# On the Poetry of Surfaces: Interview with Rukmini Dey


Rukmini Dey lecturing at ICTS in 2025 Ms Noel Matoff

Rukmini Dey is a mathematician and mathematical physicist at ICTS-TIFR, Bengaluru. Her research lies at the interface of geometry and mathematical physics, with a focus on quantization and optimization problems. She completed her PhD at Stony Brook University in 1998 under the supervision of Leon Takhtajan. Before joining ICTS-TIFR, she was a faculty member at HRI, Prayagraj. She is also a passionate poet and writer.

In this conversation with Purnima Tiwari and Aayush Verma for *Anveshanā*, Prof. Dey reflects on her childhood, her mentors, mathematics as poetry, her years at IIT Kanpur, the problem of quantization, the importance of outreach, and an academic journey shaped by geometry. We are also delighted to include a selection of her poems with this interview.

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**Could you tell us a bit about your childhood and the early interests that set you on your current path?**

**Rukmini Dey:** I was born and brought up in Kolkata. I had a really special childhood. My parents, Mira Dey and Jishnu Dey, were both physicists and taught at Presidency College and Maulana Azad College. They would come home exhausted after traveling on crowded buses, but then sit with their pen and paper and do research in physics. They had several papers, and looking up to them ignited a great interest in physics and research in us. However, at some point, I realized that mathematics, in particular, was extremely beautiful. There is something deep, serious, and extremely truthful about it. The simple fact that every line must be proved hints at its truthfulness. Later, I was influenced in a similar manner by geometry. It was the first place in our curriculum where proofs were introduced through elementary theorems. This fascinated me, and I thought there was something deep and serious that I wanted to learn.

Rukmini Dey with her mother Mira Dey.
Rukmini Dey

**Since your parents were physicists, did they actively share the nuances of their daily work with you?**

**RD:** My parents were incredibly inspiring. Whenever they came across something exciting, they would share it with us over dinner. They also bought us various books. I remember one particularly fascinating book, "Why, What, Where", that explained how things work. It covered the formation of stars, the main sequence, and extraordinary phenomena like neutron stars and black holes. I remember we were completely mesmerized by it all, which is why we three sisters wanted to study physics.

**Would you say that was the starting point of your journey as a reader?**

**RD:** No, we got into reading a long time ago. This was actually during my pre-teens, around class eight or nine. We used to be avid readers of English, Russian, and Bengali literature.

**Were your siblings similarly inclined toward the sciences?**

**RD:** Yes, my two sisters also pursued physics and are now both physics professors in the US, one at UCLA and the other at Louisiana State University. They do amazing work. My twin sister Joyoni specializes in medical imaging, interferometry, etc., at LSU, and my sister Damini is in medical physics at Cedars Sinai Hospital and UCLA.

> *"The simple fact that every line must be proved hints at its truthfulness."*

**How important is early exposure and the presence of role models in shaping one's scientific journey?**

**RD:** Early exposure makes a big difference. Not only do you get to like the subject very early, but it also becomes a part of you and gives you confidence. There will be many tough things in life; there are times when people will say you are not good enough, or you will get indirect messages that this is not suitable for you. But you keep plodding on because you know your parents/mentors did it. Having a role model makes a big difference. You see people plodding on despite all the negative obstacles, just for the joy of the subject.

**You have mentioned that having a role model is vital. Who were the people who most influenced your mathematical journey at different stages of your life?**

**RD:** Initially, my parents. Later on, for a brief while, Professor Karen Uhlenbeck was my mentor. Unfortunately, at the time, I was not in a position to learn much. But later, I kept in touch and indirectly learned a lot from her. Even though she was very far off, she would still reply warmly to my messages. I also really look up to another professor, Professor Dusa McDuff, who was at Stony Brook when I was a PhD student. She seemed to be the person of reason in this mad world. I followed their papers. They were my indirect, long-distance mentors.

