

Anirban Paul

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Education and training

Senior Research Associate Dr. Z. Josh Huang's lab, Cold Spring Harbor Laboratory, NY	2013 - present
Postdoc in Neuroscience Dr. Z. Josh Huang's lab, Cold Spring Harbor Laboratory, NY	2006 - 2013
Ph.D., Biology Mentor: Dr. Atanu Duttaroy, Howard University, Washington, D.C.	2001 - 2005
M.Sc., Zoology (Hons. Genetics), University of Calcutta, Kolkata, India.	1998 - 2000

Research

Chandelier cell subtypes and their cell state signature in schizophrenia NARSAD funded project to isolate biomarkers of morphologically and physiologically distinct rare axo-axonic cortical interneuron, Chandelier cell, subtypes and changes in their cellular state in disease models.	2018 - present
NIH BRAIN Initiative Cell Census Network (BICCN) cortical neuron transcriptome Transcriptomic diversity of genetically labeled cortical neurons based upon projection patterns and development.	2017 - present
Molecular basis of neuronal cell identity using single-cell RNAseq Discovered GABAergic neuron identity is delineated by a transcriptional architecture that encodes neuronal synaptic communication using single-cell RNA Seq and machine learning. This molecular genetic framework of neuronal identity integrates cell phenotypes along multiple axes and provides a foundation for discovering and classifying neuron types.	2012 - 2017
Discovery of novel regulatory mechanisms of MECP2 in Rett syndrome Studied RNA binding capacity of MECP2 protein with a potential role in regulating translation.	2009 - 2012
Cell-type specific gene expression profiling of the developing GABAergic circuit in mouse cerebellum. Discovered cell-type specific developmental gene expression programs and revealed a correlation between genomic clustering and developmental co-expression of hundreds of transcripts, suggesting the involvement of chromatin level gene regulation during circuit formation.	2006 - 2009
Managenese superoxide dismutase (MnSOD) in aging and neurodegeneration in <i>Drosophila</i> Impact of reactive oxygen species scavenging enzyme, MnSOD/Sod2 on aging kinetics and neurodegeneration through MnSOD knock-out and hypomorphic allelic series.	2001 - 2005

Publications

- Paul, A.**, Huang, J.Z., (2018) Single-Cell RNA Sequencing of Fluorescently Labeled Mouse Neurons Using Manual Sorting and Double In Vitro Transcription with Absolute Counts Sequencing (DIVA-Seq). *JoVE*, in press
- Pai, L.L., Vogt, D., Perez, A.C., McKinsey G.L., Wimer, M., Hu, J.S., Cho, F., **Paul, A.**, Pla, R., Nowakowski, T., Goodrich, L.V., Paz, J.T., and Rubenstein J.L. (2018) Mafb and c-Maf have prenatal compensatory and postnatal antagonist roles in cortical interneuron fate and function. *Neuron* manuscript in revision
- Huang, A. and **Paul, A.**, (2018) Diversity of interneuron types and diversification of communication devices in cortical network., invited review in submission.
- Crow, M., **Paul, A.**, Ballouz, S., Huang, J.Z., Gillis, J., (2018) Characterizing the replicability of cell types defined by single cell RNA-sequencing data using MetaNeighbor. *Nature Communications*, Feb 28: 9, 884 <https://www.nature.com/articles/s41467-018-03282-0>
- Paul, A.**, Crow, M., Gillis, J., Huang, J.Z. (2017) Transcriptional Architecture of Synaptic Communication Delineates Cortical GABAergic Neuron Identity. *Cell*, Oct 19;171(3):522-539.e20. Online [http://www.cell.com/cell/fulltext/S0092-8674\(17\)30990-X](http://www.cell.com/cell/fulltext/S0092-8674(17)30990-X)
- Vogt, D., Cho, K.K.A., Shelton, S.M., **Paul, A.**, Huang, Z.J., Sohal, V.S., Rubenstein, J.L.R. (2017) Mouse Cntnap2 and human CNTNAP2 ASD alleles cell autonomously regulate PV+ cortical interneurons. *Cerebral Cortex* Sep 28:1-12. doi: 10.1093/cercor/bhx248.
- Crow, M., **Paul, A.**, Ballouz, S., Huang, Z.J., Gillis, J. (2016) Exploiting single-cell expression to characterize co-expression replicability. *Genome Biol.* May 6;17:101
- Paul, A.**, Ying, C., Atwal G.S, Huang, J.Z. (2012) Developmental Coordination of Gene Expression between Synaptic Partners During GABAergic Circuit Assembly in Cerebellar Cortex. *Front Neural Circuits.*;6:37. Epub 2012 Jun 26.
- Godenschwege, T., Forde, R., Davis, C.P., **Paul, A.**, Beckwith, K., Duttaroy, A. (2009) Mitochondrial superoxide radicals differentially impacts muscle activity and neural functions in Drosophila. *Genetics*. Sep 183(1):175-84.
- Paul, A.**, Belton, A., Nag, S., Martin, I., Grotewiel, M.S., Duttaroy, A. (2007) Reduced mitochondrial SOD displays mortality characteristics reminiscent of natural aging. *Mech Ageing Dev.* 2007; 128(11-12):706-16.
- Belton A., **Paul A.**, and Duttaroy A. (2006) Deletions encompassing the Manganese superoxide dismutase gene in the *Drosophila melanogaster* genome. *Genome* Jul;49(7):746-51.
- Duttaroy, A., **Paul, A.**, Kundu, M., and Belton, A. (2003) A Sod2 null mutation confers severely reduced adult life span in Drosophila. *Genetics* 165:2295-2299. (see also perspective by J. Tower 'There is a problem in the furnace' in Sci. Aging. Knowl. Environ 2004 (1), pe 1).
- Paul, A.**, and Duttaroy, A. (2003) Genomic regions responsible for Manganese superoxide dismutase regulation in *Drosophila melanogaster*. *Aging Cell* 2: 223-231. (see also cover picture).

