, Rompani SB, Raics Z, Katona G, Juettner J, Hierlemann A, Rozsa B, Roska B. Causal evidence for retina-dependent and -independent visual motion computations in mouse cortex. *Nature Neuroscience* 2017 Jul; 20(7):960-968

Rompani SB, Müllner FE, Wanner A, Zhang C, Roth CN, Yonehara K, Roska B. (2017). Different Modes of Visual Integration in the Lateral Geniculate Nucleus Revealed by Single-Cell-Initiated Transsynaptic Tracing. *Neuron*. 2017 Feb 22; 93(4):767-776

Yonehara K, Fiscella M, Drinnenberg A, Esposti F, Trenholm S, Krol J, Franke F, Scherf BG, Kusnyerik A, Müller J, Szabo A, Jüttner J, Cordoba F, Reddy AP, Németh J, Nagy ZZ, Munier F, Hierlemann A, Roska B. Congenital Nystagmus Gene FRMD7 Is Necessary for Establishing a Neuronal Circuit Asymmetry for Direction Selectivity. *Neuron*. 2016 Jan 6; 89(1):177-93.

Wertz A, Trenholm S, Yonehara K, Hillier D, Raics D, Leinweber M, Szalay G, Ghanem A, Keller G, Rózsa B, Conzelmann KK, Roska B. Single-cell-initiated Monosynaptic Tracing Reveals Layer-specific Cortical Network Modules. *Science*. 2015; 349 (6243):70-4

Krol J, Krol I, Alvarez CP, Fiscella M, Hierlemann A, Roska B* and Filipowicz W*. A network comprising short and long noncoding RNAs and RNA helicase controls mouse retina architecture. (*shared corresponding authors) *Nature Communications* 2015 Jun 4; 6:7305.

Szikra T, Trenholm S, Drinnenberg A, Juettner J, Raics Z, Farrow K, Biel M, Awatramani G, Clark D, Sahel JA, da Silveira RA, Roska B. Rods in daylight act as relay cells for cone-driven horizontal cell-mediated surround inhibition to downstream visual circuits. *Nature Neuroscience*. 2014; 17(12):1728-35

Busskamp V, Krol J, Nelidova D, Daum J, Szikra T, Tsuda B, Juettner J, Farrow K, Gross Scherf B, Patino Alvarez CP, Genoud C, Sohilingam V, Tanimoto N, Stadler M, Seeliger M, Stoffel M, Filipowicz W*, Roska B* MiRNAs 182 and 183 are necessary to maintain adult cone photoreceptor outer segments and visual function (*shared corresponding authors) *Neuron*. 2014; 83(3):586-600

Yonehara K, Farrow K, Ghanem A, Hillier D, Balint K, Teixeira M, Jüttner J, Noda M, Neve R, Conzelmann KK, Roska B. The first stage of cardinal direction selectivity is localized to the dendrites of retinal ganglion cells. *Neuron*. 2013; 79(6):1078-85

Farrow K, Teixeira M, Szikra T, Juettner J, Viney JT, Balint K, Yonehara K, Roska B. Ambient illumination toggles a neuronal circuit switch in the retina and visual perception at cone threshold *Neuron*. 2013; 78, 1–14

Siegert S, Cabuy E, Gross Scherf B, Kohler H, Panda A, Le YZ, Fehling HJ, Gaidatzis DG, Stadler MB, Roska B. Transcriptional code and disease map for adult retinal cell types. *Nature Neuroscience*. 2012 Jan 22; 15(3):487-95

Yonehara K, Balint K, Noda M, Nagel G, Bamberg E, Roska B. Spatially asymmetric reorganization of inhibition establishes a motion-sensitive circuit. *Nature*. 2011; 469(7330):407-10

Busskamp V, Duebel J, Balya D, Fradot M, Viney TJ, Siegert S, Groner AC, Cabuy E, Forster V, Seeliger M, Biel M, Humphries P, Paques M, Mohand-Said S, Trono D, Deisseroth K, Sahel JA, Picaud S, Roska B. Genetic reactivation of cone photoreceptors restores visual responses in retinitis pigmentosa. *Science*. 2010; 329(5990):413-7.

Krol J, Busskamp V, Markiewicz I, Stadler MB, Ribi S, Duebel J, Oertner TO, Schübeler D, Schratt G, Fehling HJ, Richter J, Bibel M, Roska B* and Filipowicz W*. Characterizing light-regulated retinal microRNAs reveals rapid turnover as a common property of neuronal microRNAs. (*shared corresponding authors) *Cell*. 2010; 141(4):618-31.

Münch TA, da Silveira RA, Siegert S, Viney TJ, Awatramani GB, Roska B. Approach sensitivity in the retina processed by a multifunctional neural circuit. *Nature Neuroscience*. 2009 Oct; 12(10):1308-16.