Rukmini Dey with Rajesh Gopakumar in Bhutan. Rukmini Dey

**Who inspired you during your undergraduate years?**

**RD:** Apart from my parents, Professor Shobha Madan of IIT Kanpur. She was a true inspiration and a friend. I also rediscovered the music and poetry of Tagore at that time. I met my husband, Rajesh [Gopakumar], there, and he gave me warm intellectual and emotional support.

**What is your first recollection of listening to Tagore's songs?**

**RD:** It is so ingrained in us. We do not know when it started. It's like sunrise for us. As soon as the sun rose, the radio would turn on. Every day during breakfast, three very good singers would sing Tagore songs on All India Radio.

**Do you have a favorite song or poem by him?**

**RD:** I have many favorite songs for different times and different moods. There are layers and layers of meaning. What a song meant to me as a teenager is very different from right now.

**Beyond Tagore, what writers or literary traditions shaped you while you were growing up?**

**RD:** My grandfather, Bishnu Dey[1], was a poet who deeply explored poetry and literature

[1]Bishnu Dey (1909-1982) was a contemporary Bengali poet in the post-Rabindranath era. See his Wikipedia entry.

from around the world. My grandmother, Pranati Dey, used to read us Shakespeare's plays. We actually grew up on Bengali, Russian, and English literature. We read a lot of Russian books, starting from Tolstoy and Dostoevsky to Sholokhov and Turgenev. Russian history is so tumultuous, and the literature is very deep. Later on, during my undergraduate days, I was into reading Camus.

**Has your relationship with literature changed over the years?**

**RD:** Actually, this stayed with me for a long time. But somewhere in the middle of my career, I stopped reading literature. I do not know; it just could not sustain me beyond a point, except for Tagore's songs, which still uplift me. I just kept reading math books. Math is my new literature. Even if I do not understand it, I still keep reading.

**Let us move to your undergraduate years. What was your experience like as a student at IIT Kanpur?**

**RD:** I was in the five-year mathematics program at IIT Kanpur from 1987-92, and I really enjoyed it. I also met my husband, Rajesh [Gopakumar], there. I have to mention my teacher, who really inspired me at the time: Professor Shobha Madan. She was my topology teacher, and I remember her wise words even now. I also had wonderful friends, Reema, Srilatha, Monika, Renu, Rita, whose words I remember even now.

Professor Shobha Madan. IISER Mohali

**Were you in the 5-year BS-MS program then?**

**RD:** At the time, the five-year program was called an Integrated MSc, and admission was through the JEE.

**Was Professor Gopakumar your batchmate? And what do you remember most vividly about student life at IIT Kanpur?**

**RD:** Yes, he was also in our batch, studying physics. We hung around together a lot. There were beautiful villages outside the IIT Kanpur campus where we used to go for long walks.

**When did you last visit IIT Kanpur?**

**RD:** That was a long time ago. The campus has changed a lot – a lot fancier, but perhaps a lot fewer trees.

**Yeah, fewer peacocks as well, but more dogs.**

**Coming back, although you were deeply interested in physics, what led you to choose mathematics?**

**RD:** I was given [IIT] Kharagpur as an option. I had other choices, but I picked mathematics because I always liked it. I especially loved the idea of giving proofs. The fact that every single line has to be proven, and proven to be correct, really attracted me.

> Dance of the Mind
>
> *Mathematics, the dance of the mind, synonymous with truth. In that temple, I was alone with mathematics, unjudged by people. And as I was alone, the bird who nested in the temple pillars chirped happily and told me to hold water in my palm for as long as it will stay, the holy water of symmetry and harmony.*
>
> — Rukmini Dey
> *The Oriole in My Garden*

**Despite choosing mathematics, you have remained closely connected to physics.**

**RD:** I like working on problems with physical applications, but my work is mathematical and still not very practical.

**Besides Professor Shobha Madan, were there other teachers at IIT Kanpur who had a lasting influence on you?**

**RD:** Professor U.B. Tiwari was very respected amongst us. We looked up to him. And then there were several others, like Professor H.S. Mani from the physics department. We were really influenced by his teaching. Then there were Professor Jayanta Bhattacharya and Professor Kalyan Banerjee, who were very good physics teachers. I remember learning about chaos, taught by Kalyan Banerjee, and I was just thrilled by it.

