

Ramanujan in Mauritius

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Srinivasa Ramanujan has made a deep and lasting impact on many branches of mathematics and his name is well known throughout the world. But it would come as a surprise to know that he is a major force even in the remote island of Mauritius in the southernmost part of the Indian ocean off the coast of Africa! I had an opportunity to be the Chief Guest at a Ramanujan memorial event in Mauritius in March 2017 when prizes were distributed to the Third Ramanujan Mathematics Contest Winners on the campus of the University of Mauritius. My wife Mathura and I enjoyed our visit immensely and I shall now describe some of the unique aspects of this Ramanujan movement in Mauritius and the attractions (both academic and geographic) of this charming island country.

The Ramanujan Trust in Mauritius

Dr. Sattianathan Sangeelee, now retired, is a distinguished consultant physician from Mauritius who practiced in England. He was captivated by the legacy of Srinivasa Ramanujan and so he started a Ramanujan Trust in Mauritius in 2013 with support of Mr. Armoo-gum Parsuramen (former Minister of Education in Mauritius), Prof. Sudarsun Juggessur (ex-Chairman of the Council of the University of Mauritius) and Prof. Yousuf Maudarbocus (retired from University of Mauritius). There are several prominent members of Mauritius who currently support the Trust and with their approval, Dr. Sangeelee takes the lead in every action of this Trust and attends to every detail. The University of Mauritius, in particular its mathematics department, provides academic expertise, advice, and facilities to the Trust.

About Mauritius

Mauritius is a small island about 1200 miles east of the South African coast in the Indian ocean, and east of, but quite close to, Madagascar. Indeed when your aircraft descends into Mauritius, you can see the magnificent coast line of the much larger island of Madagascar quite clearly. The Republic of Mauritius consists of the island of Mauritius and a few smaller islands

further east. Very close to Mauritius is the French island of Reunion, which made headlines last year when pieces of wreckage of the ill-fated Malaysia Airlines Boeing 777 that had disappeared into the Indian ocean were found washed ashore on its beaches.

Mauritius was a Dutch colony in the 17-th century and a French colony in the 18-th century, when sugarcane plantations abounded. The French used African slave labour to clear the forests and brought immigrant labourers from India to work on the plantations. In addition, the French brought in skilled artisans from Pondicherry (a French outpost in India) to construct most of the stone buildings in Port Louis, the capital. The British took over Mauritius in 1810, but slavery was not abolished until 1835, and that too only after a bloody rebellion. Mauritius gained its independence in 1968 and became a Republic. Today, more than 60% of the island's population are third generation Indians, like Dr. Sangeelee. French influence is still very strong in Mauritius; indeed both English and French are spoken in Mauritius.

There is much more to the Mauritius economy today than just sugarcane plantations. The verdant landscape is filled with orchards growing different types of tropical fruits like lychees and mangoes, and the breathtaking scenery attracts tourists and honeymooners for a vacation that is far less expensive than in Hawaii or the Cote d'zur. Also, Mauritius is expanding in the sphere of education and the quality of mathematics instruction at the University is very good.

The Ramanujan Mathematics Contest

To identify and encourage the mathematically gifted students of Mauritius and to promote pure mathematics, Dr. Sangeelee had the brilliant idea to hold a Ramanujan Mathematics Contest each year for senior high school students, but undergraduates are also allowed to take part in it. It is not so much the total score that matters but the originality of the solutions. Professor Romila Mohee, Vice-Chancellor of the University until recently, was instrumental in setting up the Memorandum of Understanding between the Trust and

the University of Mauritius for the Ramanujan Mathematical Contests. The First Ramanujan Mathematics Contest was held in 2014; the Talent Exam questions were selected by the local mathematicians and the prizes were awarded by some prominent members of the Mauritian community. For the Second Ramanujan Mathematics Contest in 2016, Dr. Sangeelee wanted an international input and presence, and therefore at the advice of Ramanujan expert Bruce Berndt of the University of Illinois, Urbana, he approached Berndt's colleague Bruce Reznick who had considerable experience in making the exam questions for the Mathematical Olympiads. Reznick not only graciously agreed to select the questions for the Second Contest, but also for future contests. Sattianathan then invited Reznick to Mauritius as the Chief Guest for the function in March 2016 when the prizes were awarded, and asked Reznick to deliver the Ramanujan Memorial Lecture. Thus the Ramanujan Mathematics Contest in Mauritius was off to a great start with international support for its mission. Since it is a Ramanujan Mathematics Contest, questions related to Ramanujan's work are included. For example, the 2016 Talent Exam had a question on an identity involving radicals, because Ramanujan was much interested in such identities and posed problems on radicals in the *Journal of the Indian Mathematical Society*.

