Newspaper Clips
August 14, 2014

Millenium Post ND 14/08/2014 P-1

Bhargava wins 'Nobel Prize of Maths'

NEW YORK: Two Indian-origin academicians have won prestigious global prizes in the field of mathematics with one of them being awarded the Fields Medal - known as the 'Nobel Prize of mathematics'.

Manjul Bhargava won the Fields Medal while Subhash Khot won the Rolf Nevanlinna Prize, awarded by the International Mathematical Union (IMU), at the International Congress of Mathematicians 2014 held in Seoul.

Manjul Bhargava, a professor of mathematics at Princeton University, was among the four winners who have been awarded the Fields Medal, given out every four years.


Manjul Bhargava

Iranian-born mathematician and Stanford University professor Maryam Mirzakhani became the first woman to win the Fields Medal this year.

Mr Bhargava was awarded the Fields Medal for 'developing powerful new methods in the geometry of numbers, which he applied to count rings of small rank and to bound the average rank of elliptic curves.'

According to the award citation, Mr Bhargava's work is 'based both on a deep understanding of the representations of arithmetic groups and a unique blend of algebraic and analytic expertise.'

Subhash Khot was awarded the Nevanlinna Prize for his 'prescient definition of the 'Unique Games' problem, and leading the effort to understand its complexity and its pivotal role in the study of efficient approximation of optimisation problems.'

His work has led to breakthroughs in algorithmic design and approximation hardness and to new exciting interactions between computational complexity, analysis and geometry.

Mr Khot is a professor in the Computer Science Department at New York University's Courant Institute of Mathematical Sciences. He has a PhD from Princeton.

Born in 1974 in Canada, Manjul Bhargava grew up in the US and also spent much time in India. He received his PhD in 2001 from Princeton University and became a professor in 2003.

Mr Bhargava's honours include the Merten Hasse Prize of the Mathematical Association of America (2003), the SASTRA Ramanujan Prize (2005), the Cole Prize in Number Theory of the American Mathematical Society (2008) and the Infosys Prize (2012). AGENCIES

Indian Express ND 14/08/2014 P-1

2 Indians figure in maths roll of honour

V SHOBA & MIHIKA BASU
BANGALORE, MUMBAI, AUG 13

MANJUL Bhargava, a Canadian-American teaching at Princeton University, has become the first mathematician of Indian origin to win the Fields Medal, the highest honour bestowed on scientists under the age of 40 for outstanding contribution to the field of mathematics.

Artur Avila from Brazil, Martin Hairer from Austria and Maryam Mirzakhani, an Iranian who teaches at Stanford University, have also been chosen for the medal, considered the Nobel Prize of mathematics, announced at the International Congress of Mathematicians in Seoul. Avila is the first Latin American and Mirzakhani the first woman to win the award.


Artur Avila | Manjul Bhargava | Martin Hairer | Maryam Mirzakhani

Manjul Bhargava (second from left) with the other winners. REUTERS

For India as well as for Bhargava, the medal has been a long time coming. Lauded by the International Mathematical Union for "developing powerful new methods in the geometry of numbers", Bhargava, best known for his work on elliptical curves, was tipped to win the medal the last time around in 2010. Born in 1974 in Canada to migrant parents from Jaipur, Bhargava, 40, is a number theorist of international repute.

Adding to the jubilation, the Rolf Nevanlinna prize, for outstanding contributions in mathematical aspects of information sciences including computer science, has also been bagged by an Indian-origin scientist — Subhash Khot, a professor in the Computer Science Department at New York University's Courant Institute of Mathematical Sciences.

PAGE 1 ANCHOR

Mathematics wizard is an IIT-Bombay alumnus

http://www.thehindu.com/news/cities/mumbai/mathematics-wizard-is-an-iitbombay-alumnus/article6314039.ece

One of the important contributions made by Fields Medal winner Manjul Bhargava is the generalisation of the 'composition law' of binary quadratics (polynomial expressions of the form ax2 + bxy + cy2) discovered 200 years ago by Carl Friedrich Gauss (1777-1855), to higher degree polynomials using an ingenious geometric technique that he discovered.

The awards were announced at the inaugural of the nine-day International Congress of Mathematicians that began in Seoul on Wednesday.

The awards, presented at the quadrennial ICM event, include the Fields Medal, the highest award in mathematics; the Rolf Nevanlinna Prize and the Carl Friedrich Gauss Prize. At the last ICM held in Hyderabad, the Chern Medal and the Leelavati Prize were added.

The Fields Medal is awarded "to recognise outstanding mathematical achievement for existing work and for the promise of future achievement". "Manjul Bhargava has developed powerful new methods in the geometry of numbers and applied them to count rings of small rank and to bound the average rank of elliptic curves," said the medal citation.

Besides mathematics, Dr. Bhargava pursues his interests in linguistics and Indian classical music. The Indian-American theoretical computer scientist Subhash Khot, a theoretical computer scientist at the Courant Institute of Mathematical Sciences of New York University, gets the Rolf Nevanlinna Prize. The citation for him read: "Subhash Khot's prescient definition of the Unique Games problem, and his leadership in the effort to understand its complexity and its pivotal role in the study of efficient approximation of optimization problems, have produced breakthroughs in algorithmic design and approximation hardness, and new exciting interactions between computational complexity, analysis and geometry."

