

## DICK ASKEY’S BUTTERFLY EFFECT

KEN ONO

Dick Askey was a giant in the world of mathematics. Indeed, the articles in this special collection honor his significant contributions to mathematics. Dick was a major influence in my mathematical career. He introduced me to the beautiful theory of orthogonal polynomials and special functions, and he taught me the importance of learning the history of mathematics. These lessons have unequivocally paid off many times in my career as a professional mathematician. However, instead of expounding on these lessons, in this essay I wish to explain how Dick changed the trajectory of my life through an act of love in memory of Srinivasa Ramanujan. Without him I would not have been open to the idea of pursuing a career in mathematics. Let me share this personal story<sup>1</sup>.

As a troubled high school student, I believed that my parents only believed in the mindless pursuit of grades and high test scores. These expectations nearly crushed me. Then a magical letter appeared out of the blue, delivered to our home in Lutherville, Maryland, a middle class suburb of Baltimore, where my father was a full professor of mathematics at Johns Hopkins University.

On a Saturday morning in April 1984, I opened the family mailbox and found a fragile envelope covered in brilliantly colored stamps. The stamps told me that the letter was from India, and the postmark made it precise: it was from Madras. It was addressed to my father Takashi Ono, a reserved professor of mathematics. When I handed over the mail, my father looked up from the yellow legal pad on which he was scribbling commutative diagrams and equations and set down his Bic ballpoint pen. Gently, he pried open the seal and unfolded the letter inside.

After lunch, my father called me into his library, my former bedroom, which was now covered wall to wall with math books, with a large refectory table stacked high with papers and books. He was holding the letter in his hand, and although he was ordinarily a stoic and almost emotionless man, I could tell by the look on his face that he had been deeply moved. I wasn’t sure, but I got the sense that there were tears in his eyes. The letter was typewritten on delicate rice paper, and the letterhead featured a rust-colored sketch of a serious-looking Indian man whose thick hair was parted, Western style, on the left side. For my father to take even a few minutes away from his mathematics, this letter had to be important. He then said, “Ken-chan, I have to tell you an amazing story about this letter.”

*Dear Sir,*

*I understand from Mr. Richard Askey, Wisconsin, U.S.A., that you have contributed for the sculpture in memory of my late husband Mr. Srinivasa Ramanujan. I am happy over this event. I thank you very much for your good gesture and wish you success in all your endeavours.*

*Yours faithfully, S. Janaki Ammal*

My father explained to me that the letter was from Janaki Ammal, a destitute Indian woman in her eighties who lived in Madras (now known as Chennai). She thanked my father for his gift, a donation that helped fund the commissioning of a bust of her late husband, Srinivasa Ramanujan, a man who had died in 1920. Despite living near poverty for over sixty years, rejected by her husband’s family, the forgotten brokenhearted widow had only one request when a reporter found her living in a Madras slum

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<sup>1</sup>This is an adaptation of a passage in “My Search for Ramanujan” (Springer 2016) that I co-authored with A. Aczel.

in the early 1980s. She had been promised a statue to honor her husband at the time of his death. The promise had not been kept. She desperately wanted a statue erected to honor her husband's memory.

After reading about this in an Indian newspaper, Dick solicited donations from the mathematicians of the world in an awe-inspiring fundraising campaign. He used the proceeds to commission sculptor Paul Granlund to fashion a bust of Ramanujan. Askey came through and fulfilled the broken promise, and my father was one of the many mathematicians who made a contribution.

