

implications to mathematics. He called these the Mock Theta Functions, and in his last letter to Hardy, Ramanujan writes:

These enter into mathematics beautifully.

Was his motivating force a craving to find beauty? Perhaps. But to me all attempts to explain the motivations of genius

are never meaningful. If one must have an explanation the simplest might be that Ramanujan did what he could not help doing.

As in yonder valley  
The myrtle breathes its fragrance into space  
Through such as these God speaks.

## Presentation of the bust of Srinivasa Ramanujan

On 6 February 1985, at a function held in the Library Hall of the Raman Research Institute, a bronze bust of Srinivasa Ramanujan was formally presented to the Indian Academy of Sciences by Prof. S. Chandrasekhar and Mrs. Lalitha Chandrasekhar.

Before formally presenting the bust, Mrs Lalitha Chandrasekhar spoke as follows:

'I am sure all of you would want to know how this bust of Ramanujan that I am going to unveil presently came into being. The story started with a trip Professor George Andrews made to Cambridge, England, about eight years ago in 1976 in search of unpublished manuscripts of Ramanujan. He found in the Ramanujan Archives at the Trinity College Library a new manuscript that had been deposited by Professor R. A. Rankin and Professor J. M. Whittaker some five to ten years earlier. He discovered in this way what is now referred to as Ramanujan's "Lost notebook". In it Andrews found some 600 formulae that Ramanujan had apparently worked out during the last year of his life.'

The discovery of this remarkable notebook spread in the mathematical world and also caught the attention of the media. *The New York Times* interviewed Professor Andrews and a major story appeared. *The Hindu* followed with a more extensive interview during Andrews' visit to Madras in 1981. During that visit Andrews read an article in *The Hindu* about an interview with the widow of Ramanujan, Janaki Ammal. In it she was quoted as saying, 'They said years ago that a statue would be erected in honour of my husband. Where is the statue?'

Richard Askey, Professor of Mathematics, at the University of Wisconsin, at Madison, Wisconsin, who came to hear of this statement of Mrs Ramanujan thought that if no one was going to make that bust, he was going to see that it was made.

'Now, it so happens that only one photograph of Ramanujan was available for the project Professor Askey undertook; and that is the photograph which appears in Hardy's Harvard 1936 lectures on "Ramanujan". Incidentally, when Hardy was to give those lectures, no good photograph of Ramanujan was available. He had asked Chandra who was then a Fellow at Trinity College to find one for him when he visited India in 1936. On that visit Chandra met Mrs Ramanujan in Madras and discovered that she had in her possession her husband's last passport and in it there was a photograph of Ramanujan. Chandra made three enlarge-

ments of this photograph of which he gave one to Mrs Ramanujan, sent the second to Professor Hardy for inclusion in his book on "Ramanujan"—Professor Hardy's comment on receiving the photograph was: "It seems to me an extremely good one. He looks rather ill (and no doubt was very ill), but he looks all over the genius he was"—and the third has been a constant companion of Chandra's in his office ever since. It is there beside the bust I am going to unveil. "To this day" Chandra says, "That is my best contribution to mathematics". It is this photograph that has been the basis of all the pictures of Ramanujan we see.

Askey asked Chandra for this original enlargement in order to make the portrait bust. It is a challenge for a sculptor to transform a two-dimensional photograph into a three-dimensional bust. Paul Granlund, sculptor-in-residence at Gustavus Adolphus College at Saint Peter, Minnesota, took up the challenge, and he also considered it an unique opportunity since he was captivated by Ramanujan's face. Besides, he must have been influenced by Professor Askey's



Mrs Lalitha Chandrasekhar

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enthusiasm. Granlund was willing to undertake the project with the assurance that a minimum of four busts will be bought. Of the four, only three were definitely ordered to begin with: one was for Mrs Ramanujan, the second for Askey, and the third for us. The one for Mrs Ramanujan was bought from contributions by mathematicians the world over, but mostly from America; and a generous grant from the Raman Research Institute Trust.

'The first bust was cast and Prof. Askey brought a photograph of it to show it to us in Chicago. We were delighted to see it. After he left, it suddenly occurred to us that we should get another bust of Ramanujan and present it as our gift to India. But where should it be placed? It seemed to us that the most appropriate place for the bust will be in the same hall where one can pay our respects both to the greatest mathematician of India and the greatest physicist of India: Ramanujan and Raman. It was clear to us also that we should present the bust to the Indian Academy of Sciences.

'Having made this decision, Chandra called Madison to tell Askey about it. But since Askey had left on a vacation, we traced him to his vacation spot! Askey must surely have been surprised when we told him that we would like a second bust.

'In some ways we feel ennobled that we can in our humble way pay our tribute to the greatest intellect our country has produced.

'News of the bust being made for the Indian Academy of Sciences spread and other institutions in India became interested. The Tata Institute asked for one and the Defence Department in Delhi for another. So altogether Granlund made six busts.

