

ASSOCIATE PROFESSOR

Anindya Ghosh Roy

PROFILE

Neuroscientist and teacher with 10 years of experience in running an independent research lab and teaching courses in graduate level. Supervised 10 PhD theses, 11 MSc theses, and 3 post-doctoral fellows. Published over 30+ articles in peer-reviewed journals.

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EXPERIENCE

SCIENTIST V/ADDITIONAL PROFESSOR, NBRC, GURGAON, INDIA – 2019-PRESENT

Research Theme: Neuronal development and regeneration using *C. elegans*

SCIENTIST IV/ASSOCIATE PROFESSOR, NBRC, GURGAON, INDIA – 2013-2019

Research Theme: Neuronal development and regeneration using *C. elegans*

POST-DOCTORAL FELLOW, UNIVERSITY OF CALIFORNIA, SAN DIEGO, USA – 2007-2013

Project : Molecular control of neuronal regeneration, Mentor: Prof. Yishi Jin and Prof. Andrew Chisholm

POST-DOCTORAL FELLOW, COLUMBIA UNIVERSITY, NEW YORK, USA – 2005-2007

Project : Biochemical regulation of molecular motor dynein, Mentor: Prof. Richard B. Vallee

EDUCATION

Tata Institute of Fundamental Research, Mumbai, India – PhD, 2005

Molecular Biology, Genetics, Cell Biology, Thesis Supervisor: Krishanu Ray

NATIONAL BRAIN RESEARCH CENTRE, GURGAON, INDIA

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PUBLICATION

- 1) S Dey, N Kumar, J Feldman, A Ghosh-Roy . KLP-7/Kinesin-13 orchestrates axon-dendrite checkpoints for polarized trafficking in neurons. *BoRxiv*, 2024 .08.24.554630. doi: <https://doi.org/10.1101/2023.08.24.554630>
- 2) P Singh, K Selvarasu, A Ghosh-Roy. Optimization of RNAi efficiency in PVD neuron of *C. elegans*, *PLOS-One (In press)*, 2024, doi: <https://doi.org/10.1101/2023.08.31.555766>
- 3) HK Brar, S Dey, P Singh, D Pande, A Ghosh-Roy, Functional recovery associated with dendrite regeneration in PVD neuron of *C. elegans*, *eNeuro* (in press) 2024. doi: <https://doi.org/10.1101/2023.08.09.552579>
- 4) D Puri, S Sharma, S Samaddar, S Ravivarma, S Banerjee, **A Ghosh-Roy**. Muscleblind-1 interacts with tubulin mRNAs to regulate the microtubule cytoskeleton in *C. elegans* mechanosensory neurons. *PLoS Genetics*, 2023, 19 (8), e1010885, <https://doi.org/10.1371/journal.pgen.1010885>
- 5) D Puri, S Samaddar, S Banerjee, A Ghosh-Roy, Muscleblind-1 regulates microtubule cytoskeleton in *C. elegans* mechanosensory neuron through tubulin mRNAs. *BoRxiv*, 2022.09. 07.506915. doi: <https://doi.org/10.1101/2022.09.07.506915>
- 6) Brar, H.K; Dey, S; Bhardwaj, S; Pande, D; Singh, P; Dey, S; and **Ghosh-Roy, A**. Dendrite regeneration in *C. elegans* is controlled by the RAC GTPase CED-10 and the RhoGEF TIAM-1. (*PLOS-Genetics*), March, 2022, <https://doi.org/10.1371/journal.pgen.1010127>
- 7) Dey, S; and **Ghosh-Roy, A**. In vivo Assessment of Microtubule Dynamics and Orientation in *Caenorhabditis elegans* Neurons (*J Vis Exp*), 2021 Nov 20;(177). <https://doi.org/10.3791/62744> .
- 8) Brar, H.K; Dey, S; Bhardwaj, S; Pande, D; Singh, P; Dey, S; and **Ghosh-Roy, A**. Dendrite regeneration in *C. elegans* is controlled by the RAC GTPase CED-10 and the RhoGEF TIAM-1. (July, 2021) *bioRxiv* doi: <https://doi.org/10.1101/2021.07.20.453023>
- 9) Kulkarni, SS; Sabharwal, V; Sheoran, S; Basu, S; Matsumoto, K; Hisamoto, N; **Ghosh-Roy, A** and Koushika, SP. (2021) UNC-16/JIP3 negatively regulates actin dynamics dependent on DLK-1 and microtubule dynamics independent of DLK-1 in regenerating neurons. (*Genetics*) <https://doi.org/10.1093/genetics/iyab139>
- 10) Puri, D; Ponniah, K; Biswas, K; Basu, A; Dey, S; Lundquist, E.A; and **Ghosh-Roy, A** (2021), Wnt Signaling Establishes the Microtubule Polarity in Neuron Through

