

# Sabyasachi Sutradhar

📍 Department of MB&B, Yale School of Medicine, 333 Cedar Street, New Haven, CT, USA

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Immigration status: EB1A (I-140 approved); I-485 pending

## EDUCATION

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|---|--------------------|
| <b>Ph.D. in Physics</b><br><i>University of Calcutta</i> , India; <b>Computational Biophysics</b>                               | <i>2010 – 2016</i> |
| <b>M.Sc. in Physics (First class)</b><br><i>University of Burdwan</i> , India; Specialization: <b>Solid State Physics</b>       | <i>2005 – 2008</i> |
| <b>B.Sc. in Physics (First class)</b><br><i>University of Burdwan</i> , India; Major: <b>Physics</b> ; Minor: <b>Math, Chem</b> | <i>2002 – 2005</i> |

## RESEARCH EXPERIENCE

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| <b>Associate Research Scientist</b><br><b>Yale University</b> , Howard Lab 📧, Adviser: <b>Prof. Jonathon Howard</b>                     | <i>2021 – Present</i> |
| <ul style="list-style-type: none"> <li>Developed agent-based and AI-based models for neuronal morphogenesis.</li> </ul>                 |                       |
| <b>Postdoctoral Associate</b><br><b>Yale University</b> , Howard Lab 📧, Adviser: <b>Prof. Jonathon Howard</b>                           | <i>2016 – 2021</i>    |
| <ul style="list-style-type: none"> <li>Developed software to track the dendrite dynamics and morphological characterization.</li> </ul> |                       |
| <b>Doctoral Researcher</b><br><b>IACS</b> , Paul Lab 📧, Adviser: <b>Prof. Raja Paul</b>   | <i>2010 – 2016</i>    |
| <ul style="list-style-type: none"> <li>Computational models to simulate mitotic spindle, tissue morphogenesis, etc.</li> </ul>          |                       |
| <b>Masters Researcher</b><br><b>Burdwan University</b> 📧, Adviser: Prof. Pabitra K Mallick  | <i>2007 – 2008</i>    |
| <ul style="list-style-type: none"> <li>Surface Enhanced Raman Scattering.</li> </ul>  |                       |

## GRANTS

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- As **Collaborator** with Prof. Howard: "Dendrite Structure: Bridging from Molecules to Morphology"; Submitted to **NIH** in 2025; amount: **\$1,690,159**
- As **Key Personnel** with Prof. Howard: "Biophysics of branched cells: intracellular transport"; Submitted to **NSF** in 2024; amount: **\$990,068**
- As **Other Personnel** with Prof. Howard: "Dendrite structure: Data-Driven Models to Bridge from Molecules to Morphology"; Funded from **NIH** in 2020-2025; amount: **\$2,820,911**

## TECHNICAL SKILLS

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- Models Developed:** Neuronal morphogenesis, Cell division, Cell proliferation & death
- Algorithms Developed:** Tracking the length of dynamic dendrite, Trajectory segmentation, Neuronal morphometrics
- Algorithms Used:** Monte Carlo, Molecular dynamics, Gillespie, CNN-LSTM
- Image Processing Tools:** ImageJ, MATLAB, Python
- Programming Languages:** Proficient in C, C++, Python, MATLAB, Shell Script
- Computer Skills:** Proficient in handling HPCs, Unix systems, ROCKS cluster distribution

## FELLOWSHIPS & AWARDS

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- Travel award, Physical Biology of the Cell, Sep 18 - Oct 8, 2016, **MBL**, Woods Hole, MA, USA
- Junior & Senior Research Fellowship, CSIR, New Delhi, India (2009 & 2012), **Govt. of India**
- Graduate Aptitude Test in Engineering, 2008, Dept. of Higher Education, **Govt. of India**
- State Eligibility Test, 2008, **Govt. of West Bengal**