**What did H. S. Mani teach?**

**RD:** He taught us quantum mechanics.

> *"Math is my new literature. Even if I do not understand it, I still keep reading."*

**Who were some of your classmates and friends from those years whom you still remember?**

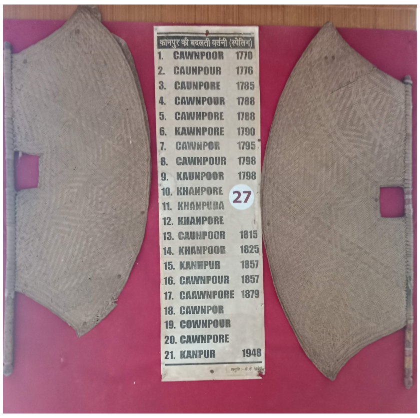
**RD:** Srilatha Ganesan and Anurag Kumar Singh were good friends. Now that they are married and in Utah. Anurag is a professor of mathematics at the University of Utah. Reema Chatterjee, Monika Agarwal, and Renu Mehra were also good friends of mine. Mahan Mitra, who is now Mahan Maharaj, was a batchmate and is a mathematician at TIFR Mumbai. I am still in touch with all of them. Rita Singh was a very good friend of mine, but we lost touch.

**Were you drawn to developments in theoretical physics such as string theory?**

**RD:** No, I was not going towards physics, though I did try to understand string theory a lot. I tried reading up on it, especially from a book by Nakahara, *Geometry, Topology and Physics*, and Polyakov's books, but it did not work out. It was very attractive, but I had my doubts. I did take a few courses in particle physics, and that fascinated me, especially Noether's theorem.

**Do you still think about string theory in the same way today?**

**RD:** Actually, I do not know enough to judge. Right now, I am mature enough to just say that I really do not know. I try not to comment on other people's work which I do not understand. But I do believe one thing: if somebody is trying to understand the universe in a certain way, we should not discourage them. You just let people develop their tools, and maybe one day, it will all make sense.




An information panel at a museum in Bithoor, Kanpur, tracing the historical spellings of the city's name. Anveshanā

**Alright, let us go back to Kanpur. Did you also spend some time exploring the city and its surroundings beyond the campus?**

**RD:** We did not go into the city much. But the areas just outside Kanpur were a different story. We loved exploring the outskirts because the villagers were so kind, and it was always such a pleasure walking around the Ganga canal area.

**Were there other places around Kanpur that you particularly enjoyed visiting?**

**RD:** Yes, we once cycled to Bithoor. We also used to go cycling a lot. A group of us would often cycle together down the Ganga. I remember Prof. Shobha Madan really enjoyed birdwatching, and I went with her to places where there were always plenty of birds. Towards the end of my time there, I became very close with a friend, Rita Singh, with whom I used to walk a lot. Rajesh was also quite an adventurer, and we used to go to the villages.

**You later returned to IIT Kanpur as a faculty member. How did that experience differ from your years there as a student?**

**RD:** It was very different, of course. As a faculty member, you have so many duties, and I was really overwhelmed and quite lonely. But I had very good students. Some of them actually kept in touch. Professor Arvind Ayyer of IISC once told me, "I was your student, and I learned analysis from you." I still remember some of my students.

**What subjects did you teach while you were there?**

**RD:** I mostly taught real analysis and differential geometry; those two subjects stand out most prominently in my mind. I may have taught topology as well, though it was a while ago, and I do not remember precisely.

**Let us move to your PhD at Stony Brook. What drew you there, and what research problems did you hope to pursue?**

**RD:** I went to Stony Brook in 1992 because I specifically wanted to learn geometry, especially areas of mathematics that provided insights into physics. It was a very good experience. I worked under Professor Leon Takhtajan, focusing on two main areas. The first was a problem in mathematical gauge theory. The second was highly geometrical: prescribing Gaussian curvature on Riemann surfaces with punctures.

