Alumni Spotlight: Insights from Prof. Swadhin K. Mandal

Prof. Swadhin K. Mandal is a faculty member of IISER Kolkata, distinguished chemist specializing in organometallic chemistry and catalysis. He completed his B.Sc. (third rank, first class) and M.Sc. (first rank, first class) at the University of Kalyani (1990–1995) and earned his Ph.D. from the Indian Institute of Science, Bangalore under S. S. Krishnamurthy. He conducted postdoctoral research at the University of California, Riverside (2002–2006) with Robert C. Haddon and as an Alexander von Humboldt Fellow with Herbert W. Roesky at the University of Göttingen (2006–2007). He has received prestigious honors including the Shanti Swarup Bhatnagar Prize in Chemical Sciences (2018), the Friedrich Wilhelm Bessel Research Award (2020), and the SERB Distinguished Investigator Award. He is a Fellow of both the Indian National Academy of Sciences (FNA) and the Indian Academy of Sciences (FASc). In 2025, he has received the prestigious J. C. Bose Fellowship from ANRF,. He serves on editorial advisory boards for leading journals in chemistry and has held visiting professorships at premier institutes, worldwide.
Here he talks with Prof. Subhratanu Bhattacharya about his journey from Classroom of KU to an illustrious career, and his perception about the University of Kalyani.

How would you describe your association with the University of Kalyani and your first impressions of the campus?

Answer: I feel strongly connected with Kalyani University (that's how we used to call it, not as University of Kalyani!) since my childhood. When I was in class eight, I stood first in my school in science exam (although I was never the first boy in the school except in my last school exam). I received a book as a prize, "Biswasghatak" written by Narayan Sanyal. It is a historical fiction novel based on facts from the Manhattan Project and inspired by the book 'Brighter than a Thousand Suns" by the Austrian author Robert Jungk. I was a voracious reader of various books since my childhood from our library at my village (the library is now abandoned, like many other libraries around, very sadly though!). I was extremely thrilled to read the book. The book is about the stories of a series of discoveries unravelling atomic structure and building up of the first atomic bomb, also, later the path towards nuclear energy, and how Germany, especially the University of Göttingen, contributed to this development.

Since then, I started dreaming of studying chemistry at Kalyani, so that someday I will go and do research at the University of Göttingen in Germany! I did not know any other university other than Kalyani University, back then. For me, studying at Kalyani University will lead me to the University of Göttingen!

I was quite clear about my objective since then. I still feel very proud that I could complete all three dreams. I studied chemistry at Kalyani University, and then I gave up my position in the USA and another offer from the UK (where I was offered a position with a promise to be converted to Professorship), and I took up the Alexander von Humboldt Fellowship at the University of Göttingen, Germany. I did not think twice to make this decision the moment I was offered an opportunity to study at Göttingen.

With this background, Kalyani University plays a very significant role in my academic career graph. I joined the chemistry department in 1990. At that time, I can very clearly remember, it was a unitary campus for both graduate and post-graduate courses. By that time, the university was already quite well established. It was considered very competitive to get admission into its Undergraduate program. Altogether, we were only 18 students in the chemistry integrated UG-PG program who were offered, which gave us a feeling of an "elite" class of students. The admission offers used to be made based on the higher secondary results.

The campus was very calm and academic, with lush green fields and tree-lined roads, within a semi-rural setting, which attracted me on the very first go. It very soon became my home away from home. I also feel proud to be a part of one of the very mature chemistry departments of India (the chemistry department was founded in 1961).

So, yes, the Kalyani University is an inseparable part of my career graph. For me, Kalyani University has been an honour since I was a child, and today, it remains the same.

Why did you choose the University of Kalyani for higher studies?

Answer: I originated from a remote village, and for me, the world was very small, I am talking about the mid-80s. I only knew about Kalyani University, of course, a little later, I got to know about Presidency College or Jadavpur University in Kolkata, which is far away from my home! But before that, my "mental marriage" with Kalyani University happened!

I never felt I would fit in Kolkata; rather, a village or town-like setting is more appealing to me, and even today, I have a similar feeling. That's how I am here in IISER Kolkata in the midst of a village, and life is incredibly healthy here, not polluted like in big cities.

How has the University of Kalyani impacted your multifaceted career?

Answer: I always believe that where your mind is stimulated, you can do anything or perhaps everything. Kalyani University stimulated my mind and my intellect! It gave me the first modern lesson in chemistry.

In the beginning, I did not like the chemistry teaching as it was being taught in English. I was struggling to grasp the language more than the science. We started loving those teachers who were not shying away from speaking in Bengali in the classroom. I now take the opportunity to give my scientific lectures in Bengali, so that I can reach out to the students from villages who are not educated by the English medium schools.