Born in Ichalkaranji in Maharashtra, Dr. Khot (36) an IIT Bombay alumnus, won the silver medal in the International Mathematics Olympiad in 1994 and 1995 and stood first in the IIT Joint Entrance Examination in 1995. His area of research is Computational Complexity Theory. His Unique Games Conjecture is about the impossibility of even obtaining good approximations to problems that are computationally hard to solve using standard computing algorithms.

HINDU ND 14/8/2014 P-9

'Mathematicians treat the discipline more as an art than as a science'

Interview with **Manjul Bhargava**, one of the four recipients of the Fields Medal prize

Manjul Bhargava *is a number theorist and Brandon R Fradd Professor of Mathematics at Princeton University, New Jersey. He is one of the four recipients of the Fields Medal, officially known as the International Medal for Outstanding Discoveries in Mathematics, this year. "Bhargava has a keen intuition that leads him unerringly to deep and beautiful mathematical questions. With his immense insight and great technical mastery, he seems to bring a 'Midas touch' to everything he works on," reads the press release announcing his award. In this email interview, Prof. Bhargava talks to* **Shubashree Desikan** *about mathematics, music and more.*

How does it feel to have won the Fields Medal? You are the first person of Indian origin to be getting it.

It is, of course, a great honour. Beyond that, it is a great source of inspiration and encouragement — not just for me, but for my students, collaborators, and colleagues. Hopefully, it will also be a source of inspiration for young people in India to take up research in the sciences.

You have grown up in Canada. Do you think of yourself as a Canadian, American, Indian, none of these or all of these?

I was born in Canada, but grew up mostly in the U.S. in a very Indian home. I learnt Hindi and Sanskrit, read Indian literature, and learnt classical Indian music. I mostly ate Indian food. On the other hand, I went to school mostly in the U.S. I liked growing up in two cultures because it allowed me to pick and choose from the best of both worlds. My Indian upbringing was very important to me.

I also spent a lot of time growing up in India. Every three or four years, I would take off six months from school to spend them in India, mostly in my hometown Jaipur, with my grandparents. There I had the opportunity to go to school, brush up on my Hindi and Sanskrit, and learn tabla (as well as some sitar and vocal music). I particularly enjoyed celebrating all the Indian holidays as a child, and flying kites on *Makar Sankranti*.

I feel very much at home in all three countries. So I definitely think of myself as all three — Canadian, American, and of course Indian.

How did you start playing the tabla?

I first started learning from my mother. When I was may be three years old, I used to hear my mother playing often, and I asked her to teach me to play a little bit. She tried to teach me the basic sound "na." She demonstrated the sound to me, and I tried to mimic her, but nothing came out. I was hooked. I learnt from my mom first, and then from Pandit Prem Prakash Sharma in Jaipur whenever I visited there.

I met Zakir*ji* when I was an undergraduate at Harvard. He came to perform there when I was a third-year student. I had the exciting opportunity to meet him afterwards at a reception, and he invited me to visit him in California (where he lives). I have had the great pleasure and privilege of learning from him on and off since then. More than that, he has been a wonderful and inspirational friend, and he and his whole family, in both California and Bombay, have been a huge source of love, encouragement, and support to me for a long time. I am very grateful to them for that.

Do you collaborate with mathematicians in India? Do you have contacts with institutes in India?

For many years now, I have been an adjunct professor at TIFR-Mumbai (Tata Institute for Fundamental Research), IIT-Bombay, and the University of Hyderabad. I've spent a lot of time at these three institutes, especially at TIFR and IIT-B, over many years. I've lectured extensively to students at these institutes, as well as collaborated a lot with mathematicians there, such as with Eknath Ghate at TIFR (who recently won the Shanti Swarup Bhatnagar Prize for mathematical sciences).

I've also been involved in starting a new institute in Bangalore called the International Centre for Theoretical Sciences. It will be inaugurated next year, and we hope it will be a great success. The director is Professor Spenta Wadia of TIFR, and the head of the International Advisory Board is Nobel Prize Winner Professor David Gross. So hopefully I will spend even more time in India after the inauguration next year.

> **'Hopefully, the medal will be a source of inspiration for young people in India to take up research in the sciences'**

Manjul Bhargava – PHOTO: BY SPECIAL ARRANGEMENT

Recently you have won prizes for your work on the Birch and Swinnerton-Dyer conjecture which was listed as one of the seven Millennium Prize Problems. Can you explain the significance of this work?

In joint work with Christopher Skinner and Wei Zhang, we have shown that the Birch and Swinnerton-Dyer Conjecture is true *most* of the time (more precisely, for more than 66.48 per cent of elliptic curves). Previously, it was not known that it was true for more than 0 per cent. So that is significant progress, but it is still *not* a complete solution.

Finishing a proof of the Birch and Swinnerton-Dyer Conjecture would be a momentous achievement, and it is one of my favourite problems, but it is not solved yet.