Siegert S, Scherf BG, Del Punta K, Didkovsky N, Heintz N, Roska B. Genetic address book for retinal cell types. *Nature Neuroscience*. 2009 Sep; 12(9):1197-204.

Boldogkoi Z, Balint K, Awatramani GB, Balya D, Busskamp V, Viney TJ, Lagali PS, Duebel J, Pásti E, Tombácz D, Tóth JS, Takács IF, Scherf BG, Roska B. Genetically timed, activity-sensor and rainbow transsynaptic viral tools. *Nature Methods*. 2009 Feb; 6(2):127-30.

Lagali PS, Balya D, Awatramani GB, Münch TA, Kim DS, Busskamp V, Cepko CL, Roska B. Light-activated channels targeted to ON bipolar cells restore visual function in retinal degeneration. *Nature Neuroscience*. 2008 Jun; 11(6):667-75.

Viney TJ, Balint K, Hillier D, Siegert S, Boldogkoi Z, Enquist LW, Meister M, Cepko CL, Roska B. Local retinal circuits of melanopsin-containing ganglion cells identified by transsynaptic viral tracing. *Curr Biol*. 2007 Jun 5; 17(11):981-8.

Roska B, Molnar A, Werblin FS. Parallel processing in retinal ganglion cells: how integration of space-time patterns of excitation and inhibition form the spiking output. *J Neurophysiol*. 2006 Jun; 95(6):3810-22.

Roska B, Werblin F. Rapid global shifts in natural scenes block spiking in specific ganglion cell types. *Nature Neuroscience*. 2003 Jun; 6(6):600-8.

Roska B, Werblin F. Vertical interactions across ten parallel, stacked representations in the mammalian retina. *Nature*. 2001 Mar 29; 410(6828):583-7.

Roska B, Nemeth E, Orzo L, Werblin FS. Three levels of lateral inhibition: A space-time study of the retina of the tiger salamander. *J Neurosci*. 2000 Mar 1; 20(5):1941-51.

Roska B, Nemeth E, Werblin FS. Response to change is facilitated by a three-neuron disinhibitory pathway in the tiger salamander retina. *J Neurosci*. 1998 May 1; 18(9):3451-9.

Roska B, Gaal L, Werblin FS. Voltage-dependent uptake is a major determinant of glutamate concentration at the cone synapse: an analytical study. *J Neurophysiol*. 1998 Oct; 80(4):1951-60.

Contributing author publications

Judák L, Chiovini B, Juhász G, Pálfi D, Mezriczky Z, Szadai Z, Katona G, Szmola B, Ócsai K, Martinecz B, Mihály A, Dénes A, Kerekes B, Szepesi A, Szalay G, Ulbert I, Mucsi Z, Roska B, Rózsa B. Sharp-wave ripple doublets induce complex dendritic spikes in parvalbumin interneurons in vivo. *Nat Commun*. 2022 Nov; 13(1):6715.

Brunner C, Grillet M, Urban A, Roska B, Montaldo G, Macé E. Whole-brain functional ultrasound imaging in awake head-fixed mice. *Nat Protoc*. 2021 Jul; 16(7): 3547-3571.

Gaub BM, Kasuba KC, Mace E, Strittmatter T, Laskowski PR, Geissler SA, Hierlemann A, Fussenegger M, Roska B, Müller DJ. Neurons differentiate magnitude and location of mechanical stimuli. *Proc Natl Acad Sci U S A*. 2020 Jan 14; 117(2):848-856.

Voigt FF, Kirschenbaum D, Platonova E, Pagès S, Campbell RAA, Kastli R, Schaettin M, Egolf L, van der Bourg A, Bethge P, Haenraets K, Frézel N, Topilko T, Perin P, Hillier D, Hildebrand S, Schueth A, Roebroeck A, Roska B, Stoeckli ET, Pizzala R, Renier N, Zeilhofer HU, Karayannis T, Ziegler U, Batti L, Holtmaat A, Lüscher C, Aguzzi A, Helmchen F. The mesoSPIM initiative: open- source light-sheet microscopes for imaging cleared tissue. *Nat Methods*. 2019 Nov; 16(11):1105-1108.

Schubert, R., Herzog, S., Trenholm, S., Roska, B., & Müller, D. J. Magnetically guided virus stamping for the targeted infection of single cells or groups of cells. *Nature Protocols*. 2019; 14(11), 3205–3219.

Picaud S, Dalkara D, Marazova K, Goureau O, Roska B, Sahel JA. The primate model for understanding and restoring vision. *Proc Natl Acad Sci U S A*. 2019 Dec 23; 116(52):26280–7.