Fellowships

- 2018 NARSAD Young Investigators Award from Brain and Behavior Research Foundation. 2019 - 2021
- Title: Discovering transcriptomic subtypes of Chandelier cells and their cell state signature in schizophrenia

	2012 NARSAD Young Investigators Award from Brain and Behavior Research Foundation. Title: Discovering biomarkers for Chandelier cells and Schizophrenia.	2013 - 2015
	International Rett Syndrome Foundation postdoctoral fellowship. Title: Novel Function of MeCP2 in mRNA Regulation and Implication in Rett Syndrome.	2009 - 2011
	John Glenn Foundation/American Federation for Aging Research Scholar for Research in Biology of Aging. Title: Genomic regions involved in Manganese superoxide dismutase regulation in <i>Drosophila melanogaster</i> .	2003
Awards and Honors	Cold Spring Harbor Symposium, best poster prize, awarded by Watson School of Biological Sciences, Cold Spring Harbor Laboratory, NY.	2017
	Cold Spring Harbor Symposium, best poster prize, awarded by Watson School of Biological Sciences, Cold Spring Harbor Laboratory, NY.	2009
	Ellison Medical Foundation sponsorship to attend Molecular Biology of Aging Workshop at Marine Biological Laboratory, Woodshole, MA.	2004
	Outstanding graduate student publication in biology, awarded by Graduate School, Howard University, Washington, DC.	2003
	Colonel A.N. Bose scholarship award for studies abroad, awarded by University of Calcutta, India.	2001
	National scholarship award for excellence in B.Sc., awarded by University of Calcutta, India.	1998 - 1999
Talks	Virginia Institute of Psychiatric and Behavioral Genetics, VCU, VA "Molecular basis of neuronal identity to investigate circuits, brain states and behavior"	2018
	Brain Awareness Campaign at The University of Tennessee, Knoxville, TN "Exploring the molecular basis of cortical neuronal identity and state"	2018
	High-Throughput Sequencing for Neuroscience, Janelia Research Campus, VA "Dissecting neuronal cell-types using single-cell RNAseq and genetic intersectional strategy."	2014
	Tata Institute of Fundamental Research, Mumbai, India "Unity and diversity: Single-cell RNAseq shows it's all in our head"	2014
	Society for Neuroscience Meeting, Washington, D.C. "MECP2 regulates mRNA translation in the brain."	2011
	Translational Control Meeting, CSHL. "Methyl-CpG-binding protein 2 regulates mRNA translation in the brain."	2010
Posters (selected)	Paul, A. , Huang, J.Z. Neuronal Cell Types Are Defined by Transcriptional Signatures of Input-Output Communication, Molecular Mechanisms of Neuronal Connectivity, CSHL, NY	2018