Do you believe that this is the best time to study maths? For instance, number theory is now being applied in cryptography and so on.

It is interesting that pure mathematicians like me rarely think directly about applications. We are instead guided primarily by what directions we find most beautiful, elegant, or most promising. We tend to treat our discipline more as an art than as a science. And indeed, this is the attitude that allows us to be the most creative and productive.

On the other hand, it is also true, historically, that the mathematics that has been the most applicable and important to society over the years has been the mathematics that scientists found while searching for beauty; and eventually all beautiful and elegant mathematics tends to find applications.

That is why it is very important to fund basic science research. When science funding is only application-driven, it does not allow full freedom and creativity. Funding basic science allows a large interconnected database of scientific techniques and knowledge to accumulate, so that when a societal need arises, the science is ready to be applied and adapted to the purpose.

Elliptic curves (and the related Birch and Swinnerton-Dyer Conjecture) are indeed good examples. They were first studied by pure mathematicians, but are now one of the most important mathematical objects in cryptography. So that is indeed exciting, but I just want to emphasise that they were exciting and central to number theory well before these applications were found. But it was inevitable that they would be found, given their fundamental nature.

That is why elliptic curves have fascinated me. They are so fundamental in both pure and applied mathematics. Beyond advancing the subject of number theory in general, a heightened understanding of elliptic curves also has important implications in coding theory and cryptography. Encryption schemes, such as those used to protect our privacy when transmitting information online, often centrally involve the use of elliptic curves.

What aspect of your education could have contributed to your enjoyment for Maths?

I've always enjoyed mathematics as far back as I can remember, since I was two or three years old. Since my mother was a mathematician, I always had her as a resource. I would always ask her questions, and so I learnt a lot from her. She was also a great source of encouragement — she always answered my questions enthusiastically, and always encouraged me to pursue whatever I was interested in. That probably single-handedly contributed the most to my enjoyment of mathematics (and all my interests).

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HINDU ND 14/8/2014 P-16

Manjul Bhargava: the 'Midas Touch' mathematician

R. RAMACHANDRAN

Manjul Bhargava, the Canadian-American number theorist from Princeton University, is one of the four who have been chosen for the highest award in mathematics, the Fields Medal, which is given once every four years by the International Mathematical Union (IMU) during the quadrennial International Congress of Mathematicians (ICM). The ICM2014 got underway on August 13 at Seoul, Republic of Korea.

Fields medal

Awarded in recognition of "outstanding mathematical achievement for existing work and for the promise of future achievement", the Fields Medal is given to mathematicians of age less than 40 on January 1 of the year of the Congress. Born of Indian parents who migrated from Jaipur in the late 1950s, Bhargava, who turned 40 just last week, could not have hoped for a better birthday gift.

"Bhargava", says the IMU citation, has been awarded the Fields Medal "for developing powerful new methods in the geometry of numbers, which he applied to count rings of small rank and to bound the average rank of elliptic curves."

A large body of work in number theory relates to the study of how numbers of interest, such as prime numbers, are distributed among the entire set of integers. Bhargava developed novel techniques to count objects in algebraic number theory that were previously considered completely inaccessible. His work has completely revolutionized the way in which fundamental arithmetic objects in algebraic number theory, such as number fields and elliptic curves, are now understood and studied, and this has given rise to wonderful applications.

About 200 years ago the German mathematician Carl Friedrich Gauss, one of the historical greats, had discovered a remarkable 'composition law' for binary quadratic forms, which are polynomials of the form $ax^2 + bxy + cy^2$, where a, b and c are integers.

Using this law two binary quadratic forms could be combined to give a third one. Gauss's law is a central tool in algebraic number theory. Bhargava discovered an ingenious and simpler geometrical technique to derive it and the technique allowed him to obtain composition laws for higher-degree polynomials as well.

Geometry of numbers

The technique reportedly dawned upon Bhargava one day while he was playing with Rubik's cube. Implicit in Gauss's method was the use of 'geometry of numbers' and it is this realization that enabled Bhargava to extend it to higher degrees. He then discovered 13 new composition laws for higher-degree polynomials.

Until then, Gauss's law was thought to be accidental and unique to binary quadratics. Nobody had even imagined that higher composition laws existed until Bhargava showed that Gauss's law is part of a bigger theory applicable to polynomials of arbitrary degree.

His approach has also broadened the canvas of applying geometry of numbers to address outstanding problems of algebraic number theory.

This work immediately led Bhargava to tackle a related problem, which was the counting of 'number fields of fixed degree by discriminant'.

Discriminant

A number field is obtained by extending the rational numbers to include non-rational roots of a polynomial equation; if the polynomial equation is quadratic, such $ax^2+bx+c = 0$, whose roots are given by the well-known formula $[-b/2a \pm \sqrt{(b2 - 4ac)}/2a]$, then one obtains a quadratic number field. The expression under the square root sign is called the 'discriminant' (defined appropriately for polynomials of different degrees). Higher degree number fields — cubic, quartic, quintic etc. — are correspondingly generated by higher degree polynomials.

