

**Nirmalya Bag**

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[Google Scholar](#); [Researchgate](#)

**ACADEMIC APPOINTMENTS**

**Indian Institute of Technology Kharagpur**, Kharagpur, India

Assistant Professor, Department of Chemistry, 2022 – Now

**Cornell University**, Ithaca, NY

Visiting Scientist, Department of Chemistry and Chemical Biology, 2022 – Now

**Cornell University**, Ithaca, NY

Postdoctoral Associate, Department of Chemistry and Chemical Biology, 2016 – 2021

Mentors: Prof. Barbara A. Baird and Dr. David A. Holowka

**University of Toronto**, Toronto, Canada

Visiting research scholar, The Terrence Donnelly Centre for Cellular and Biomolecular Research, Toronto, 2015

Host: Prof. Christopher M. Yip

**National University of Singapore**, Singapore

Postdoctoral Fellow, Department of Biological Sciences, 2015 – 2016

Mentor: Prof. Thorsten Wohland

**EDUCATION**

**National University of Singapore**, Singapore

PhD, Department of Chemistry, 2010 – 2014

Advisor: Prof. Thorsten Wohland

**Indian Institute of Technology Bombay**, India

M.Sc., Department of Chemistry, 2007 – 2009

Advisor: Prof. Anindya Datta

**University of Calcutta**, India

B.Sc., Chemistry Major, 2004 – 2007

**RESEARCH EXPERIENCE**

**Cornell University**, *Department of Chemistry and Chemical Biology*

Mentors: Prof. Barbara A. Baird and Dr. David A. Holowka

Postdoctoral research on the importance of lipid-based phase-like organization in mast cell signaling, and collaborations with material scientists, chemical biologists, cancer biologists, and biophysicists in and beyond Cornell University.

**University of Toronto**, *The Terrence Donnelly Centre for Cellular and Biomolecular Research*

Mentors: Prof. Christopher M. Yip and Prof. Thorsten Wohland

Collaborative research to develop combinatorial microscopy techniques to investigate the structure and dynamics of lipid membranes.

## Curriculum Vitae (Nirmalya Bag)

### **National University of Singapore, Department of Biological Sciences**

Mentor: Prof. Thorsten Wohland

Postdoctoral research into the a) characterization of dengue virus 'breathing' dynamics and interactions of viral envelop peptides with lipid membranes, b) relationship between membrane organization and clustering of ligand-bound EGF receptor; and collaborations with computational biologists, structural biologists, and virologists.

### **National University of Singapore, Department of Chemistry**

Advisor: Prof. Thorsten Wohland

PhD thesis: Imaging Fluorescence Correlation Spectroscopy Studies Lipid Membrane Dynamics and Organization: Applications to the Investigation of Lipid Bilayers, Cell Membranes, and Membrane-active Peptides

### **Indian Institute of Technology Bombay, Department of Chemistry**

Advisor: Prof. Anindya Datta

Master's thesis research on time-resolved fluorescence spectroscopy to study photophysical properties of aminoquinolines and their dependence on microenvironment.

## HONORS AND AWARDS

NIH Postdoctoral Fellowship: 2016 – 2021

Postdoctoral Fellowship (Department of Biological Sciences, NUS): 2015 – 2016

NUS Graduate Research Fellowship: 2010 – 2014

## RESEARCH INTERESTS

Membrane biophysics, Single molecule fluorescence spectroscopy, Super-resolution microscopy, Cell Biochemistry, Cell biology

## SERVICE TO SCIENTIFIC COMMUNITY

1. **Ad hoc Reviewer of manuscripts:** ACS Central Science, Trends in Cell Biology, Current Opinion in Immunology, Biophysical Journal, Journal of General Physiology, Biochimica et Biophysica Acta – Biomembranes, Biochimica et Biophysica Acta – Molecular Cell Research, PLOS One, Frontiers in Molecular Biosciences, International Immunopharmacology

2. Provided expert opinion to Prof. Minchul Kang (Department of Mathematics, Texas A&M University-Commerce, TX) and colleagues to fund their Fluorescence Microscopy Project through an NSF i-Corps program.