**How did you choose this quantization problem?**

With Leon Takhtajan and Vamsi Pingali at IISC Bangalore in 2017. RUKMINI DEY

**RD:** I was deeply fascinated by a visit from Maxim Kontsevich, who was working on Poisson manifolds and deformation quantization. That experience inspired me to learn more and to pursue quantization, specifically what it means for mathematicians. It is a bit different from the physicists' approach; it's much more formal. While mathematical work often finds a use in physics much later, its immediate utility is not always transparent. Still, I was completely captivated by the mathematical side of it. I ultimately focused my research on the geometric quantization of certain moduli spaces of Seiberg-Witten equations. My advisor [Leon Takhtajan] actually wanted my other project to be the focus of my PhD[2], but I really wanted to pursue this one. He gave me the freedom to do so, and it turned out to be incredibly fruitful. He would give very useful, broad hints, suggesting I look into a specific area or certain line bundles, but I had to work out the details myself. We would meet briefly every two weeks. He was a profound mathematician, and through the deep topics he taught in his classes, he helped me see the true beauty and depth of mathematics all over again.

**Did his [Takhtajan[3]] background in the Russian mathematical tradition influence the way he mentored students?**

**RD:** Yes, of course, but he was actually a physicist who later became a mathematician. In Russia, there is less distinction between physics and mathematics.

**Quantization appears in several mathematical and physical settings. How do you think about deformation and geometric quantization?**

[2]Thesis available at https://www.math.stonybrook.edu/alumni/1998-Rukmini-Dey.pdf

[3]An interview with Leon Takhtajan can be found in *Bhāvanā* July 2017 issue: https://bhavana.org.in/leon-takhtajan/.

**RD:** At very small scales, on the scale of Planck's constant, $\hbar$, quantization becomes necessary because quantum mechanics is the dominant reality in small scales. In the standard approach, observables like energy, momentum, and angular momentum are treated as operators acting on a Hilbert space. The quantum states live in this Hilbert space, the operators act upon them, and the states evolve according to the Schrödinger equation. While there are many other viewpoints nowadays, this is a starting point. In deformation quantization, we take the algebra of observables and quantize them by introducing a 'star product' which makes them naturally non-commutative. However, in the classical limit, as $\hbar \to 0$, this product simply becomes the ordinary product. Furthermore, the commutator becomes proportional to the Poisson bracket in the same limit.

When we say that $\hbar \to 0$ represents the classical limit, it simply means that the macroscopic scales of the problem are so much larger than Planck's constant ($\hbar$) that $\hbar$ effectively approaches zero. You can't take that limit in the quantum world because quantum scales are on the order of $\hbar$ itself. But when you are operating in a classical system, you can. In that limit, the star product becomes the usual product, and the star commutator becomes proportional to the Poisson bracket. That, in essence, is deformation quantization.

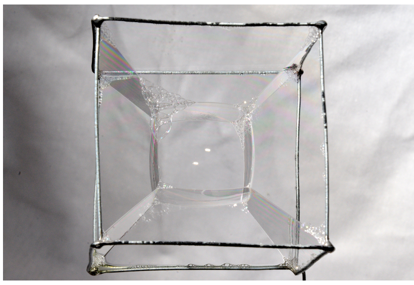
> *"While mathematical work often finds a use in physics much later, its immediate utility is not always transparent."*

Another approach is geometric quantization, which is a beautiful subject in its own right. Geometric quantization occurs when you have a symplectic manifold, and its symplectic form is integral. In that case, you can construct what is called a pre-quantum line bundle whose curvature is proportional to the symplectic form, and its sections are the wave functions. The observables (functions on the symplectic manifold) now act as operators on these sections. There is a specific way to define these operators so that they must satisfy the Dirac condition: the commutator of two operators is proportional to $\hbar$ times the operator corresponding to the Poisson bracket.

I am now trying to explore deformation quantization of non-symplectic manifolds by embedding them into certain special symplectic manifolds with a deformation quantization and then inducing the quantization from the ambient manifold. This is related to quantum information theory.