Regulation of Kinesin-13. (*Journal of Cell Biology*) 220(9):e202005080. <https://doi.org/10.1083/jcb.202005080> Epub 2021 Jun 17

11) Basu, A; Dey, S; Behra, S, Bhardwaj, S; Dey, S; and **Ghosh-Roy, A.** (2021), Regulation of UNC-40/DCC and UNC-6/Netrin by DAF-16 promotes functional rewiring of the injured axon. (*Development*), 148(11) (2021):dev198044. doi: <https://doi.org/10.1242/dev.198044> 10) Kumar, S; Basu, S; Behera, S; Dey, S; and **Ghosh-Roy,**

12) A. Swimming exercise promotes post-injury axon regeneration and functional restoration through AMPK (*eNEURO*), 0414-20.2021. DOI: <https://doi.org/10.1523/ENEURO.0414-20.2021>

13) NY Kadam, S Behera, S Kumar, A Ghosh-Roy, K Babu. The G-protein coupled receptor SRX-97 is required for concentration dependent sensing of Benzaldehyde in *Caenorhabditis elegans*. *eNeuro*, 4 January 2021, *eNEURO*.0011-20.2020; DOI: <https://doi.org/10.1523/ENEURO.0011-20.2020>

14) P Pandey, A Singh, H Kaur, **A Ghosh-Roy**, K Babu (2021). Increased dopaminergic neurotransmission results in ethanol dependent sedative behaviors in *Caenorhabditis elegans*". *PLOS GENETICS*, February 1, 2021. <https://doi.org/10.1371/journal.pgen.1009346>

15) Basu, A; Dey, S; Puri, D; Das Saha, N; Sabharwal, V; Thyagarajan, P; Srivastava, P; Koushika, S. P; and **Ghosh-Roy, A*** (2017). let-7 miRNA controls CED-7 homotypic adhesion and EFF-1-mediated axonal self-fusion to restore touch sensation following injury. *Proc Natl Acad Sci U S A*. 2017 November,114 (47) E10206-E10215. <https://doi.org/10.1073/pnas.1704372114>

16) **Ghosh-Roy, A.**, Goncharov, A., Jin, Y., Chisholm A.C. (2012) kinesin-13 and tubulin post-translational modifications regulate microtubule growth in axon regeneration. *Developmental Cell*, 23(4):716-2.

17) Chen, L., Wang, Z., **Ghosh-Roy, A.**, Hubert, T., Yan, D., O' Rourke, S., Bowerman, B., Wu, Z., Jin, Y., and Chisholm, A.D. (2011). Novel axon regeneration pathways identified by systematic genetic screening in *C. elegans*. *Neuron*. 71(6):1043-57

18) Joti, P., **Ghosh-Roy, A.**, and & Ray, K. (2011) Dynein Light Chain 1 and Myosin V in the somatic microenvironment regulates the division of stem cell progenitors during spermatogenesis. *Scientific Reports*. 1:173. PMID: PMC3240984

19) **Ghosh-Roy, A.** & Chisholm A.C. (2010). *C. elegans*: a new model organism for studies of axon regeneration. *Developmental Dynamics*, (Invited review) 239(5): 1460-1464

20) **Ghosh-Roy, A.**, Wu, Z., Ghoncharov, A., Jin, Y., Chisholm A.D. (2010). Calcium and cyclic AMP promote axonal regeneration in *C. elegans* and require DLK-1 kinase. *Journal of Neuroscience* 30(9): 3175-3183. Faculty of 1000 Biology: evaluations: <http://f1000biology.com/article/id/2423956/evaluation>

21) Varma, D., Dawn, A., **Ghosh-Roy, A.**, Weil, S.J., Ori-McKenney, K.M., Zhao, Y., Keen, J., Vallee, R.B., & Williams, J.C. (2010). Development and application of in vivo molecular traps reveals that dynein light chain occupancy differentially affects dynein-mediated processes. *Proc Natl Acad Sci U S A* 107(8): 3493-3498. PMCID: 2840451

23) Hook, P., Yagi, T., **Ghosh-Roy, A.**, Williams, J.C., & Vallee, R. B. (2009). The dynein stalk contains an antiparallel coiled coil with region-specific stability. *Biochemistry*, 48(12): 2710-2713.

24) Krishna Mohan PM, Barve M, Chatterjee A, **Ghosh-Roy A**, Hosur RV. (2008). NMR comparison of the native energy landscapes of DLC8 dimer and monomer. *Biophys Chem.* 134(1-2):10-9.