3. Serving as DSC member for 4 PhD candidates in the Department of Chemistry, IIT Kharagpur

## TEACHING EXPERIENCE

### At IIT Kharagpur

1. CY19003: Chemistry Laboratory (Autumn, 2022/23)
2. CY39001: Physical Chemistry Laboratory II (Autumn, 2022/23)
3. CY41009: Introduction to Quantum Chemistry and Spectroscopy, (Autumn, 2022/23)
4. CY61044: Molecular Spectroscopy and Molecular Structure (Spring, 2022/23)
5. CY41212: Molecular Thermodynamics and Molecular Reaction Dynamics (Spring, 2022/23)
6. CY49202: Advanced Physical Chemistry Laboratory (Spring, 2022/23)

### Before IIT Kharagpur

## Curriculum Vitae (Nirmalya Bag)

7. **Teaching Assistant and Grader:** Department of Chemistry, National University of Singapore: “Physical Chemistry Laboratory” August 2010 – December 2011. Level: Undergraduate
8. **Teaching Assistant:** Department of Biological Sciences, National University of Singapore: “Principles of Optics and Microscopy” August – December 2014 and 2015. Level: Graduate
9. **Co-Instructor and Grader:** Department of Chemistry and Chemical Biology, Cornell University: “Physical Chemistry II” January – April 2019. Level: Undergraduate
10. **High School and Undergraduate student Mentor:** Mentored 2 high school and 15 undergraduate students and visiting scholars in both National University of Singapore and Cornell University on various topics including fluorescence spectroscopy, microscopy, membrane physical chemistry, and cellular signaling as part of their independent projects.
11. **Graduate Mentor:** Mentored 2 PhD and 2 Masters students on the membrane diffusion theory, membrane biophysics, and cell biology. Currently mentoring 2 PhD and 1 Masters students in IIT Kharagpur.

### RESEARCH ADVISOR

PhD research scholars (2, both ongoing), MSc project students (4, ongoing)

### PUBLICATIONS

1. G-S Yang, A. Wagenknecht-Wiesner, B. Yin, P. Suresh, E. London, B. Baird, N. Bag\* “Lipid Driven Inter-leaflet Coupling of Plasma Membrane Order Regulates FcεRI Signaling in Mast Cells” *Biophysical Journal* (2023) (Accepted)
2. **N. Bag**<sup>#</sup>, E. London, D. A. Holowka, B. A. Baird<sup>#</sup>. “Transbilayer Coupling of Lipids in Cells Investigated by Imaging Fluorescence Correlation Spectroscopy” *Journal of Physical Chemistry. B*, 126, 2325–2336 (2022)  
(<sup>#</sup>Co-corresponding author)
3. A. Batrouni,\* **N. Bag**,\*<sup>#</sup> H. Phan, B. Baird, J. Baskin<sup>#</sup>. “A Palmitoylation Code Controls PI4KIIIα Complex Formation and PI(4,5)P2 Homeostasis at the Plasma Membrane” *Journal of Cell Science*, 135 (5):jcs.259365 (2022)  
(\*Equal contribution)  
(<sup>#</sup>Co-corresponding author)
4. **N. Bag**<sup>#</sup>, A. Wagenknecht-Wiesner, A. Lee, S. Shi, D. A. Holowka, B. A. Baird<sup>#</sup>. “Lipid-based and Protein-based Interactions Synergize Transmembrane Signaling Stimulated by Antigen-clustering of IgE Receptors” *Proceedings of the National Academy of Sciences of the United States of America*, 118, e2026583118 (2021)<sup>†</sup>  
(<sup>#</sup>Co-corresponding author)

<sup>†</sup>Highlighted in *Science Editors’ choice* ([Link](#))

5. J. A. Erstling,\* J. A. Hinckley,\* **N. Bag**,\* J. Hersh, G. B. Feuer, R. Lee, H. F. Malarkey, K. Ma, B. A. Baird, and U. B. Wiesner. “Ultrasml, Bright, and Photostable Fluorescent Core-Shell Aluminosilicate Nanoparticles for Live-Cell Optical Super-Resolution Microscopy” *Advanced Materials*, 33, 2006829 (2021)<sup>¶</sup> (\*Equal contribution)

