



Know Your Wisconsin Mathematician

Interview with Professor Ranjan Roy, Beloit College by J. Sriskandarajah, Madison College.

Tell us something about your education and how you got interested in mathematics.

I received my secondary education at an Irish Christian Brothers school in the hills of India. I had an excellent mathematics teacher, and a well-rounded education, including lots of sports. After secondary school, I stayed at home with my parents for about eighteen months studying mathematics very intensively, working at least fourteen hours per day. My parents gave me great encouragement and practical and emotional support in my studies. I got my B.S. in mathematics, physics, and chemistry at Indian Institute of Technology, Kharagpur, West Bengal, where I had good teachers of mathematics. In spite of the fact that this was an engineering college, I got a liberal education at Kharagpur. I received my M.S. in mathematics at I.I.T Kanpur, U.P. where the math department was quite strong. At Stony Brook University on Long Island, NY, I studied under Irwin Kra and Bernard Maskit, students of Bers, and received my Ph.D. in 1973.

Where have you worked and how did you end up at Beloit College?

After receiving my Ph.D., I taught at the University of Kentucky for a short time. There, I collaborated with S.M. Shah and published many papers with him. Then I returned to India where I was first at I.I.T. Delhi and then at Himachal Pradesh University in Simla, in the hills. Soon I received a fellowship at the Institute for Advanced Study in Simla where I was able to do my own research. In Simla I collaborated with Mihir Bannerjee in applied mathematics topics. After this two-year fellowship, I was appointed Reader at the Mathematics Institute at Punjab University in Chandigarh. After some time there, I returned to the U.S. and taught for two years at SUNY Plattsburgh. In 1982, I came to Beloit where I thought my opportunities for research would be better and where the students might be of a higher quality. I have been able to pursue my own work while at Beloit and I have also been able to collaborate with Richard Askey in Madison, as well as with mathematicians from farther away. I have enjoyed and still enjoy my colleagues, my students, and my teaching at Beloit.

What are your mathematical interests?

I am an analyst with an interest in the history of mathematics. I have done work in differential equations in the complex domain, Kleinian groups, fluid mechanics, and special functions. I published a book on special functions with Askey and George Andrews and I am almost finished with another, longer book on the development of mathematics. I also contributed to the NIST Handbook of Mathematical Functions, to appear very shortly.

What makes for a successful mathematics teacher?

First, a good teacher must know and love his subject and also care about his students. In addition, he should be aware of the background of the students and on that basis devote thought to how the material should be presented. One must try to show how a subject arises out of a small number of ideas and attempt to clearly reveal the interconnections among the ideas. A sense of humor and an organized approach are also helpful. Repetition is critical. One must repeat and review the material many times. Finally, one must somehow convince one's students that they will find enjoyment by devoting attention and hard work to the subject.

How has mathematics changed over the years?

This is a very broad question. I will discuss some aspects of mathematical notation and symbolism and how they have influenced the development of the subject. In the 1500s and early 1600s, very little abstract notation was used. To see this, one may read the original works of

Cardano or Bombelli. Theorems and procedures were described largely in words, often accompanied by diagrams. Even as late as Pascal, we find that he stated important theorems completely in words. Starting with Viète, mathematical notation began to be more symbolic of the algebraic operations. Harriot and Descartes took giant steps in this area, so that their notation is almost modern in form. This advance greatly facilitated the manipulation of algebraic variables and made mathematical calculation much more transparent. Thus, we may read with some ease the mathematical works written after 1650. To see this, one may study the original works of Wallis, van Schooten, or Newton.

Starting approximately in the nineteenth century, an abstract, noncomputational, and generalized approach began to grow, culminating in Hilbert's first proof of the existence of a finite basis for invariants. The abstract and existential nature of this result prompted Gordan to exclaim, "This is not mathematics; it is theology!" Ironically, Gordan's only student, the great Emmy Noether, became the mother of twentieth century abstract algebra. This trend, epitomized by Bourbaki and Grothendieck, overshadowed for some time the computational and algorithmic approach to mathematics. With the advent of the computer, we have a resurgence of interest in algorithms and formulas, so that even algebraic geometry was found to contain many interesting and important problems of a computational nature.

It appears to me that there have always been mathematicians who love to calculate and those who prefer to think in broad general terms. Naturally, to be a mathematician, one must do both, but one may lean one way or the other. For example, Fermat was a big idea man, with penetrating insights, and he was a sloppy calculator. By contrast, Stirling loved computation; he executed the prodigious task of computationally interpolating the factorial sequence 1, 1, 2, 6, 24, 120... to ten decimal places, finding that the midpoint value between the first two terms was .8862269251. He at once recognized this value as $\sqrt{\pi}/2$. Today, armed with powerful abstract theories accompanied by the computational facility of computers, both types of mathematicians can flourish.

What are your hobbies?

I spend most of my time doing or reading or teaching mathematics. I also read on a wide range of topics, including history and philosophy, and I like to play handball. In addition, I am an old movie buff and I enjoy walking and spending time with my friends and with my family.

Tell us something about your family.

My parents died long back, though my mother in law is still with us, and I have two brothers and their families. I have been married to Gretchen Carey for nearly forty years. She has a Ph.D. in philosophy from Stony Brook and she is very supportive of my work. We have a daughter and a son, both married to wonderful people, and they each have one child. My wife and I are happy grandparents.