The degree of the polynomial and its discriminant are two fundamental quantities associated with a polynomial. Despite number fields being one of the fundamental objects in algebraic number theory, answers to questions like how many number fields there are for a given degree n and a given determinant D were not known.

If one has a quadratic polynomial, counting the number of lattice points in a certain region of 3-d space gives information about the associated quadratic number field. For example, using the geometry of numbers it can be shown that, for discriminant with absolute value less than D, there are approximately D quadratic number fields.

The case of cubic number fields had been solved 40 years ago by Harold Davenport and Hans Heilbronn but since then the higher degree cases saw little progress until Bhargava came on the scene.

Quintic number fields

Armed with his new technique, Bhargava was able to solve the case of quartic and quintic number fields. The cases of degrees greater than 5 still remain open as Bhargava's composition laws alone seem inadequate to resolve these higher cases at present.

Elliptic curves have important applications in pure as well as applied mathematics. Even though Fermat's Last Theorem seems to be not even remotely connected with elliptic curves, it was key to its proof in 1995 by Andrew Wiles, who, incidentally, was also Bhargava's thesis advisor. Operations using elliptic curves have become a core component of many of the cryptographic protocols that encode credit card numbers in online transactions.

"Intellectual stimulation, beautiful structure, applications – elliptic curves have it all," Bhargava has said.

An outstanding problem in algebraic number theory has been how to count the number of points on 'elliptic curves' that have rational co-ordinates, which is the same as asking how many rational solutions does an elliptic equation have?

Rational points

For curves of degree 1 and 2, there is an effective way of finding all the rational points. Finding rational points for elliptic curves is, however, not an easy matter. They can have zero, finitely many, or infinitely many rational solutions.

When does a cubic equation have infinitely many solutions has been a central question in number theory since Pierre de Fermat in the 17th Century.

In the recent past mathematicians have attempted to devise algorithms to decide whether a given elliptic curve has finitely many or infinite rational points but that route took them nowhere. They have only been able to guess how often these different possibilities arise.

Curve's rank

When the number of rational points of an elliptic curve is infinite, the smallest number of rational points that can generate essentially all the rational points is called the curve's rank.

When the infinite set of rational points can be generated from just one point, the curve has rank 1, and so on. When the number of rational points is finite or none at all, the rank is 0.

In 1979 Dorian Goldfeld conjectured that the average rank the average rank of the group of rational points of an elliptic curve defined over rational numbers is bounded and is equal to half. That is, in a statistical sense, half of all elliptic curves have rank 0 and half have rank 1. Previously, however, mathematicians did not even know that the average rank was finite, let alone half. The conjecture, of course, does not mean that curves of higher rank – 2, 3 and so on – do not exist, or even that there are only finitely many such. Indeed, computationally mathematicians have found such curves, the highest known rank till date is 28! But as the number of elliptic curves asymptotically becomes infinitely large, the curves with higher ranks approach a vanishingly small percentage of the whole.

Using newly developed techniques, Bhargava and his doctoral student Arul Shankar (a 2007 Chennai Mathematical Institute graduate) were not only able to show that the average rank is bounded but that the bound is also less than 1, indicating that the conjecture is perhaps true.

Bhargava's work in number theory has had profound influence in the field. "A mathematician of extraordinary creativity, he has a taste for simple problems of timeless beauty, which he has solved by developing elegant and powerful new methods that offer deep insights," said IMU's information sheet on his work.

"With his keen intuition, immense insight and great technical mastery, he seems to bring a 'Midas touch' to everything he works on," it added.

Tabla player

Besides being one of the world's leading mathematicians, Bhargava is also an accomplished tabla player and plays at the concert level. He learnt the art initially from his mother and later came under the tutelage of the well-known tabla maestros Pandit Prem Prakash Sharma and Ustad Zakir Hussain.

Manjul Bhargava from Princeton University. — PHOTO: INTERNATIONAL MATHEMATICAL UNION

What they mean

- In 'geometry of numbers' one imagines a plane or a 3-dimensional space populated by a lattice whose grid points have integer co-ordinates.
- A 'ring' is an algebraic structure with two binary operations, commonly called addition and multiplication, which are generalizations of the familiar arithmetic operations with integers applied to algebraic objects. Examples of rings are polynomials of one variable with real coefficients, or square matrices of a given dimension. Algebraic number theory is the study of this and other algebraic structures.
- 'Rank' refers to the minimum number of objects required to generate the entire set of algebraic objects being studied; the dimension of a vector space, for example. The familiar 3-d vector space is of rank 3.
- 'Elliptic curves' are graphs generated by equations of the form y^2 = a polynomial of degree 3, such as $x^3 + ax + b$, where a and b are rational numbers.

Indian Express ND 14/08/2014 P-8

'Top maths prize to Bhargava will inspire generations of Indian students'

V SHOBA & MIHIKA BASU

BANGALORE, MUMBAI, AUGUST 13

AS MANJUL Bhargava became the first mathematician of Indian origin to win the Fields Medal, his contemporaries from India were a proud lot.