## TEACHING

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| <b>Assistant Teacher</b> at Yale                                   | <i>Spring, 2024</i> |
| ◦ Computational modeling in biology, Monte Carlo, Gillespie method |                     |
| <b>Teaching Assistant</b> at IACS                                  | <i>2010 – 2015</i>  |
| ◦ Calculus, Fourier series, Ising model                            |                     |
| <b>Assistant Teacher</b> at MAH High School, Hooghly, WB, India    | <i>2008 – 2010</i>  |
| ◦ Subjects: Physics, Chemistry, Mathematics                        |                     |

## MENTORSHIP

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|---|-----------------------|
| <b>Aaron Daniels</b> , Undergrad, Currently at Yale                       | <i>2025 – Present</i> |
| ◦ Classifying Branching Structures Using AI Tools                         |                       |
| <b>Max Watzky</b> , Undergrad, Currently at Yale                          | <i>2025 – Present</i> |
| ◦ Classifying Neuronal Morphologies Using AI Tools                        |                       |
| <b>Gunalan Natesan</b> , Rotating Graduate, Currently at Yale             | <i>2024 – 2025</i>    |
| ◦ Topological Properties of Class IV Dendritic Arbors                     |                       |
| <b>Sofia Fausone</b> , Undergrad, Currently at Oxford                     | <i>2024</i>           |
| ◦ Reverse-engineering Stochastic Data to Equations Using Machine Learning |                       |
| <b>Kebron Gurara</b> , Undergrad, Currently at Yale                       | <i>2023 – 2024</i>    |
| ◦ Mathematical Methods for Characterizing Dendritic Arbors                |                       |
| <b>Daniel Fridman</b> , Undergrad, Currently at Harvard                   | <i>2019 – 2020</i>    |
| ◦ Bayesian Inference in Dynamic Instability of Neuronal Dendritic Tips    |                       |

## LEADERSHIP

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| <b>Management</b>   | <i>2016 – Present</i> |
| ◦ Computers, Meetings, Web site, and Software in Howard Lab                             |                       |
| <b>President &amp; Vice-President</b> of Research Scholars' Association, IACS           | <i>2012 – 2015</i>    |
| ◦ Organized popular scientific lectures, Ph.D. student representative, student outreach |                       |
| <b>Editor</b>   | <i>2014 – 2015</i>    |
| ◦ 'Wriddhi', Bengali cultural magazine  |                       |

## REVIEW SERVICES

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- **Indian Journal of Physics**, Springer, Impact Factor 1.947
- **J. of Theoretical Biology**, Elsevier, Impact Factor 2.691

## WORKSHOPS

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- **Big Data & Machine Learning Workshop**, January 8-9, 2025, Yale University, CT, USA
- **Parallel Computing with MATLAB**, April 4, 2018, YCRC, Yale University, CT, USA
- **Virtual Cell Workshop**, Jun 12 - 14, 2017, U. Conn. Med. School, Farmington, CT, USA
- **Physical Biology of the Cell**, Sep 18 - Oct 8, 2016, MBL, Woods Hole, MA, USA
- Unifying Concepts in Materials: JAK School & Symposium 2012, JNCASR & NCBS, India

## TALKS

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### Invited

- Using AI to predict mechanisms that regulate branching morphogenesis, Feb 5, 2025, Physics X Data Science Seminar Series, **Yale University**, New Haven, USA
- Pattern formation through Self-organization, May 22, 2022, Marmara High School, **Turkey**
- Self-organization in Biology, Feb 28, 2022, **Barasat College**, WB, India
- Deciphering the Dendritic Tip Dynamics of Drosophila Class IV Sensory Neuron, Feb 22, 2018, Department of MEMS, **Yale University**, New Haven, USA

### Conferences & Symposiums

- Branching Elongation and Retraction of Dendritic tips Generate Branched Neurons, Feb 7, 2023, MNT Meeting, **Flat Iron Institute**, New York, USA
- Dynamic Instability of Dendritic tips Generates Complex Neuronal Morphologies, Sep 10, 2021, Science Hill RIP talk, **Yale University**, New Haven, USA
- Tip dynamics shape branching morphology in class IV neurons, Oct 25, 2019, PEB/QBio retreat talk solicitation, **Yale University**, New Haven, USA
- Modeling mitosis in computer, February 11, 2016, **IACS**, Kolkata, India
- Stochastic simulation quantifying cell division and mechanics, Nov 24, 2015, Department of Physics, **Calcutta University**, Kolkata, India
- Regulation of kinetochore-microtubule dynamics plays important role in budding yeast chromosome positioning, Cell Mechanics Meeting, Jan 31, 2013, **RRI, Bangalore**, India