The contest is open to all Mauritian students both in high school and in College, but the age limit is 32, which was the life span of Ramanujan. The contest is for one and half hour duration and 100 applicants are selected to take part in it. Winners of previous competitions are not eligible to take part in the contest again. The First Place Winner is given a Srinivasa Ramanujan Gold Medal and a cash prize of (Mauritian) Rupees 25,000 (about US\$700). Two runners-up are awarded a book prize and a cash prize of (Mauritian) Rupees 10,000 each. The book that was given as a gift was "The Man Who Knew Infinity", Robert Kanigel's widely acclaimed biography of Ramanujan.

My Visit to Mauritius Arranged by the Ramanujan Trust

After having read my book *Ramanujan's Place in the World of Mathematics* (Springer, 2012), Dr. Sangeelee invited me to be the Chief Guest for the function in March 2017 when the prizes for the Third Mathematics Contest would be awarded, and asked me to deliver the Ramanujan Memorial Lecture on the topic given by the

title of my book. I had not heard of this Trust and was pleasantly surprised that it functioned in far off Mauritius. I was delighted to hear that Ramanujan had such a strong presence even in a far flung island, and since fostering the legacy of Ramanujan is one of my priorities, I readily accepted the invitation. I did not know what to expect, and so I communicated with Bruce Reznick to get an idea of what had happened the previous year.

It is a long journey to Mauritius from America by any route. Mathura and I travelled to London from where we flew by Air Mauritius on a 12-hour non-stop flight. We had a 12-hour transit in London and so we rested at the Heathrow Airport Hilton before boarding the Air Mauritius Airbus A-340 flight, which although very long, was extremely comfortable. The inflight service was superb. Upon arrival in Mauritius we were pleasantly surprised that such a small remote island had such a magnificent ultra-modern airport which was capable of receiving the mammoth double-decker Airbus A-380. We were well rested when we arrived there on a Sunday at noon, and we spent the rest of the day relaxing by the pool at the gorgeous Hilton Mauritius Resort (where we stayed) which has an enviable beach front location on the west coast of Mauritius. I was ready to begin work the next day.



Just before the interview for Mauritius National Television. From left to right: Dr. Sattianathan Sangeelee, Vice-President of Mauritius Dr. Barlen Vyapoory, Krishna Alladi, Director of the Rajiv Gandhi Science Centre Dr. Aman Mauloo, and Mathura Alladi.

On Monday morning, Dr. Sangeelee arranged a 40-minute television interview with me on the theme "Ramanujan as an inspiration to students." I was interviewed by four persons — (i) Dr. Sangeelee who admirably acted as the interview coordinator, (ii) Professor Bhuruth, Chair of the mathematics department at the University of Mauritius, (iii) Dr. Vyapoory, the Vice-

President of Mauritius, who is a mathematics enthusiast, and (iv) Dr. Aman Maulloo, Director of the Rajiv Gandhi Science Centre, Mauritius. As I was interviewed, there was a live audience of about 20 students, some of whom asked me questions in the end; that was also part of the interview. It was a very enjoyable experience. The entire interview was shown on the Mauritius National Television that night. Mathura who was with me at all other events, could not attend this TV interview because at the same time she was asked to address a group of dance students next door at the Mahatma Gandhi Centre, on how she trains her students in Indian classical dance in Florida.



Krishna Alladi delivering the Ramanujan Memorial Lecture. The dignitaries on the dais have their heads turned towards the screen to watch the slides of Krishna's talk!

The Ramanujan Memorial Function was on Tuesday afternoon on the campus of the University of Mauritius. The auditorium was packed to capacity and the audience of about 200 comprised students, faculty, and dignitaries from different professions including the Chairman of Air Mauritius, who had very kindly sponsored my Air Mauritius ticket (the trans-atlantic ticket was sponsored by the Ramanujan Trust). My one hour talk "Ramanujan's place in the world of mathematics", contained mathematical snapshots interspersed with stories and anecdotes to make it palatable to a



The Vice-President of Mauritius Dr. Barlen Vyapoory giving the prize to the first place winner of the Mathematics Contest. Krishna Alladi and the Indian Commissioner Mr. Abhay Thakur are seen on the dais.