25) Wu, Z., **Ghosh-Roy, A.**, Yanik, M.F., Zhang, J.Z., Jin, Y., and Chisholm, A.D. (2007). *C. elegans* neuronal regeneration is influenced by life stage, synaptic branching, and ephrin signaling. *Proc Natl Acad Sci U.S.A*, 104: 15132-15137. PMCID: 1975853 Faculty of 1000 Biology: evaluations: <http://f1000biology.com/article/id/1095855/evaluation>

26) Williams, J.C., Roulhac P.L., **Roy, A.G.**, Vallee, R. B., Fitzgerald, M.C., & Hendrickson, W.A. (2007). Structural and thermodynamic characterization of a cytoplasmic dynein light chain intermediate chain complex. *Proc Natl Acad Sci U S A* 104(24), 10028-10033. PMCID: 1885999

27) Chatterjee A, Krishna Mohan PM, Prabhu A, **Ghosh-Roy A**, Hosur RV. (2007). Equilibrium unfolding of DLC8 monomer by urea and guanidine hydrochloride: Distinctive global and residue level features. *Biochimie.* 89(1):117-34.

28) **Ghosh-Roy, A.**, Desai, B.S., & Ray, K. Dynein light chain 1 regulates dynamin-mediated F-actin assembly during sperm individualization in *Drosophila*. (2005). *Mol Biol Cell*, 16(7), 3107-3116. PMCID:1165396

29) **Ghosh-Roy, A.**, Kulkarni, M., Kumar, V., Shirolkar, S., & Ray, K. (2004). Cytoplasmic dynein-dynactin complex is required for spermatid growth but not axoneme assembly in *Drosophila*. *Mol Biol Cell*, 15(5), 2470-2483. PMCID: 404038

AWARDS & HONOURS

- 2023- Wellcome Trust-DBT Senior Fellowship
- 2021- Invited Member of Faculty Opinions (<https://facultyopinions.com/prime/thefaculty/member/1140663>)
- 2021- Review Editor in Frontiers in Physiology
- 2013-2019 Wellcome Trust-DBT Intermediate Fellowship
- 2013 Ramalingaswami Fellowship”- Gratefully declined
- 2009-2010 Christopher Dana Reeve Postdoctoral Fellowship
- 2006 Young Scientist Award-2006 by Indian National Science Academy (INSA)
- 2005 Zita Lobo Memorial Best Thesis Award-2005 for the PhD thesis.
- 2005 Scholarships from Burroughs Wellcome Fund, Scholars of The for Genomics Research at Harvard and Society for General Physiology for attending and supporting the course-fees of Physiology-2005 in MBL, Woods Hole
- 2003 American Society of Cell Biology (ASCB) Predoctoral Award for attending the 43rd ASCB meeting in San Francisco.
- 2003-2004 Journal of Cell Science travel fellowship” and “Sarojini Damodaran International Travel Award for visiting Prof. Richard B. Vallee’s lab in Columbia University.
- 2001-2003 Kanwal Rekhi Career development fellowship

GRANTS

- 2023-2028 Wellcome Trust-DBT India alliance Senior fellowship grant, Title: “Study of neuronal regeneration using *C. elegans*”. award amount: INR 4.5 Crore
- 2020-2023 Science and Engineering Research Board, Department of Science and Technology, Government of India, Grant Title: “Study of neuronal regeneration after injury using *Caenorhabditis elegans*” award amount: INR 57 Lakh
- 2013-2019 Wellcome Trust-DBT India alliance grant for intermediate career grant, Title: “Regulation of microtubule cytoskeleton in polarity, maintenance and remodelling of neural network”. award amount: INR 3.5 Crore

MEETINGS ORGANIZED

- 2022 3rd India *C. elegans* meeting at Trivandrum India during 27th-30th Sept
- 2019 Microtubules, Motors, Transport and Trafficking (M2T2) meeting (<https://m2t22019592069640.wordpress.com/m2t2-2019/>) at NBRC
- 2018 India | EMBO Symposium at NBRC (Co-organizer Sourav Banerjee)
- 2016 IBRC-APRC NBRC School at NBRC (Co-organizer Sourav Banerjee)