<sup>¶</sup>Application of a US Patent is submitted through Cornell University

6. **N. Bag**, M. Ramezani, D. Holowka, B. Baird. “Bringing Light to ER Contacts and a New Phase in Organelle Communication.” *Proceedings of the National Academy of Sciences of the United States of America*, 117, 9668-9670 (2020)

## Curriculum Vitae (Nirmalya Bag)

7. **N. Bag**, D. Holowka, B. Baird. "Imaging FCS Delineates Subtle Heterogeneity in Plasma Membranes of Resting Mast Cells." *Molecular Biology of the Cell*, 31, 709-723 (2020)

†Selected in the Sixth Annual Special Issue on Quantitative Cell Biology edited by Profs. Jennifer Lippincott-Schwartz, Diane Lidke, and Alex Mogilner.

8. J. K. Marzinek, **N. Bag**, R. G. Huber, D. A Holdbrook, T. Wohland, C. S. Verma, P. J. Bond. "A Funneled Conformational Landscape Governs Flavivirus Fusion Peptide Interaction with Lipid Membranes." *Journal of Chemical Theory and Computation*, 14, 3920-3932 (2018)

9. **N. Bag**, S. Huang, T. Wohland. "Investigating the Dynamics and Organization of Membrane Proteins and Lipids by Imaging Fluorescence Correlation Spectroscopy." (*Book chapter in Springer Biophysics Series: Membrane Organization and Dynamics edited by Prof. Amitabha Chattopadhyaya*) (2018)

10. S. Huang, S. Y. Lim, A. Gupta, **N. Bag**, T. Wohland. "Plasma Membrane Organization is Probe and Cell Line Dependent." *Biochimica et Biophysica Acta – Biomembranes*, 1859, 1483-1492 (2017)

11. X. X. Lim, A. Chandramohan, X. Y. E. Lim, **N. Bag**, K. K. Sharma, M. Wirawan, T. Wohland, S-M. Lok, G. S. Anand. "Conformational Changes in Intact Dengue Virus Reveal Serotype-specific Expansion." *Nature Communications*, 8, 14339 (2017)

12. **N. Bag**, X. W. Ng, J. Sankaran, T. Wohland. "Spatiotemporal Mapping of Diffusion Dynamics and Organization in Plasma Membranes." *Methods and Applications of Fluorescence*, 4, 034003 (2016)

13. J.W. Krieger, A.P. Singh, **N. Bag**, C.S. Garbe, T. E. Saunders, J. Langowski, T. Wohland. "Practical guidelines for Imaging Fluorescence (Cross-) Correlation Spectroscopy in Live Cells and Organisms" *Nature Protocols*, 10, 1948-1974 (2015)

14. **N. Bag**,\* S. Huang,\* T. Wohland. "Plasma Membrane Organization of Epidermal Growth Factor Receptor in Resting and Ligand-Bound States" *Biophysical Journal*, 109, 1925-1936 (2015)† (\*Equal contribution)

†Highlighted on the Journal webpage with a slider

15. X. W. Ng, **N. Bag**, T. Wohland. "Characterization of Lipid and Cell Membrane Organization by the Fluorescence Correlation Spectroscopy Diffusion Law." *CHIMIA*, 69, 112-117 (2015)

16. **N. Bag** and T. Wohland. "Imaging Fluorescence Fluctuation Spectroscopy: New Tools for Quantitative Bioimaging." *Annual Review of Physical Chemistry*, 65, 225-248 (2014)

17. S-M. Guo,\* **N. Bag**,\* A. Mishra, T. Wohland and M. Bathe. "Bayesian Total Internal Reflection Fluorescence Correlation Spectroscopy Reveals hIAPP-Induced Plasma Membrane Domain Organization in Live Cells." *Biophysical Journal*, 106, 190-200 (2014)† (\*Equal contribution)

†Selected in the yearly collection entitled 'Single-Molecule Dynamics in Membranes' by the editorial board of the Biophysical Journal.