**Could you explain the mathematical distinction between minimal and constant mean curvature surfaces, and the optimization principles behind them?**

**RD:** Yes, that is another very interesting topic. Minimal surfaces are zero-mean curvature surfaces like the helicoid and the catenoid, and mathematicians have been studying them for 200 years. On the other hand, there are CMC (constant mean curvature) surfaces, such as the sphere, the cylinder, the unduloid, and the nodoid, which are also reflected in nature.



A soap film spanning a cubic wire frame forms an area-minimizing surface. By Ddg-foto through Wikimedia Commons

Both categories involve integrable systems. I should also mention that there is an optimization problem behind all of this. For example, minimal surfaces locally minimize area. The optimization problem that guides CMC surfaces is a bit different. For those surfaces, the goal is to minimize the surface area given a volume constraint.

As an aside, Nature is always optimizing one thing or another under certain constraints. It's truly amazing. For instance, I recently became very interested in the growth of a lily. If you ever watch the ICTS talk[4] "To paint the lily, mathematically" by Professor L. Mahadevan from Harvard, you will see him explaining the exact mechanics of how a lily grows. That is an energy optimization problem subject to differential growth constraints.

**Would it be fair to say that optimization principles motivate your geometric intuition?**

**RD:** Not really so much. It's the geometry; I like the visual part. Optimization is something to ponder, and it feels right.

As an aside, I also work on maximal surfaces which optimize the Lorentzian area in Lorentz-Minkowski space,

**Right. But their mean curvature is still zero?**

**RD:** Yes, mean curvature in Lorentz-Minkowski space is zero for maximal surfaces. And they can have singularities, which is a feature of Lorentzian space. For instance, conical singularities, swallowtail singularities, etc.

**Because of the negative part of the metric?**

RD Exactly. By the way, recently, we have been able to connect CMC surfaces of revolution to certain number-theoretic objects, namely, elliptic curves.

**Okay. That is interesting.**

**RD:** We also sometimes see very surprising applications of number theory in geometry. For example, the minimal surface equation is highly non-linear. Because of this, if you add the height functions of two minimal surfaces together, you would not usually expect to get the height function of a third minimal surface. However, there is an Euler-Ramanujan identity

[4]Available at https://www.youtube.com/watch?v=OYVckALM1I4

that allows us to decompose the height function of Scherk's surface in terms of an infinite sum of height functions of shifted helicoids. This is known in liquid crystallography!

It is fascinating because, in research, you quickly find that you cannot restrict yourself entirely to geometry, even when geometry is your primary focus. Number theory showed up in geometry. Take another example. We worked on an interpolation problem: given two real-analytic curves, can you interpolate them with a minimal or maximal surface? To solve it, we found that the tools of functional analysis were needed. Everything is interconnected and useful.

**Besides Professor Takhtajan, were there other mathematicians who influenced you during your time at Stony Brook?**

**RD:** Professor Dennis Sullivan was there, which was incredibly interesting. Every tea time, he would hold informal seminars, sharing his theories and explaining his unique mathematical viewpoint to the graduate students who would gather to listen. Sometimes he would invite other professors to speak. For instance, I remember he once invited Professor Michael Anderson, who was making significant progress on the Poincaré conjecture at the time using Hamilton's method. He gave us a wonderful talk. We would often gather during tea time just to hear Dennis Sullivan's explanations. It was a wonderful experience listening to his unique viewpoints on various topics of mathematics.

**Besides your advisor, who else influenced your mathematical development during your PhD years?**

*"...in research, you quickly find that you cannot restrict yourself entirely to geometry, even when geometry is your primary focus."*

**RD:** I learned a great deal from my peers; they were truly amazing. I remember Carlos Florentino, who used to explain so much to me. I had Iranian, Russian, and Jewish friends who were all incredibly kind. At that time, America and its graduate schools felt like a great equalizer, bringing together people from all over the world. Along with my Indian friends, it was a fantastic, diverse community. I learned most of my math from my peers, really. I had wonderful Chinese and Korean friends. My roommates were always either Chinese, Korean, Indonesian, or Japanese, and I learned so much from them. It was not always about mathematics—it was about life.

