

Dear Colleagues and Distinguished Guests:

At the award ceremony last year, I made some extended remarks on why the Ramanujan Prize was established at ICTP and what circumstances made it possible. I will not go over them again in as much detail but wish to summarize some aspects.

Here, by the way, is one of Ramanujan's better pictures. Ramanujan was born on Dec 22, 1887---four days from today---and received no formal university education. Yet, by the time he was 20, he was known locally as a mathematics genius. He had published several small results, and posed and solved many problems. But he had no job and no source of livelihood. Here is how the local revenue collector of his day described a visit by Ramanujan in 1911:

“A short uncouth figure, stout, unshaven, not over clean, with one conspicuous feature—namely, shining eyes—walked in with a frayed notebook under his arm. He was miserably poor. ... He opened his book and began to explain some of his discoveries. I saw quite at once that there was something out of the way;

but my knowledge did not permit me to judge whether he talked sense or nonsense. ... I asked him what he wanted. He said he wanted a pittance to live on so that he might pursue his researches.”

This last sentence moves me every time I read it.

Ramanujan did get the job as a revenue clerk but was highly dissatisfied because he could not continue the work as he wanted. Two years later, he wrote to G.H. Hardy, then a towering mathematics professor in Cambridge, England, introducing himself in this way:

“I have had no university education but have undergone the ordinary school course. After leaving school I have been employing the spare time at my disposal to work at mathematics. I have not trodden through the conventional regular course which is followed in a university course, but I am striking out a new path for myself. I have made a special investigation of divergent series in general and the results I get are termed by the local mathematicians as 'startling'.”

The rest of the story is well told, among other places, in the book, “The Man who knew Infinity: A Life of the Genius Ramanujan”, and, in Hardy’s own beautiful essay “A Mathematician’s Apology”, where he made it clear that the best thing he did was to discover Ramanujan. Ramanujan is the quintessential genius from a poor country who would have died as nothing more than a local hero had Hardy and Cambridge not supported him.

Almost a century later, the situation has not changed much in many parts of the world. How many Ramanujans have we lost altogether, and how many more will we lose? I don’t know. At ICTP, we are mindful of this aspect and have set ourselves up for the extraordinary goal of righting it. This is why it was so appropriate to name the Prize after Ramanujan.

Ramanujan was certainly one of the mathematicians who thrived on deriving mathematical formulae in the best traditions of Euler and Jacobi. He derived numerous formulae involving divergent series, continued fractions, elliptic functions, and so forth. If

you want a simple and approximate formula for the perimeter of an ellipse, Ramanujan was your person. If you want a result for the logarithmic derivative of the gamma function, he was your person. He had an extraordinary and intuitive ability to manipulate numbers and infinite series, almost in a flash. His sort of mathematics fell out of favor for a while, when mathematics assumed a more formal tone, but has regained importance more recently. For some time now Ramanujan's work has seen an extraordinary renewal.

Ramanujan died at 32. He had become a legend by that time. In our library here, you will see a bust of Ramanujan, donated generously to us by the Deemed University Sastra in India, not far from where Ramanujan was born.

I now wish to say a few words about Niels Henrik Abel, another great mathematician, who is associated with this prize because of the support the prize derives from the Abel Board. Here is a picture of Abel. A lot about him can be found in the wonderful book,

“Niels Henrik Abel and his Times: Called Too Soon by Flames Afar”. I will remark briefly comparing Abel and Ramanujan.

For obvious reasons, longevity often influences a scientist's stamp on his world. There are exceptions of people who die young and yet change the world for ever. They die before being tainted by the perils of the establishment, and posterity regards them as great without a grudge. Abel and Ramanujan belong to this unique class.

Abel and Ramanujan were born 85 years apart in time and a world apart in space: Abel in 1802 in Frindø (near Stavanger), Norway, and Ramanujan in 1887 in Erode, Tamil Nadu, India. Both died young--- Abel at 27 and Ramanujan at 32. They both grew up in poverty and hardship; Norway was not in great shape at that time. The lives of these two mathematicians are at once romantic, tragic, and heroic. Of the two, perhaps Ramanujan may have been the more fortunate. He found a sympathetic mentor in Hardy. Abel had the misfortune that his best

work was mislaid at the Paris Academy by none other than the famous Cauchy, and was recognized only posthumously.

Abel was a pioneer in the development of several branches of modern mathematics, especially group theory and elliptic functions. He showed, while still 19 years old, that there exist no general algebraic solutions for the roots of polynomials with degree equal to or greater than 5, thus resolving a problem that had intrigued mathematicians for centuries. By the way, Ramanujan was shown how to solve cubic equations when he was 15 and he went on to find his own method to solve the quartic. The following year, not knowing that the quintic could not be solved by radicals, as Abel had shown, he tried to solve the quintic and, of course, did not succeed.

In 2001, a year before the bi-centenary of Abel, the Norwegian Government established an Abel Fund, part of which was to be used by the Norwegian Academy of Science and Letters to award an annual Abel Prize for mathematics, equal in value to the

Nobel Prizes. It is this Fund that has agreed to finance the Ramanujan Prize.