"The Indian contingent at ICM Seoul is delighted and excited. He is one of the finest mathematical minds in the world today and much more is expected of him in the future," said Ramachandran Balasubramanian, director of the Institute of Mathematical Sciences in Chennai, in an email from Seoul.

"The Fields Medal was long overdue," said Rajat Tandon, a professor of mathematics at the University of Hyderabad. "Manjul's approach is often quite simple but extremely creative. He revisits classical problems that have been set aside by others in a completely new way and achieves astounding success," he said.

Talking about Bhargava's achievement, professor Dipendra Prasad, School of Mathematics, Tata Institute of Fundamental Research, said, "I am sure Manjul's medal will inspire generations of Indian students — many very talented in mathematics — to think of mathematics as a profession, and to give them the confidence that if he could reach the top, some others among them have a chance too."

Dr Eknath Ghate, scientist at the Tata Institute of Fundamental Research (TIFR), Mumbai, and Bhargava's friend said, "His outlook on life is very Indian and he has a keen interest in Indian classical music, languages and food. He is fond of speaking in Hindi and enjoys coming to India. He is simply brilliant."

Describing him as cheerful and humble, Dr A Raghuram, head of the mathematics department at the Indian Institute of Science Education and Research, Pune, said Bhargava is the "most original number theorist in the world today". "He is strikingly original and also an accomplished tabla player. The Indian circle at Princeton says that whenever there is an event or concert at the university, Bhargava often plays the tabla," said Raghuram. Bhargava had trained under Ustad Zakir Hussain.

IMU in a release said, "when he was a graduate student, Bhargava read the monumental *Disquisitiones Arithmeticae*, a book about number theory by Carl Friedrich Gauss. All mathematicians know of the Disquisitiones, but few have actually read it, as its notation and computational nature make it difficult for modern readers to follow. Bhargava nevertheless found the book to be a wellspring of inspiration."

Business Standard ND 14/08/2014 P-1

A professor who sees common thread in Sanskrit, music and mathematics

Manjul Bhargava wins Fields Medal, considered Nobel Prize for maths

LIFE OF A WIZARD

- **Aug 8, 1974:** Born in Hamilton, Ontario, Canada
- **1996:** Earns AB (Artium Baccalaureus, equivalent to BA) in mathematics from Harvard University
- **2001:** Awarded PhD by Princeton University
- **2003:** Joins Princeton University as a professor
- **2011:** Is the Simons Lecturer at MIT
- **2012:** Wins Infosys Award for research in mathematical sciences
- **2014:** Bags Fields Medal, considered Nobel for mathematics

BIBHU RANJAN MISHRA
Bangalore, 13 August

Do Indian classical music and Sanskrit have a direct correlation with mathematics? In case you are confused, ask Manjul Bhargava. The mathematics professor at Princeton University who just turned 40 took inspiration from both music and Sanskrit to pursue mathematics, his pet subject — and how. On Wednesday, he won Fields Medal, often described as the 'Nobel Prize of Mathematics', and was chosen one of the four best mathematicians globally. He is the first Indian-origin person to win this medal.

"As a child, I enjoyed studying Sanskrit, Sanskrit poetry and Indian classical music. I saw maths in all these things; that further inspired me to pursue mathematics. When I went to college, I took Sanskrit, a lot of music, computer science and physics, and also mathematics. To me, mathematics was the common thread in all these subjects," he says.

A graduate in mathematics from Harvard University and a PhD from Princeton University in 2001, Bhargava is also a recipient of the Infosys Prize for Mathematical Sciences, which he received in 2012.

"Today is an incredible day of celebration for all of us Indians... This (Fields Medal) in some sense is harder to win than the Nobel, since it is awarded once every four years and the winner has to be younger than 40 years old. This is an extraordinary and rare achievement," says N R Narayana Murthy, co-founder & chairman of Infosys, the country's second-largest IT services firm.

In a world where students are losing interest in research in pure basic sciences, Bhargava is an exception. As a child, mathematics always fascinated him. "One of my early childhood memory was stacking oranges in the form of a pyramid. My work primarily revolves around understanding whole numbers like prime and square," he says.

Turn to Page 20

A professor who sees common thread in Sanskrit, music and maths

After finishing his PhD, Bhargava joined Princeton University as a professor in 2003. His primary research interests lie in the number theory, representation theory, and algebraic geometry. Since then, he has earned several awards and citations for his contribution to many critical areas of mathematical research and algorithm, including Derek Bok Awards for Excellence in Teaching, Hoopes Prize for Excellence in Scholarly Work and Research from Harvard University and AMS-MAA-SIAM Morgan Prize for Outstanding Undergraduate Research in Mathematics.

The Fields Medal this year was conferred on him for 'developing powerful new methods in the geometry of numbers, which he applied to count rings of small rank and to bound the average rank of elliptic curves.

Named after Canadian mathematician John Charles Fields and instituted by International Mathematical Union, Fields medal is awarded once every four years to exceptional talents under the age of 40. Though the award carries cash prize of around 15,000 Canadian dollars, it is considered the highest honour in the field of mathematical research.