INVITED SEMINAR

- 2022 Dec-9, IAN-2022 meeting, in the symposium of “Neurodevelopment and its disorders”.
- 2022 Brain Awareness Week, March 14 to 20 at DBT-InStem, organised by InStem, Bangalore, Title of seminar: "Study of neuronal regeneration using *C. elegans*"
- 2022 25th Feb, IN-EMBO webinar series. Title of the lecture: “*C. elegans* as a model for nerve regeneration study”
- 2021 IBRO school organised by IGIB, “Regulatory RNAs and the Brain: Development to Disease”.
- 2021 Keynote speaker in the Brain Awareness Week on 17th March 2021 organized by Centre for Cognitive and Brain Sciences at the Indian Institute of Technology Gandhinagar, Title of seminar: "*C. elegans* as a model for nerve regeneration study”
- 2020 Symposium on Chromaffin Cell Biology, ISCCB-20 at the Indian Institute of Technology, Chennai,
- 2019 1st International, Molecular Medicine Conference “From Bench to Bedside and Beyond” at the Amity University, Gurgaon
- 2019 Seminar in Summer Undergraduate Research Program (SURP) at University of Delhi
- 2019 2nd RCB Bioimaging School, RCB Faridabad,
- 2018 Wellcome Researcher Meeting, Warwick Conference Centre, London

- 2018 2nd India *C elegans* meeting, NII-Delhi
- 2017 21st International *C. elegans* Meeting, University of California-Los Angeles
- 2017 Fellows meeting of Wellcome Trust-DBT India Alliance, Hyderabad
- 2017 Indian Academy of Neurosciences-Annual meeting, Ravenshaw University, Cuttack
- 2017 Recent Advancement in Neuroscience, NISER-Bhubaneswar
- 2017 Current Trends in Intracellular Transport and Molecular Motors, IIT-Mumbai
- 2016 Cochin University Science and Technology-National University of Singapore, CUSAT
- 2016 Axon Guidance, Synapse Formation and Regeneration conference, Cold Spring Harbour Laboratory
- 2016 Development and Functions of Brain Circuit, IBRO School, NBRC
- 2016 1st Indian *Caenorhabditis elegans* meeting, 40th Mahabaleshwar seminar
- 2016 NEURONAL DEVELOPMENT, SYNAPTIC FUNCTION & BEHAVIOR, Nagoya University, Japan,
- 2015 IIT Delhi-NBRC conclave at NBRC, 2015
- 2012 Head North Regeneration Symposium at University of California San Diego
- 2011 Neuro development meeting: Scripps Institute, USA
- 2009 Plenary seminar in International *C. elegans* meeting at UCLA
- 2008 Neuronal development, synaptic function & Behavior meeting: University of Wisconsin-Madison.
- 2007 UCSD-Salk Neuro development Group meeting: Salk, La Jolla, USA
- 2006 Young scientist meeting 2006: Indian National Science Academy (INSA),

TEACHING EXPERIENCE

Graduate level courses covering Genetics, Membrane Biophysics and Cell Biology.

Laboratory practical course for masters students in Light microscopy: covering bright-field, fluorescence and confocal microscopy practical lab session.

RESEARCH EXPERIENCE

The goal of our research team is to understand how neurons and neuronal circuits develop and maintain normal function and regenerate

We are using a variety of approaches to study the development and function of neural circuits in vivo, including genetics, genomics, sub-cellular imaging, laser neurosurgery and optogenetics. Since *C. elegans* is transparent and has a simple nervous system, we can manipulate and observe individual neurons in intact, living animals.

We are interested in understanding how neurons are polarized during the initial stages of development, how neural circuits respond to injury in adulthood; and how molecular mechanisms such as cytoskeleton dynamics, RNA based mechanisms, and intracellular signalling affect these processes. One major focus is axon and dendrite regeneration.

OTHER ACTIVITIES

Serving as a member of Biohazard ethics committee in Amity University, Gurgaon since 2017

Served as Officiating Registrar of NBRC from January 2018 to March 2019. Managed all the academic responsibilities including Phd/MSc admission, course work, examinations etc

IN THE NEWS

July 2021 Most-Shared Articles of May/June 2021



<https://blog.eneuro.org/2021/07/most-shared-july-2021>

June 2021 Nerve regrows after injury in a soil-living worm. (**Nature India**)

<https://www.natureasia.com/en/nindia/article/10.1038/nindia.2021.93>

June 2021 Restoring damaged neural circuit through physical exercise (**India Alliance-Wellcome Trust/DBT**) <https://www.indiaalliance.org/news/restoring-damaged-neural-circuit>

April 2020 A report on our 'M2T2-2019 meeting' was published in Journal of Cell
Journal of
Science **Cell Science** <https://jcs.biologists.org/content/133/8/jcs245928>

Nov 2017 - A news on our research was covered in "The Hindu"
THE HINDU "NBRC team uncovers how damaged neurons recover
functions"

<https://www.thehindu.com/sci-tech/science/nbrc-team-uncovers-how-damaged-neurons-recover-functions/article20550707.ece>