Actually, only when you face a challenge in life that it opens up new opportunities. Since I was sitting idly in many lectures at the beginning, I started reading by myself at home with the help of a dictionary. Many times, I dropped out of the class, and in fact, in the first part, I paid an extra fee to sit in the exam because I was not regular in class. But slowly I picked up within two years, when I started realizing the rigorous academic training by its renowned professors.

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Various dedicated faculty members shaped the fundamentals of the scientific chemistry background in me. The calm and focused atmosphere at KU inspired my independent thinking, which helped my future scientific outlook.

In the final year of my MSc, I discovered that many of my seniors from KU were doing outstanding research at IISc Bangalore. Some notable examples include Subhrangshu Mandal (now a faculty member at the University of Texas at Arlington, USA), Paresh C. Ray (currently a professor at Jackson State University, USA), Swapan Pati (now a faculty member at JNCASR, Bangalore, and a recipient of the Shanti Swarup Bhatnagar Prize in Chemical Sciences), and Jitendra K. Bera (now a professor at IIT Kanpur).

Their story we heard from Prof. A P Chattopadhyay, a shy but very inspiring faculty member of Chemistry at KU then, who told me to go to IISc Bangalore for a PhD. Later, I joined the IISc Bangalore for my PhD.

So basically, KU worked as the launching pad for my career growth: towards my destiny, and that was the University of Göttingen!

What has been the trajectory of your career since you left the University of Kalyani?

Answer: After leaving the university, I joined Prof. S. S. Krishnamurthy's group at the Inorganic and Physical Chemistry (IPC) department of the Indian Institute of Science, Bangalore, for my doctoral research, which I finished in 2002.

Having earned the PhD degree, I pursued postdoctoral research with Prof. Robert C. Haddon in the Department of Chemistry at the University of California, Riverside, USA.

In 2006, I joined the famous German Inorganic Chemist Prof. Herbert W. Roesky as the Alexander von Humboldt Fellow at my dream destination: the University of Göttingen!

Following this, I started as an Assistant Professor at IISER Kolkata in 2007. Now, I am working as a professor in the Department of Chemical Sciences, where I served earlier as the Head of the Department.

During my journey at IISER Kolkata, I have been fortunate to earn several prestigious national and international recognitions, including the very competitive (annually, approx. 20 internationally recognised scholars are awarded globally across the field of natural sciences, medicine, engineering and social sciences) Friedrich Wilhelm Bessel Research Award (2020) from the Alexander von Humboldt Foundation in Germany and the Shanti Swarup Bhatnagar Prize in Chemical Sciences (2018). I have also been recognised with the SERB Distinguished Investigator Award. I was elected as a Fellow of the Indian National Science Academy and the Indian Academy of Sciences. Very recently, I was awarded the prestigious J. C. Bose Fellowship by the ANRF, Govt of India.

I am serving (or have served) as an International Editorial Advisory Member for various journals of the American Chemical Society and the Royal Society of Chemistry. I also held visiting professorships at several esteemed institutions, including IIT Bombay, the Weizmann Institute of Science, Israel, Rutgers University, New Brunswick, USA, Paul Sabatier University, France and various universities in Germany, including the University of Göttingen.

My current research interests include the development of new concepts in catalysis using main-group elements that mimic transition metals.

My work has been published in nearly 140 high-impact international journals and patents, including Nature, Nature Catalysis, Journal of the American Chemical Society (JACS), Angewandte Chemie, etc, among others. To date, I have supervised 19 PhD students, several master's and postdoctoral students.

What inspires your own research?

Answer: I am driven by the excitement of thinking outside the box and pursuing ideas that no one has imagined before. Freedom of thought is at the core of my research philosophy.

I always tell my students: Don't work on problems that have already been solved. Even if we obtain results, we don't pursue them unless the problem itself is novel and truly excites us. We only publish work that inspires us and has the potential to shift perspectives.

Currently, we're challenging the conventional belief that certain catalytic reactions are impossible without metals. Our goal is to develop metal-free catalytic processes for reactions that the scientific community widely assumes cannot occur without metal catalysts. It's an enormous challenge, but that's exactly what makes it so exciting for me.

What do you enjoy most about your career?

Answer: In our profession, we are given an excellent opportunity to shape young and bright minds. I very much enjoy the development of human resources, and they are the best product we can ever produce, and yes, they are the finest products which can be made in India!

Moreover, while doing this, I also learn many new things from students. I am fortunate to interact closely with young minds, and many times those minds are brighter than thousands of suns!

This is the enormous excitement of my career!

Could you provide some information about your research?

Answer: Yes, of course!

It is now widely recognized that certain essential elements will be depleted from the earth within the next 100 years due to their increasing industrial demand. To address this challenge, it is imperative to seek sustainable alternatives that replace existing methods with more environmentally friendly solutions. A key highlight of our research is an innovative approach to catalysis, which eliminates the need for expensive, rare, and toxic transition metals: traditionally considered essential for catalytic transformations such as C-C coupling reactions and CO_2 reduction.