**How was it returning to India after your PhD? What differences did you notice between the research environments in the US and India?**

**RD:** I felt a great sense of relief upon returning to India; it was my own country, after all. To be honest, I had been quite sensitive to the racism I experienced abroad, and coming home lifted that burden. Returning to a place like the Harish-Chandra Research Institute (HRI) was especially wonderful because it was so deeply connected to nature.

My colleagues were good to me, and I loved teaching. The best part was that we were all on the same campus, so we were students and teachers together, without much hierarchical distinction between us. We used to have music and poetry parties; it was just too good. But professionally, you are right that once you are on the faculty, you feel the politics a little bit. You start to see that this group is a little separate from the other one. There was no concerted effort between groups. And, of course, exposure to the rest of the world was not really there.

**Despite those challenges, HRI seems to have been a very special place for you.**

**RD:** I had a beautiful time in HRI. I must say. Some of my best graduate students were at HRI: Pradip Kumar and Rahul Kumar Singh. They are both excellent. Pradip is now on the faculty at Shiv Nadar University (SNU), and Rahul is at IIT Patna. They took up our research on minimal surfaces very seriously, and today, I am proud to say that each of them leads a large research group of their own.

**After HRI, your career took you briefly to IIT Kanpur before ICTS. How did those transitions shape you?**

**RD:** I spent some time at IIT Kanpur, but I found myself very lonely there. I moved back to HRI in a year or so.

Pictures from 2023 of ICTS. Left: Pāṇini library. Right: A tree. Anveshanā

When Rajesh was appointed as the Director of ICTS, we moved to Bangalore. I also joined ICTS. Initially, I did not like moving to a big city at all. Compared to Allahabad, which was very personal and connected, Bangalore seemed quite impersonal. The language was also a barrier; I knew Hindi, but I struggled with Kannada, and I still do. It feels a bit foreign when you can not speak the local tongue. Beyond that, even the visible difference in the city's wealth levels was a significant adjustment.

It was just a matter of time to get adjusted, though. I tend to put down roots in a new place quite easily. I am currently learning Kannada and have made wonderful friends. So, while the cultural differences seemed vast initially, I feel very settled now.

**Is Kannada your fourth language, then—after Bengali, Hindi, and English?**

**RD:** Indeed, Kannada is my fourth language.

**How has ICTS shaped your experience as a mentor and teacher?**

**RD:** It has been a great journey. One important thing I should mention about ICTS is the caliber of the students. I had the opportunity to work with fantastic MSc students, as well as

With cleaning staff at ICTS. Rukmini Dey

both short-term and long-term summer students from all over India. They came to do their master's projects or simply to spend some time at the institute, and it was wonderful. Now, I also have an excellent PhD student. That influx of student energy is definitely incredible.

**Have your interactions with young students convinced you that there is much more scientific talent waiting to be nurtured?**

**RD:** Absolutely. Outreach is never enough. We put in a lot of effort, but for outreach to truly work, it has to be sustained over a long period. You need to see the same students returning again and again, watching their interest grow until they eventually want to become scientists themselves. Scientific creativity is inherent in all children, but somehow, it often goes un-nurtured. That is why we need sustained, monthly activities. For example, we host astronomy talks and telescope viewing, and we bring in students from the surrounding villages. We see tremendous interest from them, but it cannot be just a one-time event. It is not enough to just say, "Oh, we looked through a telescope and saw Jupiter." It takes sustained effort to genuinely cultivate their interest in science—and when we do, we actually see it work.

*"Scientific creativity is inherent in all children, but somehow, it often goes un-nurtured."*

We organize many hands-on activities, and Professor Joseph Samuel and Professor Supurna Sinha have been incredibly active in this effort. The impact is profound; I have seen young girls say, "I want to be a scientist like you." Moments like that are incredibly special.

The Jawaharlal Nehru Planetarium (JNP) does a very good job of this, and we are actually considering adopting some of their methods. They have a program called REAP, which involves sustained effort to engage students over time. Ultimately, that program has produced excellent scientists, many of whom come from modest backgrounds.