I now wish to mention the people and organizations that were involved in setting up this award, and welcome our guests as well as the honoree at this brief ceremony.

In some form or the other Professor Laudal of the Department of Mathematics in Oslo, Norway, Professor John Ball of Oxford University, the President of the International Mathematical Union, and Professor Jacob Palis, the former President of IMPA, were involved in establishing the Ramanujan Prize. The Niels Hendrik Abel Memorial Fund has supported the Prize. We have the special pleasure of having in our midst Professor Ragner Winther, the President of the Abel Board. Besides being an excellent mathematician, I am happy to say that he is a very level-headed person. I welcome him to ICTP in general, and to this event in particular, and look forward to strengthening ties between the Abel Fund and ICTP.

The Norwegian Academy of Science and Letters has put its support behind this endeavor. We also have in our midst Anne Marie Astad, the information officer of the Academy. Anne Marie has been very helpful to us in many different ways since our collaboration with the Academy started, and today she represents also the Secretary General of the Academy, Professor Reidun Sirevåg. Welcome to ICTP, Anne Marie.

We have another very special guest today, Professor Lennert Carleson, the 2006 Abel Laureate. The Abel Prize is by far the most distinguished Prize in mathematics today. Professor Carleson is from the Royal Institute of Technology, Sweden, and was, for sometime, the director of the Mittag-Leffler Institute, building it up from a rather dormant existence into one of the most popular and active mathematical research institutes in the world. He was also the president of the International Mathematical Union.

Perhaps interesting to some of us is what he wrote for this book that is a collection of short essays

by some 100 distinguished scientists. Speaking of how to build a tradition where none exists, whether in mathematics or science, he made the following metaphorical comment:

“Sweden has no tradition in downhill skiing—we have the snow but no mountains that can compare to the Alps. On the continent, however, the best skiers are national heroes. Nevertheless, in the 1970’s Ingmar Stenmark from the little village Tärnaby in Sweden became the leading skier in Europe. A few years later Sweden had 3 skiers among the 15 best and they all came from the same village! This is now history. However - and this may be sign in the sky also for mathematics—this year (2004) the leading skier in the women’s competition is again Swedish and she also comes from Tärnaby!

The story illustrates that many of us can obtain amazing results if we are willing to concentrate our efforts on one goal for a very long period and if we believe in ourselves. The young people in Tärnaby

knew Ingmar Stenmark as one of them and thought if he could do it, they can also.”

Professor Carleson received the Abel Prize for his contributions to harmonic analysis and the theory of smooth dynamical systems. He has solved many difficult open problems, and I was touched by what he told us last May: that he had not heard much about dynamical systems before plunging headlong onto solving one of the most difficult problems in the subject.

Now I come to the Prize winner this year. A distinguished international committee consisting of

Le Dung Trang (ICTP, Chair)

Bernt Oksendal (IMU nominee, Norway)

Kung Ching Chang (Peking University)

Jacob Palis (IMPA, Brazil)

Peter Sarnak (Princeton University)

S.R.S. Varadhan (Courant Institute)

was formed to select the prize winner. I am very thankful to all of them for their efforts in choosing the prize winner this year as the last. You may recall that

they recommended Professor Marcelo Viana from IMPA, Brazil, for the Prize. The choice of the committee this year is Professor Ramadorai Sujatha. A few words about her are in order.

Professor Sujatha is Associate Professor in the School of Mathematics at the Tata Institute of Fundamental Research, Mumbai, India. Dr. Sujatha received all her education in India and has been with TIFR since 1985. The citation reads as follows:

“The Prize is awarded to Dr. Sujatha in recognition of her work on the arithmetic of algebraic varieties and her substantial contributions to non-commutative Iwasawa theory. In particular, together with Coates, Fukaya, Kato, and Venjakob, she formulated a non-commutative version of the main conjecture of Iwasawa theory, which now drives much of the work in this important subject.”

It is my hope that the mathematicians recognized through the Ramanujan Prize will make their mark in ways that will render them eligible for further recognitions in the world of science. I am pleased that

the event this year links several institutions: ICTP, IMPA, Norwegian Academy of Science and Letters, Abel Board, IMA, and the event has involves several countries such as India, Italy, Norway and Sweden. This, too, has a romantic character.

The rest of the event today will go as follows. After some remarks by Professor Winther, the prize will be awarded to Professor Sujatha by Professor Carleson. I am thankful to him for agreeing to do so. I just have to mention that the challenge for him is to match the graciousness and worldly wisdom of the Queen who presented him the Abel Prize. Professor Sujatha will make some remarks, mostly telling us about how her work fits in the big scheme of things, but not going into too many details. In the afternoon at 3 PM, she will present a formal colloquium in the mathematics section at 3 PM this afternoon. I invite all of you interested in knowing more about her work to that meeting. After her speech, Professor Carleson will tell us about his work that led to the Abel Prize---

also informally. I am looking forward to his remarks,
as I am sure the rest of us are, as well.