Our work on transition metal-mimicking catalysts not only opens new avenues for research but also holds immense promise for industrial applications, offering cost-effective and sustainable alternatives. Our work has been praised and highlighted by international experts, including a Chemistry Nobel Laureate.

Many industrial processes, including pharmaceutical industries, heavily rely on rare, expensive, and often toxic transition metals. We have made fundamental contributions to transition metal-free catalysis, particularly in the field of C-C cross-coupling reactions, a breakthrough that aligns with the Nobel Prize-winning chemistry in this area (Nobel Prize in Chemistry, 2010).

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These reactions are crucial for various industrial applications and have traditionally depended on palladium (Pd)-based catalysts. However, achieving such transformations without transition metals has long been considered a major challenge. My group has successfully developed methods to accomplish C-C and C-N cross-coupling reactions without any transition metals.

In a parallel effort to eliminate the dependence on transition metals, we have made significant contributions to CO_2 conversion, addressing one of the most pressing global challenges: greenhouse gas emissions. My research team has developed metal-free catalysts for the discovery of new reactions with CO_2 into valuable chemicals, under ambient conditions. These innovative approaches not only make CO_2 conversion processes more economically viable but also pave the way for future green industrial technologies.

Prof A P Chattopadhyay (middle) with KU chemistry alumni (right to left): Swadhin Mandal with Prof Swapan Pati (JNCASR, Bangalore), Prof Jitendra Bera (IIT Kanpur) and Prof. Sukhendu Mandal (IISER Thiruvananthapuram) during BRICS meet at IISER Kolkata in Jan,2020,

What message would you like to share with the current students of the University of Kalyani?

Answer: Stick to your goals and never give up. Do whatever makes you happy and raises your self-esteem. I lost my wife almost eight years ago, very suddenly and at a very young age, so I can tell you, life can go upside down anytime. So, don't wait, just try everything or anything you love to do.

Remember only one thing: while doing so, you must not harm others!

You often emphasize passion and excitement in research. What advice would you give to students struggling to find their true passion?

Answer: That's a great and very real question! Many students feel uncertain about their "true passion,".

Here's some advice:

Passion is often discovered through action, not contemplation. Try things. Read literature, attend seminars. Remember, curiosity grows with exposure. Many researchers didn't begin with a burning passion for their topic. They found an area that was interesting enough, and over time, their engagement and depth of understanding grew into passion.

Your interests will evolve. That's normal. Mentors and research communities can make a huge difference. Sometimes, a good supervisor or lab culture can ignite your passion more than the topic itself.

How do you feel when you look back at your journey from being a student at the University of Kalyani to becoming an internationally recognized scientist?

Answer: I feel very nostalgic!

I came from a modest family background in a rural village setting around Karimpur, which was not well-developed at the time. Coming from an obscure village towards gradually maturing up into a doctorate and post-doctorate researcher in a seemingly unknown country, to becoming what I am today. It has been, overall, an overwhelming experience!

My parents are my backbone of success, who have always inspired me to excel towards my journey. My wife has been a great friend who stood by me until she was alive, and I believe even today she is with me.

Of course, my teachers from KU, my PhD supervisor Prof S. S. Krishnamurthy, who taught me the value and ethics of scientific research, all contributed very significantly.

My daughter, the brightest mind I have ever seen, always inspired me to be better. She is literally my inspiration to learn new things and be smarter.

Notably, I must say, a handful of my students who were always with me during the most difficult days and today have increased my life span with their care and love. I truly admire their affection.

It's a limitless ladder of excellence, and we are climbing through it. I believe that whoever I am today, I must strive to be better tomorrow and even better the day after that. This journey is not mine alone; it has been shaped by the collective efforts of many. I often find myself at a loss for words to fully express my gratitude for the support I have received from each one of them.

Beyond Lab: Lab trip to Vietnam at Ninh Binh fun with his daughter and PhD students

Some selected notable publications of Prof. Mandal

•Gautam, Sreejyothi…Mandal and coworkers, J. Am. Chem. Soc. 2025, 147, 23001−23013 (*Highlighted and Commented by a Chemistry Nobel Laureate*)

•Maji… Mandal and coworkers, Nature Catalysis 2024, 7, 375-385 (*Highlighted and Commented by a Chemistry Nobel Laureate*)

•Sil… Mandal and coworkers, J. Am. Chem. Soc. 2022, 144, 22611-22621 *(The first author is an alumnus from KU, Chemistry)*

•Ahmed… Mandal and coworkers, J. Am. Chem. Soc., 2018, 140, 8330-8339. *(Highlighted in Chemistry World)*

•Sau… Mandal and coworkers, Angew. Chem. Int. Ed. 2016, 55, 15147 –15151 *(Highlighted in Nature India)*