# ABEL PRIZE & FIELDS MEDAL AWARDEE MATHEMATICIANS



## STUDENTS' STUDY PROJECT

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**(Re-accredited with 'B' Grade by NAAC)**

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# DECLARATION

We do hereby declare that the work presented in this study project entitled

**"ABEL PRIZE & FIELDS MEDAL AWARDEE MATHEMATICIANS"** has been originally carried out by us under the supervision of **Dr. Vangala Srinivas**, Lecturer in Mathematics, and has not been submitted either in part or in full for any research project work to any other Govt. Degree colleges in Telangana state.

Date:    - 11 - 2021

Place:    Peddapally

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# CERTIFICATE

This is to certify that the **JIGNASA**- Students' study project entitled **"ABEL PRIZE & FIELDS MEDAL AWARDEE MATHEMATICIANS"** has been carried out by the Students of B.Sc. (MPC& MPCs) under my supervision. I further certify that the study project work done by them is original and has not been submitted for any research project either in part or in full to any other degree college.

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# ACKNOWLEDGEMENTS

**OBJECTIVES:**

Main objectives of the study project carried out are as follows

- To study and understand about Abel prize and its winners.

- To study and understand about Fields medal and its winners.

- To study and understand the area of contributions of Abel prize awardee.

- To study and understand the area of contributions of Fields medal awardee.

# ABEL PRIZE & FIELDS MEDAL AWARDEE MATHEMATICIANS

## Abel Prize:

The Abel Prize is a prize awarded annually by the King of Norway to one or more outstanding mathematicians and theoretical computer scientists. It is named after Norwegian mathematician Niels Henrik Abel (1802–1829) and directly modelled after the Nobel Prizes. It comes with a monetary award of 7.5 million Norwegian kroner (NOK) (increased from 6 million NOK in 2019).

The Abel Prize's history dates back to 1899, when its establishment was proposed by the Norwegian mathematician Sophus Lie when he learned that Alfred Nobel's plans for annual prizes would not include a prize in mathematics.
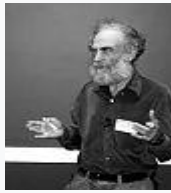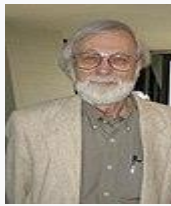
In 1902, King Oscar II of Sweden and Norway indicated his willingness to finance a mathematics prize to complement the Nobel Prizes, but the establishment of the prize was prevented by the dissolution of the union between Norway and Sweden in 1905. It took almost a century before the prize was finally established by the Government of Norway in 2001, and it was specifically intended "to give the mathematicians their own equivalent of a Nobel Prize."
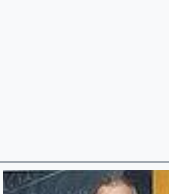
The laureates are selected by the Abel Committee, the members of which are appointed by the Norwegian Academy of Science and Letters.

The award ceremony takes place in the Aula of the University of Oslo, where the Nobel Peace Prize was awarded between 1947 and 1989. The Abel Prize board has also established an Abel symposium, administered by the Norwegian Mathematical Society, which takes place twice a year.

# Laureates:

| Year | Laureate(s) | Image | Institution(s) | Citation |
|---|---|---|---|---|
| 2003 | Jean-Pierre Serre |  | Collège de France | "For playing a key role in shaping the modern form of many parts of mathematics, including topology, algebraic geometry and number theory." |
| 2004 | Michael Atiyah |  | University of Edinburgh<br><br>University of Cambridge | "For their discovery and proof of the index theorem, bringing together topology, geometry and analysis, and their outstanding role in building new bridges between mathematics and theoretical physics." |
| 2004 | Isadore Singer |  | Massachusetts Institute of Technology University of California, Berkeley | "For their discovery and proof of the index theorem, bringing together topology, geometry and analysis, and their outstanding role in building new bridges between mathematics and theoretical physics." |
| 2005 | Peter Lax |  | Courant Institute | "For his groundbreaking contributions to the theory and application of partial differential equations and to the computation of their solutions." |
| 2006 | Lennart Carleson |  | Royal Institute of Technology | "For his profound and seminal contributions to harmonic analysis and the theory of smooth dynamical systems." |
| 2007 | S. R. Srinivasa Varadhan |  | Courant Institute | "For his fundamental contributions to probability theory and in particular for creating a unified theory of large deviation." |
| 2008 | John G. Thompson |  | University of Florida | "For their profound achievements in algebra and in particular for shaping modern group theory." |
| 2008 | Jacques Tits |  | Collège de France | "For their profound achievements in algebra and in particular for shaping modern group theory." |

