

About Sohang Kundu

Sohang joined Dolna in 1997 in lower nursery and graduated top of his class in 2012. Following a Bachelor's degree in Chemistry from Presidency University and a Master's from the Indian Institute of Technology Bombay, he traveled to the United States on a fully funded scholarship to the PhD program in Physical Chemistry at the University of Illinois, Urbana-Champaign. During his doctoral studies, Sohang published 18 research papers in international journals with his advisor Dr. Nancy Makri. His work was recognized with multiple graduate scholarships and invited talks at several US and international conferences, culminating in him receiving the annual dissertation award from the University of Illinois' Department of Chemistry in 2023. Following his PhD, Sohang joined Dr. Timothy Berkelbach's research group at Columbia University where he currently holds the position of a postdoctoral research scientist.



Sohang's thesis has been recognized with the 2024 Justin Jankunas Doctoral Dissertation Award in Chemical Physics by the American Physical Society for its contributions to the understanding of photosynthetic light harvesting using Feynman path integrals.

About the Justin Jankunas Award and the American Physical Society

The American Physical Society (APS) is the largest association of physicists in the United States, with a membership base spanning the whole world. The APS national meeting is held in March each year, and is attended by more than 10,000 physicists – including previous, current, and potential Nobel prize winners. *The Justin Jankunas Award is presented by the Division of Chemical Physics of APS to “recognize one doctoral thesis of outstanding quality and achievement in chemical physics every year”.* Out of numerous candidates nominated by the physics and chemistry departments of all the universities in the United States, up to three finalists are invited each year to the APS National Meeting to deliver a 20-minute lecture based on their thesis research. At the end of the ceremony, one of the lectures is awarded the Justin Jankunas Dissertation Award. The award is named after Dr. Justin Jankunas, a bright and young chemical physicist who graduated from Stanford University with flying colors in 2013, and was conducting postdoctoral research at Ecole Polytechnique Fédérale de Lausanne when he passed away in a tragic motorcycle accident. It was in his memory, and in recognition of the 19 research papers he had published in his short career, that his friends, family, and teachers helped rename the “APS Doctoral Dissertation Award in Chemical Physics” the “Justin Jankunas Award”.

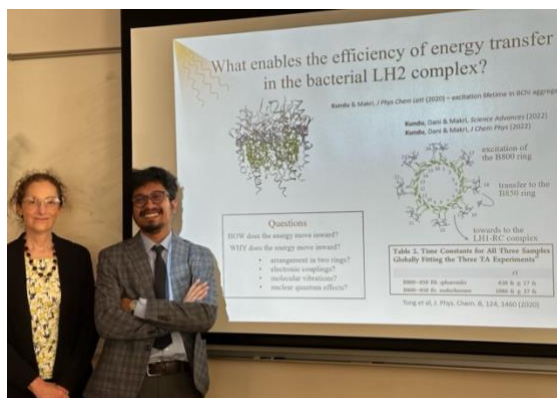
Dr. Sohang Kundu, who has received the award this year, is only the second Indian to do so.

About the work that won Sohang the award

Sohang's main interest, ever since his time as a curious teenager in school was in the overlap between chemistry and physics. Within the walls of Dolna he wondered how the laws of physics he learnt from Jyotishka da and Susmita di applied to the chemical reactions on Balaji da's blackboard. That the same calculus, algebra and trigonometry Suparna di and Balaji da taught him were the tools he needed to apply the laws of physics to these chemical reactions, amazed him.

During his journey at the undergraduate and postgraduate levels, Sohang became fascinated by the microscopic world of electrons-protons-neutrons – the fundamental particles of matter – and their interactions with photons, the fundamental particles of light. And so, for his PhD, Sohang decided to take up a research problem that would only bring him closer to that world – he studied the chemical physics of photosynthesis. Photosynthesis is arguably one of evolution's biggest accomplishments as it provides every living being the energy it needs to carry out its life's processes. All of our energy comes from the Sun and enters the bottom of our food chain, absorbed by molecules in bacteria and plants. Despite decades of research, scientists have barely been able to scratch the surface of the true complexity of this process. Sohang's thesis aims to demystify photosynthesis by asking the question: "what makes the molecular architectures in plants and bacteria so efficient in absorbing and transferring solar energy?" Besides uncovering the truth behind nature's most fundamental phenomenon, the answer to this question would enable chemists in designing molecules in the laboratory to develop more efficient artificial solar cells. At a time when it is imperative to harness renewable energy with improved efficiency, this research contributes to enabling a sustainable and greener future.

During his PhD Sohang developed methods to solve equations of physics laid down by Richard Feynman and applied them to the particles involved in photosynthetic architectures. His solutions, analyzed using computer simulations, show with unprecedented clarity that favorable interactions between the motions of electrons and those of nuclei (the positively charged parts of atoms) enable bacteria and plants to harness solar energy and utilize it to drive essential chemical reactions. Using his findings, Sohang was able to explain the outcomes of experiments performed in the recent past and also helped clarify a decades-long debate about the role of nuclear motion in the early steps of photosynthesis. The Justin Jankunas award recognizes both the innovations of new methodology, removing existing bottlenecks in solving the equations of physics, and their applications to photosynthesis.



Sohang with his PhD advisor Dr. Nancy Makri after successfully defending his thesis, May 8th, 2023

As a postdoctoral scientist at Columbia, Sohang has now moved on to a different research problem. Still driven by the need to develop alternate technology for generating and preserving energy, Sohang is currently invested in understanding the fundamental chemistry and physics of Lithium-ion batteries.