He was born in Canada and brought up in the US but Bhargava, with roots in Jaipur, has a strong connection with India. "We speak Hindi at home and celebrate all Indian festivals. I am pretty much an Indian at heart."

Besides mathematics, which is his first love, he is also an accomplished tabla player; he learnt that art with Pandit Prem Prakash Sharma and Ustad Zakir Hussain.

"I first met him when he won the Infosys Science prize three years ago. If you meet or talk to Manjul, you will find he is very passionate about India and has his interests close to his heart. He is as unassuming and friendly as he is brilliant," Murthy adds.

Bhargava feels very sad about the state of scientific research in India. Despite having very good mathematical talent, many are getting attracted to engineering and medicines for "easy money", he says, adding this is a mistake that might prove costly, not only to the individual but to the country.

"Science is also a very collaborative discipline... So, doing scientific research is like a big venture that gives you an amazing feeling... it is a lot of fun and it is very important for the world," Bhargava says.

HINDU ND 14/8/2014 P-11

Mathematics wizard also a fan of Indian classical music

R. Ramachandran

NEW DELHI: One of the important contributions made by Fields Medal winner Manjul Bhargava is the generalisation of the 'composition law' of binary quadratics (polynomial expressions of the form ax2 + bxy + cy2) discovered 200 years ago by Carl Friedrich Gauss (1777-1855), to higher degree polynomials using an ingenious geometric technique that he discovered.

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MATHEMATICAL GENIUSES

INDIAN-ORIGIN ACADEMICIANS WIN PRESTIGIOUS AWARDS

2014 FIELDS MEDALLISTS

Manjul Bhargava (40)
- Born in Canada, raised in the U.S.
- Princeton University professor

"Developing powerful new methods in the geometry of numbers"

Artur Avila (35)
- Brazil, **first winner from South America**
- Researcher at Institute of Mathematics of Jussieu, Paris

"Profound contributions to dynamical systems"

Maryam Mirzakhani (37)
- Iran, **first female winner**
- Stanford University professor

"Outstanding contributions to dynamics, geometry of Riemann surfaces and their moduli spaces"

Martin Hairer (38)
- Austria
- Warwick University professor

"Outstanding contributions to the theory of stochastic partial differential equations"

ROLF NEVANLINNA PRIZE (For outstanding contributions in mathematical aspects of information sciences)

Subhash Khot (36) • Indian-American
- Computer scientist at the Courant Institute of Mathematical Sciences, New York University

"Prescient definition of the 'Unique Games' problem"

The Indian-American theoretical computer scientist Subhash Khot, a theoretical computer scientist at the Courant Institute of Mathematical Sciences of New York University, gets the Rolf Nevanlinna Prize. The citation for him read: "Subhash Khot's prescient definition of the Unique Games problem, and his leadership in the effort to understand its complexity and its pivotal role in the study of efficient approximation of optimization problems, have produced breakthroughs in algorithmic design and approximation hardness, and new exciting interactions between computational complexity, analysis and geometry."

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Times of India, ND 14/08/2014
P-15

12 VCs' selection: Prez nod for review of UPA nominees

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Twelve central universities have been headless since the beginning of this year. UPA had set up 12 selection panels and the process was underway even during the election

New Delhi: The mess left behind by UPA on appointment of vice-chancellors of 12 central universities is slowly getting cleared. President as visitor of these universities has cleared HRD ministry's new proposal to deal with appointments.

Rashtrapati Bhavan sources said, "Ministry is examining names of shortlisted candidates as well as composition of search-cum-selection committees appointed during the previous government."

For instance, in case of Central University of Kerala, the search-cum-selection committee had shortlisted Jancy James, who demitted office as the first VC, G Gopa Kumar and one more academic. Rashtrapati Bhavan sources said though the UPA government was in favour of giving another term to James, the new government gave its approval to the name of Kumar, who has now taken the charge.

Sources said in case of Hari Singh Gour Central University, HRD ministry has proposed scrapping of the search-cum-selection committee consisting of Y K Alagh, Y S P Thorat, MM Salunkhe, Srinivasan Chandrasekharan and Sukhdeo Thorat. President has agreed with this proposal also. "Salunkhe was VC of central university of Rajasthan and was made member of search committee for Hari Singh Gour University. This raises serious question of conflict of interest," source said.

Twelve central universities have been headless since the beginning of this year. UPA had set up 12 search-cum-selection panels and the process was underway even during polls.

For the full report, log on to www.timesofindia.com

Asian Age, ND 14/08/2014 P-4

Students of IIT-K make 'humanoid' robot Bi-ped

AGE CORRESPONDENT
LUCKNOW, AUG. 13

Students in IIT-Kanpur have developed a "humanoid" robot, aptly called "Bi-ped".

The robot walks on two feet and is not supported on wheels like other robots. Utsav Gupta and Vivek Verma, Shivam Soni, Varun Verma and Deepak Pawar, all B.Tech students, put up their new creation at the first ever student research convention organised by Hall IV (hostel) on the campus of IIT-Kanpur.

The new feature of attaching legs to the robot allows it to perform tasks which are done by humans and which cannot be performed by robot with wheels.