Alsteens D, Newton R, Schubert R, Martinez-Martin D, Delguste M, Roska B, Müller DJ. Nanomechanical mapping of first binding steps of a virus to animal cells. *Nature Nanotechnology*. 2017 Feb; 12(2):177-183.

Glangetas C, Massi L, Fois GR, Jalabert M, Girard D, Diana M, Yonehara K, Roska B, Xu C, Lüthi A, Caille S, Georges F. NMDA-receptor-dependent plasticity in the bed nucleus of the stria terminalis triggers long-term anxiolysis. *Nature Communications* 2017 Feb 20; 8:14456.

Hartl D, Krebs AR, Jüttner J, Roska B, Schübeler D. Cis-regulatory landscapes of four cell types of the retina. *Nucleic Acids Res.* 2017 Nov 16; 45(20):11607-11621.

Franke F, Fiscella M, Sevelev M, Roska B, Hierlemann A, da Silveira RA. Structures of Neural Correlation and How They Favor Coding. *Neuron*. 2016 Jan 20; 89(2):409-22.

Sorce B, Escobedo C, Toyoda Y, Stewart MP, Cattin CJ, Newton R, Banerjee I, Stettler A, Roska B, Eaton S, Hyman AA, Hierlemann A, Müller DJ. Mitotic cells contract actomyosin cortex and generate pressure to round against or escape epithelial confinement. *Nature Communication* 2015 Nov 25; 6:8872.

Fiscella M, Franke F, Farrow K, Müller J, Roska B, da Silveira RA, Hierlemann A. Visual coding with a population of direction-selective neurons. *Journal of Neurophysiology* 2015 Oct; 114(4):2485-99.

Zhang C, Rompani SB, Roska B, McCall MA. Adeno-associated virus-RNAi of GlyR α 1 and characterization of its synapse-specific inhibition in OFF alpha transient retinal ganglion cells. *Journal of Neurophysiology* 2014 Dec 15; 112(12):3125-37.

Cronin T, Vandenberghe LH, Hantz P, Juttner J, Reimann A, Kacsó AE, Huckfeldt RM, Busskamp V, Kohler H, Lagali PS, Roska B, Bennett J. Efficient transduction and optogenetic stimulation of retinal bipolar cells by a synthetic adeno-associated virus capsid and promoter. *EMBO Molecular Medicine* 2014 Aug 4; 6(9):1175-90.

Chuong AS, Miri ML, Busskamp V, Matthews GA, Acker LC, Sørensen AT, Young A, Klapoetke NC, Henninger MA, Kodandaramaiah SB, Ogawa M, Ramanlal SB, Bandler RC, Allen BD, Forest CR, Chow BY, Han X, Lin Y, Tye KM, Roska B, Cardin JA, Boyden ES. Noninvasive optical inhibition with a red-shifted microbial rhodopsin. *Nature Neuroscience* 2014 Aug; 17(8):1123-9.

Tang JC, Szikra T, Kozorovitskiy Y, Teixiera M, Sabatini BL, Roska B, Cepko CL. A nanobody-based system using fluorescent proteins as scaffolds for cell-specific gene manipulation. *Cell*. 2013 Aug 15; 154(4):928-39.

Sahel JA, Léveillard T, Picaud S, Dalkara D, Marazova K, Safran A, Paques M, Duebel J, Roska B, Mohand-Said S. Functional rescue of cone photoreceptors in retinitis pigmentosa. *Graefes Arch Clin Exp Ophthalmol*. 2013 Jul; 251(7):1669-77.

Di Meglio T, Kratochwil CF, Vilain N, Loche A, Vitobello A, Yonehara K, Hrycay SM, Roska B, Peters AH, Eichmann A, Wellik D, Ducret S, Rijli FM. Ezh2 orchestrates topographic migration and connectivity of mouse precerebellar neurons. *Science*. 2013 Jan 11; 339(6116):204-7.

Fiscella M, Farrow K, Jones IL, Jäckel D, Müller J, Frey U, Bakkum DJ, Hantz P, Roska B, Hierlemann A. Recording from defined populations of retinal ganglion cells using a high-density CMOS-integrated microelectrode array with real-time switchable electrode selection. *Journal of Neuroscience Methods*. 2012 Oct 15; 211(1):103-13.

Katona G, Szalay G, Maák P, Kaszás A, Veress M, Hillier D, Chiovini B, Vizi ES, Roska B, Rózsa B. Fast two-photon *in vivo* imaging with three-dimensional random-access scanning in large tissue volumes. *Nature Methods*. 2012 Jan 8; 9(2):201-8.

Fradot M, Busskamp V, Forster V, Cronin T, Léveillard T, Bennett J, Sahel JA, Roska B, Picaud S. Gene therapy in ophthalmology: validation on cultured retinal cells and explants from postmortem human eyes. *Human Gene Therapy*. 2011 May; 22(5):587-93.