18. **N. Bag**, D. H. X. Yap and T. Wohland. "Temperature Dependence of Diffusion in Model and Live Cell Membranes Characterized by Imaging Fluorescence Correlation Spectroscopy." *Biochimica et Biophysica Acta – Biomembranes*, 1838, 802-813 (2014)

## Curriculum Vitae (Nirmalya Bag)

19. **N. Bag**, A. Ali, V. S. Chauhan, T. Wohland and A. Mishra. "Membrane Destabilization by Monomeric hIAPP Observed by Imaging Fluorescence Correlation Spectroscopy." *Chemical Communications*, 49, 9155-9157 (2013)
20. J. Sankaran, **N. Bag**, R. Kraut and T. Wohland. "Accuracy and Precision of Camera-Based Fluorescence Correlation Spectroscopy." *Analytical Chemistry*, 85, 3948-3954 (2013)
21. **N. Bag**, J. Sankaran, A. Paul, R. Kraut and T. Wohland. "Calibration and Limits of Camera-Based Fluorescence Correlation Spectroscopy: A Supported Lipid Bilayer Study." *ChemPhysChem*, 13, 2784-2794 (2012)
22. R. Kraut, **N. Bag** and T. Wohland. "Fluorescence Correlation Methods for Imaging Cellular Behavior of Sphingolipid-Interacting Probes." *Methods in Cell Biology*, 108, 395-427 (2012)
23. T. N. Burai, **N. Bag**, S. Agarwal, E. S. S. Iyer and A. Datta. "Modulation of Fluorescence Properties of MMeAQ in Micelles and Cyclodextrins." *Chemical Physics Letters*, 495, 208-211 (2010)

### MEMBERSHIP IN PROFESSIONAL ORGANIZATION

Biophysical Society (2012 – Present)

### CONFERENCE PRESENTATIONS

1. FCS@50 – Celebrating 50 years of FCS, January 12-14, 2023 (Thiruvananthapuram)
2. National Workshop of Fluorescence and Raman Spectroscopy, January 8-11, 2023 (IISER Thiruvananthapuram)
3. Lipid Research Division Seminar Series (American Society for Biochemistry and Molecular Biology), April 27, 2022, Virtual Meeting (Invited Oral Presentation)
4. 65<sup>th</sup> Biophysical Society Annual Meeting, February 22-26, 2021, Virtual Meeting (Oral Presentation).
5. 64<sup>th</sup> Biophysical Society Annual Meeting, February 15-19, 2020, San Diego, California, USA (Poster Presentation).
6. 63<sup>rd</sup> Biophysical Society Annual Meeting, March 2-6, 2019, Baltimore, Maryland, USA (Poster Presentation).
7. 62<sup>nd</sup> Biophysical Society Annual Meeting, February 17-21, 2018, San Francisco, California, USA (Poster Presentation).
8. 61<sup>st</sup> Biophysical Society Annual Meeting, February 11-15, 2017, New Orleans, Louisiana, USA (Oral Presentation).
9. International Physics of Living Systems Network (iPoLS), July 21-24, 2014, Munich, Germany (Oral Presentation).
10. 5<sup>th</sup> International Lipid Symposium, March 18-21, 2014, NUS, Singapore (Poster Presentation).  
† Best poster award
11. 58<sup>th</sup> Biophysical Society Annual Meeting, February 15-19, 2014, San Francisco, California, USA (Poster Presentation).
12. 7<sup>th</sup> Singapore International Chemistry Conference (SICC 7) and 12<sup>th</sup> Asia-Pacific International Symposium on Microscale Separation and Analysis (APCE 2012), December 16-19, 2012, NUS, Singapore (Poster Presentation).
13. Focus on Microscopy Conference (FoM 2012), April 1-4, 2012, Singapore (Oral Presentation).
14. 56<sup>th</sup> Biophysical Society Annual Meeting, February 25-29, 2012, San Diego, California, USA (Poster Presentation).
15. 6<sup>th</sup> International Structural Biology and Functional Genomics, December 6-8, 2010, NUS, Singapore (Poster Presentation).