"The robot can detect a wall in front and take a turn, can stand up after falling down and can even kick a ball. Also, it can work at the locations where human lives are at risk, like in cases of fire mishaps, detecting and diffusing a bomb and can do a number of other jobs like fetching files in the office and taking care of a child at home," said Utsav Gupta.

Times of India, ND 14/08/2014 P-23

Gold particles can help fight cancer

Kill Tumour Cells In Brain, Says Study

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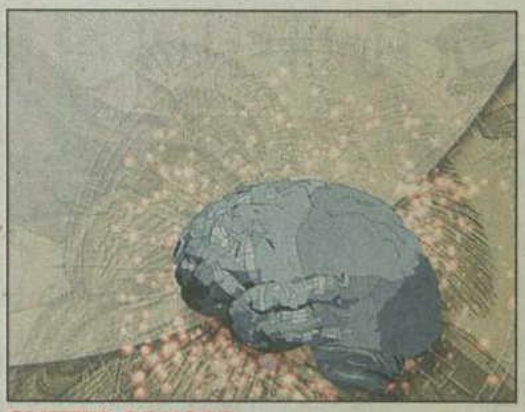
London: A novel treatment for an aggressive form of brain cancer, which involves using tiny nanoparticles of gold to kill tumour cells, has been successfully tested by scientists in the UK.

The groundbreaking technique could eventually be used to treat glioblastoma multiforme — the commonest and most aggressive brain tumour in adults that is also notoriously difficult to treat, University of Cambridge researchers said. Most patients die within a few months of diagnosis and just six in every 100 patients with the condition are alive after five years.

The research involved engineering nanostructures containing both gold and cisplatin, a conventional chemotherapy drug. These were released into tumour cells that had been taken from glioblastoma patients and grown in the lab. Once inside, these 'nanospheres' were exposed to radiotherapy. This caused the gold to release electrons that damaged the cancer cell's DNA and its overall structure, thereby enhancing the impact of the chemotherapy drug.

The process was so effective that 20 days later, the cell culture showed no evidence of any revival, suggesting that the tumour cells had been destroyed.

Gold is a benign material which in itself poses no threat to the patient, and the size and shape of the particles can be controlled very accurately.



GLITTER OF HOPE

Higher BMI increases risk of common cancers

A first of its kind study by a team of doctors, including one of Indian-origin, has revealed that a higher body mass index increases the risk of developing 10 of the most common cancers. This is the largest study of its kind on BMI and cancer, involving more than five million adults in the UK. Researchers at the London School of Hygiene &Tropical Medicine and the Farr Institute of Health Informatics estimate that over 12,000 cases of these 10 cancers each year are attributable to being overweight or obese and calculate that if average BMI in the population continues to rise, there could be over 3,500 extra cancer cases every year. A total of 1,66,955 people developed one of the 22 cancers studied over the follow-up period. BMI was linked to 17 out of the 22 types of cancers examined. **Kounteya Sinha**

HINDU ND 14/8/2014 P-16

Cell phones can be charged using sound

Soon you can use traffic noise, music, chants from a football ground and even your own voice to charge your cell phone.

Scientists from Queen Mary University of London and Nokia have created an energy—harvesting prototype (a nanogenerator) that could be used to charge a cell phone using everyday background noise — such as traffic, music, and our own voices.

The team used the key properties of zinc oxide, a material that when squashed or stretched creates a voltage by converting energy from motion into electrical energy, in the form of nanorods.

The nanorods can be coated onto various surfaces in different locations making the energy harvesting quite versatile. When this surface is squashed or stretched, the nanorods then generate a high voltage.

The nanorods respond to vibration and movement created by everyday sound, such as our voices. Electrical contacts on both sides of the rods are then used to harvest the voltage to charge a phone, 'phys.org' reported. Researchers first developed a process whereby they could spray on the nanorod chemicals — almost like nanorod graffiti — to cover a plastic sheet in a layer of zinc oxide.

When put into a mixture of chemicals and heated to just 90 degrees C, the nanorods grew all over the surface of the sheet. Secondly, gold is traditionally used as an electrical contact but the team were able to produce a method of using cheap and cheerful aluminium foil instead.

Five volts

The ultimate device generates five volts, which is enough to charge a phone.

"Being able to keep mobile devices working for longer, or do away with batteries completely by tapping into the stray energy that is all around us is an exciting concept," said Dr Joe Briscoe from QMUL's School of Engineering and Materials Science. — **PTI**

Times of India, ND 14/08/2014 P-23

Soon, charge phones with your sweat

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London: You may soon be able to charge your phone with your sweat.

For the first time ever, scientists have found a way to make human sweat power your small electronic devices. Researchers have designed a sensor in the form of a temporary tattoo that can both monitor a person's progress during exercise and produce power from their perspiration.

The device works by detecting and responding to lactate, which is naturally present in sweat.

Scientists have created a sweat-powered bio battery. Batteries produce energy by passing current, in the form of electrons, from an anode to a cathode. In this case, the anode contained the enzyme that removes electrons from lactate, and the cathode contained a molecule that accepts the electrons. When 15 volunteers wore the tattoo bio batteries while exercising on a stationary bike, they produced different amounts of power.