## POSTERS

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- Envisioning AI at Yale, 2025, May 12, **Yale University**, New Haven, CT, USA
- Towards Interpretable Quantitative Cell Representations Summit: Feb 2024, **Allen Institute**, Seattle, USA
- **BPS 2022**: Feb 2022, San Francisco, CA, USA
- **BPS 2020**: Feb 2020, San Diego, CA, USA
- Yale Day of Data: Nov 2018, **Yale University**, New Haven, CT, USA
- **Gordon Research Conference**: Stochastic Physics in Biology, Jan 2017, Ventura, CA, USA
- Indo-French Conference on Frontiers in Cytoskeleton Research, Oct 2015, **IISER Pune**, India
- Interdisciplinary approach to biological sciences: Feb 2015, **IACS**, Kolkata, India
- Chromosome Stability, Dec 2014, **JNCASR, Bangalore**, India
- Statphys-Kolkata VIII, Dec 2014, **SNBNCBS**, Kolkata, India
- Cell Mechanics Meeting: Jan 2013, **RRI**, Bangalore, India
- Conference on Chromosome Stability, Dec 2012, Thiruvananthapuram, India
- An Interdisciplinary Approach to Soft matter & Biological Physics: Dec 2011, Kolkata, India

**PUBLICATIONS** [† indicates equal authorship]

17. S. Sutradhar, S. Shree, Md Shah Jalal, J. Howard, **BranchMorphoGen**: A generalized framework to simulate branching morphogenesis, (in preparation)
16. S. Sutradhar, Md Shah Jalal, S. Shree, J. Howard, Emergence of branch hierarchy in Drosophila Class IV da neurons, (in preparation)
15. X. Ouyang†, S. Sutradhar†, O. Trottier, S. Shree, Q. Yu, Y. Tu, J. Howard, Neurons exploit stochastic growth to rapidly and economically build radially oriented dense dendritic arbors, **Nature Communications**, 16, 5903 (2025). [↗](#)
14. K. Singh, S. Das, D. Rai, S. Sutradhar, A. Sarkar, J. Howard, K. Ray, PI(3)P signaling regulates endosomal flux underlying developmental synaptic remodeling via Rab4, (bioRxiv, in Review), (2025) [↗](#)
13. O. Glomb, G. Swaim, P.M. LLancao, C. Lovejoy, S. Sutradhar, J. Park, Y. Wu, M. Hammarlund, J. Howard, S. M. Ferguson, S. Yogevev, A kinesin-1 adaptor complex controls bimodal slow axonal transport of spectrin in *Caenorhabditis elegans*, **Developmental Cell**, 58, 19 Oct, (2023) [↗](#)
12. A. Luchniak, Y-W. Kuo, C. McGuinness, S. Sutradhar, R. Orbach, M. Mahamdeh, J. Howard, Dynamic microtubules slow down during their shrinkage phase, **Biophysical Journal**, 122, 616–623, February 21, (2023) [↗](#)
11. S. Shree†, S. Sutradhar†, O. Trottier, Y. Tu, X. Liang, J. Howard, Dynamic Instability of Dendrite Tips Generates the Highly Branched Morphologies of Sensory Neurons, **Science Advances**, 8, eabn0080, 29 June (2022) [↗](#)
10. R. Basak, S. Sutradhar, J. Howard, Focal Laser Stimulation of Fly Nociceptors Activates Distinct Axonal and Dendritic  $Ca^{2+}$  Signals, **Biophysical Journal**, (120 1-12), (2021) [↗](#)
9. S. Chatterjee, S. Sutradhar, S. Puri, R. Paul, Ordering kinetics in a q-state random-bond clock model: Role of vortices and interfaces, **Physical Review E**, 101, 032128 (2020) [↗](#)
8. P. Iyer, S. Sutradhar, R. Paul, D. Bhattacharyya, A novel combinatorial approach of quantitative microscopy and in silico modeling deciphers Arf1-dependent Golgi size regulation, **The European Physical Journal E**, 42, 1-9 (2019) [↗](#)
7. S. Basu, S. Sutradhar, R. Paul, Substrate stiffness and mechanical stress due to intercellular cooperativity guides tissue structure, **Journal of Theoretical Biology**, 457, 124-136 (2018) [↗](#)
6. S. Basu, S. Majumder, S. Sutradhar, S. K. Das, R. Paul, Phase segregation in a binary fluid confined inside a nanopore, **Europhysics Letter**, 116 (5), 56003, (2017) [↗](#)
5. G. E. Thomas, K. Bandopadhyay, S. Sutradhar, P. Singh, K. K. Gireesh, S. Simon, Renjith MR, B. Badarudeen, M. Banerjee, R. Paul, J. Mitra, T. K. Manna, EB1 regulates attachment of Ska1 with microtubules by forming extended structures on the microtubule, **Nature Communications**, 7:11665, (2016) [↗](#)
4. S. Sutradhar, S. Basu, R. Paul, Inter-centrosomal angular separation during mitosis plays a crucial role for maintaining spindle stability, **Physical Review E**, 92, 4, 1547–1558 (2015) [↗](#)
3. S. Sutradhar†, V. Yadav†, S. Sridhar, L. Sreekumar, D. Bhattacharyya, S. K. Ghosh, R. Paul, K. Sanyal, A comprehensive model to predict mitotic division in budding yeasts, **Molecular Biology of the Cell**, August 26, 22, 3954-3965 (2015) [↗](#); **Cover article** [↗](#)