'The one to Mrs Ramanujan was unveiled in Madras by Mrs Ramaseshan a few months ago. We had a private

ceremony in our apartment for some mathematicians when we unveiled ours. I know you are anxious to see the bust of Ramanujan. There is no reason for any more delay. It is with immense pleasure that I now unveil this bust of Srinivasa Ramanujan so that all of you can look upon him, or rather, that he can gaze upon you with his thoughtful expression. In some special sense it would seem right to say that Ramanujan belongs not only to India but to the entire world since his phenomenal rise from poor circumstances to become the source of inspiration to so many has amazed mathematicians everywhere. I thank you for your patience in hearing me.'

In his speech, Prof. Chandrasekhar expressed his gratitude to the more than 100 scientists and mathematicians of the world and to the Raman Research Institute Trust who had contributed money for the bust. He added that as long as people do mathematics, the work of Ramanujan will continue to be appreciated.

He then read a tribute to Ramanujan from Prof. Askey which is reproduced in full below:

'Srinivasa Ramanujan is a name known to all mathematicians, and most know something about his life. However if I am typical, it is only possible to start to appreciate his greatness by working on problems close to those he studied. My own introduction to some of Ramanujan's work came in the academic year 1975-76. First, George Andrews and I discovered some new orthogonal polynomials and the further we went the more we had to use some identities of Ramanujan. Then in the spring of 1976 Andrews went to Europe for a meeting and stopped in Cambridge to see what old manuscripts he could find. One find was not a manuscript but 140 pages of formulas in Ramanujan's handwriting. There is a direct line from these pages to the bust which is being



Presentation of Ramanujan's bust to Mrs Janaki Ammal.



Prof. S. Chandrasekhar

dedicated today, but before telling that story, the incredible story of the work on these sheets should be outlined.

'As you all know, Ramanujan returned to India in 1919 and died a year later. What is only now starting to be appreciated is the seriousness of his illness in England the previous two years. These pages are not dated, but from internal evidence they were written late in Ramanujan's life, much of it in his last year. Two thirds of the pages deal with basic hypergeometric series and most of this work is significantly deeper than Ramanujan's earlier work on the same subject. Try to imagine the quality of Ramanujan's mind, one which drove him to work unceasingly while deathly ill, and one great enough to grow deeper while his body became weaker. I stand in awe of his accomplishments; understanding is beyond me. We would admire any mathematician whose life's work was half of what Ramanujan found in the last year of his life while he was dying.

'Some of Ramanujan's work has one quality which is shared by very little other work. Most mathematics, including some very good work, is predictable. Much of the rest seems inevitable after it is understood, and it would eventually be discovered by someone else. Little of Ramanujan's work seems predictable at first glance, and after we understand it there is still a fairly large body of work about which it would be safe to predict that it would not be rediscovered by anyone who has lived in this century. Then there are some of the formulas Ramanujan found that no one understands or can prove. We will probably never understand how Ramanujan found them.

'The story of the thread from these sheets to the bust is simple. Andrews has done a lot of very deep work trying to understand what Ramanujan discovered. Eventually *The New York Times* heard about it and interviewed him. *The Hindu* followed with a more extensive interview, and also published an interview with Ramanujan's widow, Janaki Ammal. She lamented the fact that a statue of Ramanujan had never been

made, although one had been promised. Andrews sent me copies of these interviews, and after a couple of months my subconscious finally got through to my conscious mind and it was clear that a bust should be made. Since Janaki Ammal was 80, time was important, so it was up to individuals rather than governments or societies, since institutions move slowly. My first reason for wanting a bust was simple; if Ramanujan's widow wanted one she should have it. That was the least we could do to show our appreciation of Ramanujan to someone who had been a great help to him. Later I realized there was a second reason, which Janaki Ammal must have realized all along. She knew Ramanujan, and while she did not understand his mathematics, she knew that he was one of the few whose work will last. As long as people do mathematics, some of Ramanujan's work will be appreciated. Fame is a strange thing and is often fleeting. An interview on a television programme is now the accepted form of honor. In Ramanujan's case a more permanent memorial is appropriate: one which can be appreciated by those who do not understand his mathematics should be added to the memorial Ramanujan made for himself with his work.

'I am pleased to have played a role in this, and would like to thank the more than one hundred mathematicians and scientists who contributed money for the bust which was presented to Janaki Ammal. The bust being dedicated today was donated by a couple who are now friends, Subrahmanyan and Lalitha Chandrasekhar. When I asked Chandra about the appropriateness of a bust of Ramanujan, he immediately replied that it was a good idea and they would do all they could to help. They did. Finally I want to thank the sculptor, Paul Granlund. While he does not appreciate Ramanujan's mathematics as those of us who have studied it do, he studied Ramanujan's passport photo deeply, and the results show in the bust. He probably understands some things about Ramanujan that we do not.'