PERSPIRATION POWER

Interestingly, people who were less fit (exercising fewer than once a week) produced more power than those who were moderately fit (exercising one to three times per week).

Enthusiasts who worked out more than three times per week produced the least amount of power.

The researchers say that this is probably because the less-fit people became fatigued sooner, causing glycolysis to kick in earlier, forming more lactate.

The maximum amount of energy produced by a person in the low-fitness group was 70 microWatts per cm2 of skin.

Wenzhao Jia from University of California San Diego said "The current produced is not that high, but we are working on enhancing it so that eventually we could power some small electronic devices."

UGC schemes for empowerment of SCs, STs, minorities

The Hindu

NEW DELHI: The University Grants Commission (UGC) is implementing a number of schemes for educational empowerment of SCs, STs and minorities that include setting up of equal opportunity cells and scholarships.

HRD Minister Smriti Irani informed Lok Sabha today that educational empowerment schemes like setting up of residential coaching academies for minorities, SC, ST and women in central universities, deemed to be universities, establishment of equal opportunity cells for SC, ST and minorities are being implemented by the UGC.

Other UGC sponsored schemes are post-doctoral fellowships for SC, ST, Rajiv Gandhi national fellowships for SC, ST, setting up of Centre for Studies in Social Exclusion and Inclusive Policy, remedial coaching schemes for SCs, STs, OBC and minorities, scheme of career oriented courses in universities and colleges, construction of women's hostels for colleges.

Irani said during Question Hour that Central Educational Institutions (Reservation in Admission Act) 2006, which came into force with effect from January 4, 2007, provides for 15 per cent, 7.5 per cent and 27 per cent reservation in admission of students belonging to SCs, STs and OBCs respectively in central educational institutions established, maintained or aided by the central government.

The HRD Minister said the gross enrollment ratio in higher education of SCs and STs in 2009-10 were 11.1 per cent and 10.3 per cent in comparison to 15 per cent of all category.

In 2010-11, the gross enrollment ratio in higher education of SCs and STs were 13.5 per cent and 12.9 per cent in comparison to 19.4 per cent of general category students and in 2011-12, the gross enrollment ratio in higher education of SCs and STs were 14.5 per cent and 10.8 per cent in comparison to 20.4 per cent of general category students.

Irani said in order to expand educational opportunities in 374 educationally backward districts, the central government had in 2009 launched the scheme of setting up of 374 model degree colleges in districts having Gross Enrollment Ratio (GER) for higher education less than national average.

"The Centre has recently launched Rashtriya Uchchatar Shiksha Abhiyan (RUSA) which intends to incentivise the states for developing higher education with equity and inclusion. The MDCs scheme has now been subsumed in RUSA. There is a special component of equity in RUSA," she said.

IISc gets Rs 20-crore fund from Infosys Science Foundation

Prashanth G N, Bangalore, Aug 13, 2014, DHNS:
http://www.deccanherald.com/content/425331/iisc-gets-rs-20-crore.html

It’s raining money on Indian Institute of Science (IISc). With a view to encourage research in basic sciences, the Infosys Science Foundation has presented a grant of Rs 20 crore to IISc for research in mathematics and physics and for setting up a Mathematics and Physics Infosys Chair Professorship.

Infosys Science Foundation chairperson Sudha Murthy personally handed over the grant statement to the respective departments in the presence of previous IISc Director P Balaram.

The Rs 20 crore fund comes after the Rs 140 crore funding from Robert Bosch Foundation, Rs 225 crore grant by Infosys co-founder Kris Gopalakrishnan for setting up a Brain Research Centre inside IISc and the very recent Rs 75 crore grant by the Tatas to the Centre for Neuroscience, for research on Alzheimer's disease.

IISc has been sitting on a corpus of Rs 460 crore from spate of donations from private agencies and individuals in the recent past.

The Chairman of Mathematics Prof Gadadhar Misra told Deccan Herald that Infosys Foundation had already released Rs 1.2 crore over and above the Rs 20-crore fund.

"The additional grant will be utilised to set up professorships in mathematics and physics. We have begun the search for a top-notch world class mathematician, who can work as scholar-in-residence for a year at IISc. We will pay the Chair between $ 200,000 to 300,000 per year. The overall Rs 20-crore grant will be set up as a corpus fund, and the interest it earns, around Rs 1.5 crore annually will be plugged back into research. And when the principal amount goes up due to interest, the same will be ploughed back into the corpus fund. In all, we will have Rs 1.5 crore every year for research work, which is substantial."

He said that the search for the chairs in mathematics and physics will cover the globe. Universities in USA are strong, particularly Stanford University which has very good mathematics researchers, California Institute of Technology (Caltech) for Physics, Columbia university for both, MIT for both disciplines and Princeton which is very strong in Physics, he said.

The Rs 225-crore donation by Infosys co-founder Kris Gopalakrishnan is perhaps the single-largest donation to IISc from an individual. The Pratiksha Trust that Kris has set up will give the money over 10 years.