2. S. Sau, **S. Sutradhar**, R. Paul, P. Sinha, Budding yeast kinetochore proteins, Chl4 and Ctf19, Are Required to maintain SPB-Centromere Proximity during G1 and Late Anaphase, **PLoS One**, 9, 7, e101294 (2014) [↗](#)
1. **S. Sutradhar**, R. Paul, Tug-of-war between opposing molecular motors explains chromosomal oscillation during mitosis, **Journal of Theoretical Biology**, 344, 56–59 (2013) [↗](#)

## COLLABORATORS

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|  |                       |
|--|-----------------------|
| <b>Prof. Yuhai Tu</b><br>Center for Computational Biology, <b>Flat Iron Institute</b> ; NY               | <i>2016 – Present</i> |
| <b>Prof. Shaul Yogev</b><br>Department of Neuroscience, <b>Yale</b> , New Haven, USA                     | <i>2022 – 2023</i>    |
| <b>Prof. Krishanu Ray</b><br>Dept. of Biological Sciences, <b>TIFR</b> , Mumbai, India                   | <i>2022 – 2024</i>    |
| <b>Prof. Dibyendu Bhattacharyya</b><br>ACTREC, Navi Mumbai, India  | <i>2013 – 2016</i>    |
| <b>Prof. Tapas Manna</b><br>School of Biology, <b>IISER</b> , Thiruvananthapuram, India                  | <i>2014 – 2016</i>    |
| <b>Prof. Kaustuv Sanyal</b><br>Unit of Molecular Biology and Genetics, <b>JNC SAR</b> , Bangalore, India | <i>2012 – 2015</i>    |
| <b>Prof. Pratima Sinha</b><br>Department of Biochemistry, <b>Bose Institute</b> , Kolkata, India         | <i>2010 – 2012</i>    |

## LIST OF REFEREES

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**Jonathon Howard**, Ph.D.  
Eugene Higgins Professor of Molecular Biophysics  
& Biochemistry, Professor of Physics  
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Email: joe.howard@yale.edu [↗](#)  
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**Raja Paul**, Ph.D.  
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Computational Sciences  
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**Yuhai Tu**, Ph.D.  
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*Sabyasachi Sutradhar*

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November 5, 2025