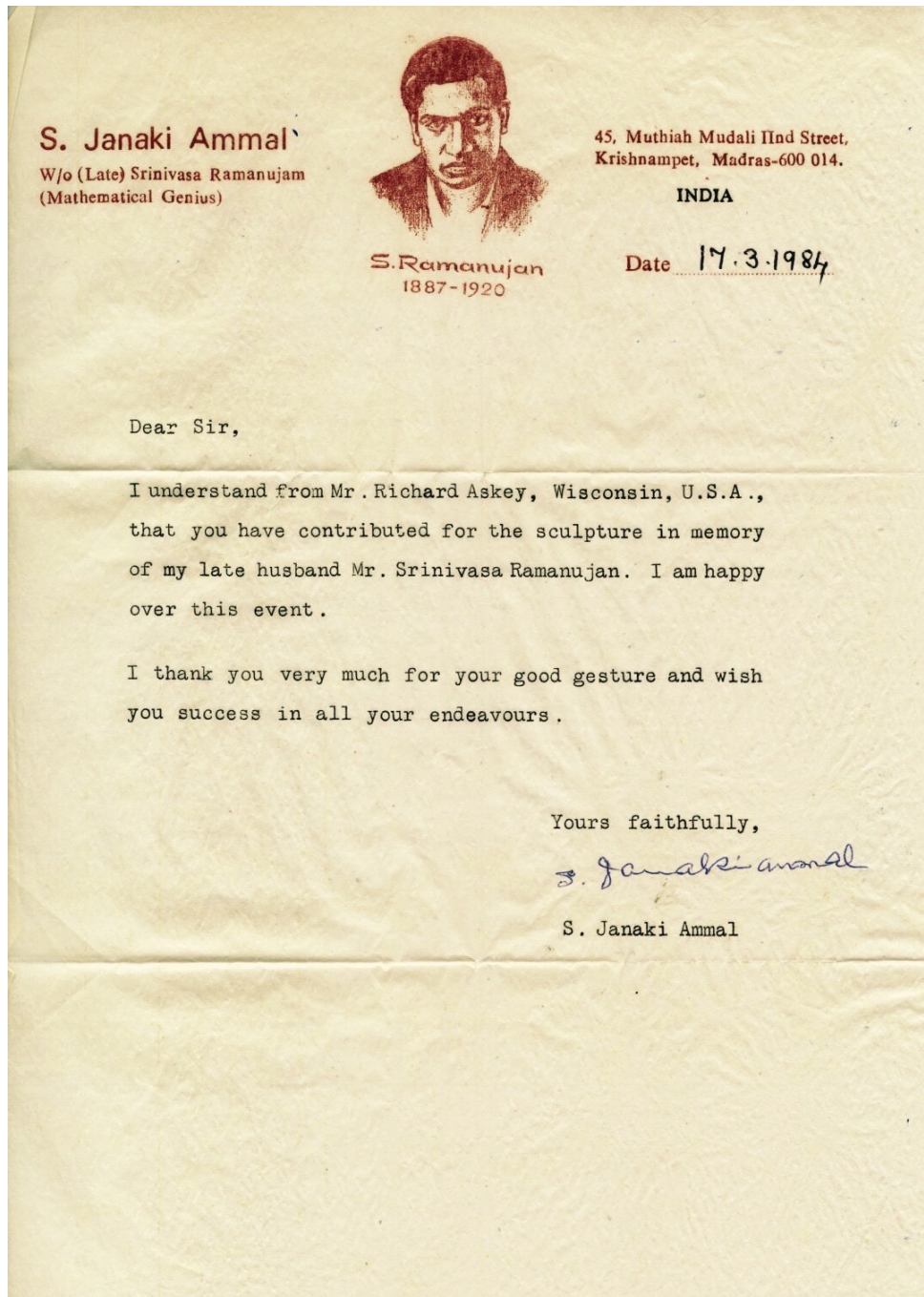


Granlund bust of Ramanujan

I asked, "Who is this guy Ramanujan? What did he do?" My father told me the most incredible story; it was the life of Srinivasa Ramanujan. It was the story of an Indian man who overcame incredible odds to become one of the most romantic and influential figures in the history of mathematics. It was the story of a self-taught two-time college dropout whose ideas came to him as visions from Namagiri, his family's Hindu goddess. It was the story of a man who had the courage to send his ideas to random mathematicians at Cambridge University, and then to accept the invitation of G. H. Hardy, a world-class mathematician who recognized his genius, and to travel halfway around the world to work with him in England. It was the story of a man who suffered racial prejudice as he strove for accomplishment and recognition. It was the story of a man who would then die tragically at the young age of thirty-two.