Standing next to the Bust of Ramanujan on the campus of the University of Mauritius, left to right: The High Commissioner of India Mr. Abhay Thakur, Krishna Alladi, Dr. Sattianathan Sangeelee, and Mathura Alladi.

general audience. On the dais with me, and attending the lecture, were the Vice-President of Mauritius, the Minister for Education, the Vice-Chancellor (= President) of the University, the Indian High Commissioner (= Consul General of India), the Chair of the Mathematics Department, and Dr. Sangeelee. Following my lecture, the prizes were awarded to the winners by the Vice-President of Mauritius. It was a fantastic function.

After the Ramanujan Memorial Function and the High Tea that followed it, we walked across campus to see the Bust of Ramanujan that Dr. Sangeelee had installed on the university campus in 2013; Dr. Sangeelee was inspired by Ramanujan's 125th birth anniversary in 2012 to commission this impressive bust which was sculpted in India, and flown to Mauritius in 2013.

On Wednesday morning, I addressed a group of undergraduate and graduate mathematics students at the University on the theme "The remarkable life and mathematics of Paul Erdős". Since I was in Mauritius on a visit in memory of Ramanujan, I emphasised how Erdős' proof of Bertrand's postulate, his very first paper that catapulted him to world fame, was related to Ramanujan's own proof, and that was how Erdős made his first mathematical connection with Ramanujan. I then discussed the Erdős-Kac theorem and the birth of probabilistic number theory, and showed the students how the origins of this subject could be traced back to a paper of Hardy and Ramanujan's on round numbers. After my lecture on Erdős, the Vice-President of Mauritius graciously hosted a lunch.



Krishna Alladi delivering his lecture “On the remarkable life and mathematics of Paul Erdős” to graduate and undergraduate mathematics students at the University of Mauritius.

Sightseeing

The island of Mauritius has much to offer by way of natural scenery. On Monday afternoon, following my TV interview, Sattianathan’s younger brother Ramathan, a retired senior bank official in Mauritius, took us on an excursion to the beaches of the south western shore. Many of the beaches have gorgeous turquoise blue waters. Parasailing is a favorite sport on these lovely beaches.

On Wednesday, after my lecture on Erdős, Dr. Sattianathan took us around Mauritius to see the beaches on the northwestern part of the island.

We had all day Thursday for sightseeing before boarding the Air Mauritius flight to London at 10:00 pm. So Mathura and I went to the hilly interior of the island in a chauffeured car we hired at the hotel. It was

a very different terrain from the beaches we saw. In the mountainous region, there is the lovely Black River Gorges National Park which among other things has spectacular waterfalls, and the “seven coloured earth” — a breathtakingly beautiful area of multi-coloured soil, just as impressive, although on a much smaller scale, compared to the coloured volcanic cinder cones you see in Haleakala in Maui. And throughout the mountainous interior of Mauritius, there are several gigantic granite cliffs comparable in majesty to what one sees at Zion National Park.



The spectacular “Seven Coloured Earth” of Mauritius.

Mauritius is the only place in the world where the *Dodo*, a large flightless bird, existed. The Dodo is now extinct, but well preserved remains of the Dodo can be found in the National Museum in Port Louis, the capital of Mauritius. Bruce Reznick was fortunate to



Krishna with Dr. Sattianathan Sangeelee on a tour of the coast of Mauritius.

see the remains of the Dodo (he made that his sightseeing priority!), but we missed it because the National Museum was closed for renovation when we were there.

Concluding Thought

It was a most memorable visit to Mauritius that surpassed our expectations thanks to the untiring efforts of Dr. Sattianathan Sangeelee and the kindness of several prominent citizens of Mauritius. It is also satisfying to see that in Mauritius the preservation of the legacy of Ramanujan and the encouragement of mathematical talent among youth was being carried out by both academic and non-academic individuals. The world of mathematics will profit from support given by members of different professional backgrounds. It was an eye opener for me that Ramanujan's

name has cast a magic spell over this enchanting island, and I am fortunate to have been given an opportunity to take part in the Ramanujan celebrations in a distant part of the globe.

On the night of our arrival in Mauritius, Dr. Sangeelee called me by phone at the hotel and said that a cyclonic storm was threatening the island of Mauritius, and had it come through, the entire event would have been cancelled. Fortunately, the storm missed Mauritius and went further north, and so a decision was taken that morning to proceed with the event as scheduled. We were not aware of the impending danger as we were flying for nearly 24 hours to get to Mauritius. I think the Goddess of Namakkal played a role in diverting the storm so that the Ramanujan Memorial Function would not be hampered!



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