Molnar A, Hsueh HA, Roska B, Werblin FS. Crossover inhibition in the retina: circuitry that compensates for nonlinear rectifying synaptic transmission. *Journal of Computational Neuroscience*. 2009 Dec; 27(3):569-90.

Roesch K, Jadhav AP, Trimarchi JM, Stadler MB, Roska B, Sun BB, Cepko CL. The transcriptome of retinal Müller glial cells. *Journal of Comparative Neurology*. 2008 Jul 10; 509(2):225-38.

Trimarchi JM, Stadler MB, Roska B, Billings N, Sun B, Bartz B, Cepko CL. Molecular heterogeneity of developing retinal ganglion and amacrine cells revealed through single cell gene expression profiling. *Journal of Comparative Neurology*. 2007 Jun 20; 502(6):1047-65.

Guerrero G, Siegel MS, Roska B, Loots E, Isacoff EY. Tuning FlaSh: redesign of the dynamics, voltage range, and color of the genetically encoded optical sensor of membrane potential. *Biophysical Journal*. 2002 Dec; 83(6): 3607-18.

Gaal L, Roska B, Picaud SA, Wu SM, Marc R, Werblin FS. Postsynaptic response kinetics are controlled by a glutamate transporter at cone photoreceptors. *Journal of Neurophysiology*. 1998 Jan; 79(1):190-6.

Reviews and previews

Sahel JA, Bennett J, Roska B. Depicting brighter possibilities for treating blindness. *Sci Transl Med*. 2019 May 29; 11(494).

Roska B. The first steps in vision: cell types, circuits, and repair. *EMBO Mol Med*. 2019 Mar; 11(3).

Roska B, Sahel JA. Restoring vision. *Nature*. 2018 May; 557(7705):359-367.

Scholl HP, Strauss RW, Singh MS, Dalkara D, Roska B, Picaud S, Sahel JA. Emerging therapies for inherited retinal degeneration. *Science Translational Medicine* 2016 Dec 7; 8(368):368rv6.

Yonehara K, Roska B. "MAPseq"-uencing Long-Range Neuronal Projections. *Neuron*. 2016 Sep 7; 91(5):945-7.

Krol J, Roska B. Treatment synergy in axon regeneration. *Nature Neuroscience*. 2016 Jul 26;19(8):983-4.

Yue L, Weiland JD, Roska B, Humayun MS. Retinal stimulation strategies to restore vision: Fundamentals and systems. *Progress Retinal Eye Res*. 2016 Jul; 53:21-47.

Krol J, Roska B. Rods Feed Cones to Keep them Alive. *Cell*. 2015 May 7; 161(4):706-8.

Yonehara K, Roska B. Neuroscience: retinal projectome reveals organizing principles of the visual system. *Current Biology*. 2014 Sep 22; 24(18):R833-5.

Trenholm S, Roska B. Cell-type-specific electric stimulation for vision restoration. *Neuron*. 2014 Jul 2; 83(1):1-2.

Yonehara K, Roska B. Motion detection: neuronal circuit meets theory. *Cell*. 2013 Sep 12; 154(6):1188-9.

Packer AM, Roska B, Häusser M. Targeting neurons and photons for optogenetics. *Nature Neuroscience*. 2013 Jul; 16(7):805-15.

Sahel JA, Roska B. Gene therapy for blindness. *Annual Reviews Neuroscience*. 2013 Jul 8; 36:467-88.

Busskamp V, Picaud S, Sahel JA, Roska B. Optogenetic therapy for retinitis pigmentosa. *Gene Therapy*. 2012 Feb; 19(2):169-75.

Busskamp V, Roska B. Optogenetic approaches to restoring visual function in retinitis pigmentosa. *Current Opinion Neurobiology*. 2011 Dec; 21(6):942-6.

Azeredo da Silveira R, Roska B. Cell types, circuits, computation. Current Opinion Neurobiology. 2011 Oct; 21(5):664-71.

Werblin F, Roska B. The movies in our eyes. Scientific American. 2007 Apr; 296(4):72-9.

Porod W, Werblin F, Chua LO, Roska T, Rodriguez-Vazquez A, Roska B, Fay P, Bernstein GH, Huang YF, Csurgay AI. Bio-inspired nano-sensor-enhanced CNN visual computer. Ann N Y Acad Sci. 2004 May;1013:92-109. PubMed PMID: 15194609. Werblin F, Roska B, Balya D. Parallel processing in the mammalian retina: lateral and vertical interactions across stacked representations. Progress Brain Research. 2001;131:229-38. Review.

Book chapters

Roska, B. and Meister, M. The Retina Dissects the Visual Scene into Distinct Features. Book chapter. 2014; The New Visual Neurosciences. MIT Press.