I was stunned by this tender story. I was also surprised that this short letter, which was really no more than a form letter, had stirred up such deep emotions in my father, a man I thought had feelings only for numbers and formulas. However, I quickly recognized that Ramanujan's biography mirrored my father's life in many ways. Both men were self-taught creative geniuses. Both men escaped poverty thanks to the generosity of a world-class mathematician who offered the opportunity to work with the world's best in a foreign land. In my father's case, he was a struggling graduate student in postwar Japan in the late 1940s and early 1950s. His career began with an unexpected invitation from André Weil, the distinguished number theorist at the Institute for Advanced Study, to study with him in Princeton. And both men were rewarded for their achievements despite the indignities and hindrances to success that they suffered due to racial prejudice. Although it would take me decades to truly understand the depth of his personal journey, as a 10th grader I clearly understood that my father had a profound romantic view of these parallel stories.

The “butterfly effect” set into motion by Dick’s fundraising campaign was a turning point in my life. As a 10th grader, I had believed that my parents only valued perfect grades and high test scores. With this letter, I saw in my father’s eyes the genuine admiration he held for Ramanujan, a two-time college dropout. This realization gave me hope, and the magical letter born from Dick’s act of love has come to symbolize my path from troubled teen to professional mathematician.



Janaki Ammal's letter

Fifteen years later in 1999, Dick lobbied the University of Wisconsin to hire me as a young faculty member. I spent ten years in Madison, and this was a halcyon time in my life. My two children mostly grew up in Madison, where Dick was like an uncle. I enjoyed attending seminars with Dick, even though he had a tendency to fall asleep halfway through the lectures. Somehow he was generally able to share obscure historical tidbits about the origin of the subject at hand. His command of mathematical history, his towering presence, and his belief in me were key factors that helped me advance in my career during my years in Madison.

At the UW Madison Mathematics Department dinner on May 6, 2003 in Van Vleck Hall, I had the honor of toasting Dick on the occasion of his retirement. I honored Dick with these words:

*“Richard Askey received the Ph.D. from Princeton University in 1961. He spent 2 years as Dickson Instructor at the University of Chicago before coming to Madison as an Assistant Professor in 1963. He became (full) Professor in 1968. In 1986 he was named the Gabor Szegő Professor of Mathematics, and in 1995 he was awarded the John Bascom Professorship in Mathematics by the University. Dick is a member of the National Academy of Sciences and is an Honorary Fellow of the Indian Academy of Sciences.*

*Dick Askey is the world’s foremost authority on Special Functions and he has had a profound influence on that subject. His dedication to Mathematics and Mathematics Education is unsurpassed. Besides a great number of papers, Dick has also written or edited 6 books, including “Special Functions” (with G. Andrews and R. Roy) which was published by Cambridge University Press in 1999. This 650 page book contains a wealth of information and is destined to become a classic.*

*He (along with Wilson) is responsible for completely developing new sets of orthogonal polynomials. Over the last few decades, these results and Askey’s ‘scheme’ for classifying relationships between such functions have played important roles in a striking number of areas. Furthermore, one way to measure the influence of a mathematician and the quality of his work is through the theorems he did not prove but the theorems proven using his work and ‘his school’. For Dick, this includes, among others:*

- *de Branges’ solution of the Bieberbach Conjecture.*
- *Proof of the irrationality of  $\zeta(3)$ , and more recently the irrationality of infinitely many values of zeta at odd integers.*
- *Applications to the study of quantum groups.*
- *Algebraic geometry of ‘hypergeometric varieties’ (i.e. rigid Calabi-Yau varieties).*
- *Arithmetic formula for the Eichler-Selberg trace formula (an important player in Deligne’s proof of the Weil Conjectures).*

*Dick is a gift, a national treasure.”*

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