Doing the maths

Ehsan Masood

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A new mathematics prize seeks to reward top talent from the developing world without encouraging a global brain-drain. The west should look and learn, says Ehsan Masood.

In December 2005, a new prize was unveiled for leading young mathematicians from the developing world. The first Ramanujan prize went to **Marcelo Viana**, a professor at the Institute of Pure and Applied Mathematics in Brazil. The prize is intended to reward excellence and highlight the importance of mathematics to researchers, policy-makers and the public.

The prize is in memory of Tamil Nadu-born **Srinivasa Ramanujan** (1887-1920), a mathematical child prodigy, largely self-taught, who made an indelible mark on several fields in both pure and applied maths – elliptic functions, the analytical theory of numbers, continued fractions, and infinite series – despite a short life often marred by poor health. Almost 120 years after his birth, mathematicians and historians of the subject are still debating the impact of his work, which is the subject of its own scholarly periodical, ***The Ramanujan Journal***.

Today, pure mathematics is one of the few fields of research where a talented specialist from a less developed country is, in theory, able to excel at the highest levels without the need for developed-country assistance. Perhaps the best-known example where this happens is the **International Mathematical Olympiad**, an annual competition for mathematics students from all over the world, inaugurated in 1959. The results in recent years are fascinating and revealing: China has won six times since 1997, Vietnam and Kazakhstan were among the ten highest-ranked countries from 2000-04, and no developed country has won the contest since 2000.

Yet what happens to those bright young things once they graduate? Part of the answer lies in what is called the **Fields medal**, the equivalent of the maths Nobel prize (though awarded every four years rather than annually). Since its inception in 1936, researchers from Europe, the

The Ramanujan prize, to be awarded annually to an outstanding mathematician under the age of 45 from the developing world, was created by the International Centre for Theoretical Physics in cooperation with the International Mathematical Union. The $10,000 prize is donated by the Oslo-based Niels Henrik Abel Memorial Fund. For details of the award and the first prizewinner

United States or Russia have dominated the award; only one mathematician from a developing country, **Shing-Tung Yau** of China in 1982, has been victorious. What seems to be happening is that the clever young students who win at the maths Olympics then abandon the subject for professional careers likely to prove more financially rewarding.

Katepalli Sreenivasan heads the International Centre for Theoretical Physics (**ICTP**) in Trieste, Italy, which co-sponsors the Ramanujan prize. The idea for the prize came to him, he says, precisely because top maths students from developing countries are opting out of academic research in search of more lucrative career options. The result is that what might have been candidates for the Fields medal are more likely to be found in Bangalore or Silicon Valley than at a university in a developing country.

Thus, the point of the Ramanujan prize is not to create another Ramanujan. What it might just do is to give international recognition to another potential Ramanujan before he or she abandons mathematics altogether – which is what might have happened to Ramanujan himself had he not made contact with, and been encouraged by, a leading mathematician from Cambridge, England.

In 1914 Ramanujan left India on a scholarship to the University of Cambridge, then a hothouse for the world's finest mathematicians and physicists. This became possible because the English mathematician **GH Hardy** (1877-1947) had recognised his genius after being sent some of the young man's work and responding to his letters. Without Hardy's support or Cambridge's patronage, it is likely that Ramanujan would have spent the rest of his days as a clerical officer in Chennai.

Abdus Salam's message

The ICTP is engaged in the tricky task of nurturing developing-country mathematicians without aiding the brain-drain process. In countries where top-rated mathematicians are few, losing your sharpest people to the west could bring research in your own country to a stop. This is something that the theoretical physicist **Abdus Salam** (1926-96), who co-founded the ICTP in 1964, was all too aware of.

Salam (another child prodigy) shared a Nobel prize in 1979 for his theoretical work in showing that two of the four fundamental forces of nature can be considered to be one and the same – the two forces being electromagnetism, and the "weak" force that accounts for radioactivity.

Pakistan-born Salam (who died in 1996) became professor of theoretical physics at Imperial College London. But more than anything else he wanted to develop mathematics and theoretical physics in developing countries on a sufficiently large scale and with the resources that could nurture a generation of empiricists who would not feel the need to emigrate to the west in the way that he had had to.

Salam formally proposed the idea of the ICTP to the United Nations in 1960. He used a metaphor from nuclear physics to drive home his case to the assembled delegates, that an institute wishing to become "self-reacting and self-sustaining" needs to be of a "critical size": "It is necessary that the number of first-rate

Ehsan Masood is project director of The Gateway Trust

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"The globalisation of

physicists should exceed a basic minimum…In most underdeveloped countries, the number of theoretical physicists is too small to form self-reacting groups. The result is that these men live in a frustrating atmosphere of enforced isolation completely lacking the stimulus that comes with cross-fertilisation of ideas."

What is unique about the ICTP is that promising scientists from developing countries (not only in theoretical physics) can update their knowledge of a field through advanced short courses. They can also conduct collaborative research with scientists from other countries. The beauty is that no one has to emigrate from their country of origin to get up to speed with the latest ideas, or to work with stimulating colleagues.

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The presence of the ICTP has had a significant impact on theoretical physics in the developing world. The Ramanujan prize may well be the first step in doing the same for mathematics.

The experience of the maths Olympiad, meanwhile, suggests that the Ramanujan prize initiative might usefully become another example of beneficial "east-to-west" (or "south-to-north") export. The success of researchers from China, India and other developing countries contrasts markedly with the **declining interest** in mathematics at school and teacher shortages in Britain, which have become matters of national, political concern. Perhaps the equivalent of a Ramanujan prize for promising young mathematicians from developed countries would make equal sense?

"Srinivasa 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", **Katepalli Sreenivasan** said at the launch of the prize in the young Indian's honour. "Almost a century later the situation has not changed in many parts of the world. How many Ramanujans have we lost altogether, and how many more will we lose? I don't know, but we have set ourselves the extraordinary goal of righting it."

International Centre for Theoretical Physics (ICTP)

International Mathematics Union (IMU): prizes

International Congress of Mathematicians: Madrid 2006

Masters of Theory: Cambridge and the Rise of Mathematical Physics, by Andrew Warwick (University of Chicago Press, 2003) (US) (UK)

The Crest of the Peacock: Non-European Roots of Mathematics, by George Joseph (Penguin, 2000) (US) (UK)

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