If we are ever going to find the next Ramanujan, it will be through programs like this—sustained programs where students can return again and again for the mentorship they need.

**What does a typical outreach event day look like? What activities are planned?**

**RD:** There are various monthly events, of course. We have Math Circles that meet twice a month. Then there is *Kaapi With Kuriosity*, which is our regular monthly public lecture series. We host an Open Day. For an entire day, researchers from ICTS and other neighboring institutes come to showcase their experiments and work. Explain their research areas to anyone who visits, as the campus is completely open to the public. So, Open Days are a major undertaking. Then, there are also the PRISM events and many public lectures hosted. A list of our activities can be found in the outreach section of the ICTS website.

**Can you think of a defining moment or a turning point in your career? How did it affect your outlook towards teaching, research, and life in general?**

**RD:** I do not think it was a single moment; rather, it was the collective experience I have had with my students, from the long-term visiting and summer students to my current graduate students and postdocs. These were the real turning points. We have learned so much from one another, and it has been incredibly fruitful. The most important thing about youth is that they are not inhibited. As experienced researchers, we often hesitate because we fear saying the wrong thing. But students will freely voice their thoughts, whether they are perfectly correct or not, and that openness is invaluable.

It is truly amazing to watch them progress. I often say that my first graduate student, Pradip Kumar, changed my mathematical life. My entire perspective started shifting from that point onward. It began with my first student, then my second, and continued through all the postdocs, visiting students, and my current graduate student.

Dedicated to Postdocs and Students

*They came in with joyous energy, Happy to learn and try the research into the unknown, They went out, thoughtful young men and women, Futuristic, optimistic and able.*

— Rukmini Dey
*The Oriole in My Garden*

**You seem to value that quality of asking questions, especially since young people are often afraid to do so. Why do you think it matters so much?**

**RD:** Students absolutely should speak up. Whether their ideas are right or wrong, that


Rukmini Dey and her postdoc at ICTS, Dr. Savita Rani
RUKMINI DEY

constant flow of innumerable ideas is what keeps science moving forward. If you are discouraged from asking questions, you are essentially discouraging your own mind from being creative. Because of this, I always gave my very good students freedom to pursue what interested them. For instance, with my first student, we collaborated on his very first problem and paper, but he conducted his core PhD research entirely on his own. My greatest joy as a mentor is watching people take flight and soar far beyond me.

**Have there been any mathematicians or physicists whom you consider your heroes or heroines, people whose work or style feels especially close to your own?**

**RD:** Yes, two women mathematicians in particular and I have already mentioned them: Professor Karen Uhlenbeck and Professor Dusa McDuff. I have always looked up to them for their profound reasoning and clear-sightedness. This has given me great courage and hope.

**Finally, what role do music, poetry, and writing play in your life as a mathematician? Do they help you connect science with the broader human experience?**

**RD:** Yes, absolutely. As I mentioned earlier, Tagore's songs are an essential part of my life. Whenever I have felt down, his music has never failed to lift my spirits and transport me to a different plane, one where I feel like sadness simply cannot reach me. Alongside singing his song, I have also been writing short vignettes and sketches from my own life, and I have actually published a few books of poetry. One of them is a recent book that brings together all my poetry. It's called *The Oriole in My Garden*[5]. Whenever I have a small idea, I note it down on my phone. To me, mathematics is the ultimate poetry. It is like a flowing stream, constantly moving and evolving, yet fundamentally still and clear. It is a philosophy in itself. Ultimately, poetry, music, and mathematics are all flowers from the same garden of freedom. That is precisely the concept I explored in my book. In the real world, you simply do not have the freedom to do whatever you like; we are bound by limitations. True freedom only exists within your own creativity. The major avenues where I have found absolute creative freedom are music, poetry, and mathematics.

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*"...poetry, music, and mathematics are all flowers from the same garden of freedom."*

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[5]The book is available on https://amzn.in/d/oh3XNzvd