	Paul, A., Huang, J.Z. Molecular logic of neuronal types are encoded by transcriptional architecture of synaptic communication, <i>Brains & Behavior: Order & Disorder in the Nervous System</i> , CSHL, NY	2018
	Paul, A., Crow, M., Gillis, J., Huang, J.Z. Transcriptional Architecture of Synaptic Communication Delineates Cortical GABAergic Neuron Identity. Single Cell Analysis Meeting, Society for Neuroscience, Washington D.C.	2017
	Paul, A., Crow, M., Gillis, J., Huang, J.Z. Transcriptional Architecture of Synaptic Communication Delineates Cortical GABAergic Neuron Identity. Single Cell Analysis Meeting, CSHL, NY	2017
	Paul, A., Crow, M., Gillis, J., Huang, J.Z. Transcriptional Architecture of Synaptic Communication Delineates Cortical GABAergic Neuron Identity. Control of Neuronal Identity-II, Janelia Research Campus, VA	2017
	Paul, A., Crow, M., Gillis, J., Huang, J.Z. Transcriptional Architecture of Synaptic Communication Delineates Cortical GABAergic Neuron Identity. Wiring the Brain Conference, CSHL, NY	2017
	Paul, A., Taniguchi H, Huang JZ. "A transcriptomics approach to unravel the neuronal identity of Chandelier cells in neocortex." Control of Neuronal Identity, Janelia Farm Research Campus, VA	2011
	Paul, A., Taniguchi H, Huang JZ. "A single-cell transcriptomics approach to unravel the neuronal identity of Chandelier cells in neocortex." <i>Workshop on single-cell analysis</i> , CSHL, NY	2011
	Paul, A., Paik R, Krishnan K, Pappin C, Zhang M, Huang JZ. "MeCP2 regulates mRNA translation in mouse brain." <i>11th Annual Rett Syndrome Symposium</i> , Virginia	2010
	Paul A., Huang JZ. "Cell-type Specific Gene Expression In The Developing Cerebellar GABAergic Circuit." <i>Constructing Neural Circuits</i> , Janelia Farm Research Campus, VA	2009
Training and teaching experience	Technology transfer and training of graduate student from Memorial Sloan Kettering Cancer Center, NY to perform single-cell sorting and single-cell RNA sequencing on early developing neurons.	2014 - 2015
	Pre-meeting workshop at a Conference on Patenting in the Life Sciences, Cold Spring Harbor Laboratory.	2013
	Trained MD-PhD student, PhD student and laboratory technicians on wet lab techniques and analysis.	2006 - 2012
	Mentored summer students in wet-lab experiments. Summer student Pragya Kakani was awarded the 2011 Neuroscience Research Prize by the American Academy of Neurology and the Child Neurology Society, USA for her active contribution to the "Developmental gene expression during cerebellum circuit formation" project.	2008 – 2009
Courses	Introduction to CS and Python programing, EdX (MITx 6.00.1x)	2015
	Programing for Biology Course, (Perl), Cold Spring Harbor Laboratory	2013

Quantitative Imaging Course, Cold Spring Harbor Laboratory	2011
Workshop on Single Cell Analysis, Cold Spring Harbor Laboratory	2011
Communicating science workshop hosted by Alan Alda	2010
Molecular Biology of Aging Workshop, Marine Biological Laboratory, Woodshole, MA	2004

Conferences (selected):	Brains & Behavior: Order & Disorder in the Nervous System, CSHL, NY	2018
	Society for Neuroscience Conference, Washington D.C.	2017
	Single Cell Analysis Meeting, CSHL, NY	2017
	Control of Neuronal Identity-II, Janelia Research Campus, VA.	2017
	Wiring the brain Conference, CSHL, NY.	2017
	High-Throughput Sequencing for Neuroscience, Janelia Research Campus, VA	2014
	Patenting in the life sciences, CSHL, NY.	2013
	Society for Neuroscience Conference, Washington D.C.	2011
	Control of Neuronal Identity-I, Janelia Research Campus, VA.	2011
	12 th Annual International Rett Syndrome Foundation Conference, VA.	2011
	Axon Guidance and Neuronal Regeneration Meeting, CSHL, NY.	2010
	Constructing Neural Circuits, Janelia Research Campus, VA.	2009