| Year | Laureate(s) | Image | Institution(s) | Citation |
|------|-------------|-------|----------------|----------|
| 2009 | Mikhail Gromov |  | Institut des Hautes Études Scientifiques[29] and Courant Institute[30] | "For his revolutionary contributions to geometry." |
| 2010 | John Tate |  | University of Texas at Austin | "For his vast and lasting impact on the theory of numbers." |
| 2011 | John Milnor |  | Stony Brook University | "For pioneering discoveries in topology, geometry, and algebra." |
| 2012 | Endre Szemerédi |  | Alfréd Rényi Institute and Rutgers University | "For his fundamental contributions to discrete mathematics and theoretical computer science, and in recognition of the profound and lasting impact of these contributions on additive number theory and ergodic theory." |
| 2013 | Pierre Deligne |  | Institute for Advanced Study | "For seminal contributions to algebraic geometry and for their transformative impact on number theory, representation theory, and related fields." |
| 2014 | Yakov Sinai |  | Princeton University and Landau Institute for Theoretical Physics[36] | "For his fundamental contributions to dynamical systems, ergodic theory, and mathematical physics." |

| Year | Laureate(s) | Image | Institution(s) | Citation |
|---|---|---|---|---|
| 2015 | John F. Nash Jr. |  | Princeton University | "For striking and seminal contributions to the theory of nonlinear partial differential equations and its applications to geometric analysis." |
| | Louis Nirenberg |  | Courant Institute | |
| 2016 | Andrew Wiles |  | University of Oxford[39][40] | "For his stunning proof of Fermat's Last Theorem by way of the modularity conjecture for semistable elliptic curves, opening a new era in number theory." |
| 2017 | Yves Meyer | | École normale supérieure Paris-Saclay | "For his pivotal role in the development of the mathematical theory of wavelets." |
| 2018 | Robert Langlands |  | Institute for Advanced Study | "For his visionary program connecting representation theory to number theory." |
| 2019 | Karen Uhlenbeck |  | University of Texas at Austin | "For her pioneering achievements in geometric partial differential equations, gauge theory and integrable systems, and for the fundamental impact of her work on analysis, geometry and mathematical physics." |
| 2020 | Hillel Furstenberg |  | Hebrew University of Jerusalem | "For pioneering the use of methods from probability and dynamics in group theory, number theory and combinatorics." |
| | Grigory Margulis |  | Yale University | |

| Year | Laureate(s) | Image | Institution(s) | Citation |
|---|---|---|---|---|
| 2021 | László Lovász |  | Eötvös Loránd University | "For their foundational contributions to theoretical computer science and discrete mathematics, and their leading role in shaping them into central fields of modern mathematics". |
| | Avi Wigderson |  | Institute for Advanced Study | |

# Selection criteria:

Anyone may submit a nomination for the Abel Prize, although self-nominations are not permitted. The nominee must be alive. If the awardee dies after being declared the winner, the prize will be awarded posthumously.

# Indian Abel Prize winner

Indian-born New York University professor Srinivasa SR Varadhan won Norway's 6 million kroner (US$975,000, euro736,000) Abel Prize for mathematics for his fundamental contributions to probability theory.

Varadhan, 67, teaches at NYU's Courant Institute of Mathematical Sciences, and the award said his theories are useful in a broad range of fields, including quantum field theory, statistical physics, population dynamics, econometrics and finance, and traffic engineering.

The Abel Prize, first awarded in 2003, was created by the Norwegian government and named after 19th Century Norwegian mathematician Niels Henrik Abel.

# Fields Medal:

The Fields Medal is a prize awarded to two, three, or four mathematicians under 40 years of age at the International Congress of the International Mathematical Union (IMU), a meeting that takes place every four years.

The Fields Medal is regarded as one of the highest honors a mathematician can receive, and has been described as the mathematician's Nobel Prize, although there are several key differences, including frequency of award, number of awards, and age limits. According to the annual Academic Excellence Survey by ARWU, the Fields Medal is consistently regarded as the top award in the field of mathematics worldwide, and in another reputation survey conducted by IREG in 2013–14, the Fields Medal came closely after the Abel Prize as the second most prestigious international award in mathematics.

The prize comes with a monetary award which, since 2006, has been CA$15,000. The name of the award is in honour of Canadian mathematician John Charles Fields. Fields was instrumental in establishing the award, designing the medal himself, and funding the monetary component.

Its purpose is to give recognition and support to younger mathematical researchers who have made major contributions. In 2014, the Iranian mathematician Maryam Mirzakhani became the first female Fields Medallist. In all, sixty people have been awarded the Fields Medal.

# Some of the Field Medallists:

| Year | ICM location | Medalists [21] | Affiliation (when awarded) | Affiliation (current/ last) | Reasons |
|---|---|---|---|---|---|
| 2018 | Rio de Janeiro, Brazil | Caucher Birkar | University of Cambridge, UK | University of Cambridge, UK | "For the proof of the boundedness of Fano varieties and for contributions to the minimal model program." |
| 2018 | Rio de Janeiro, Brazil | Alessio Figalli | Swiss Federal Institute of Technology Zurich, Switzerland | Swiss Federal Institute of Technology Zurich, Switzerland | "For contributions to the theory of optimal transport and its applications in partial differential equations, metric geometry and probability. |
| 2018 | Rio de Janeiro, Brazil | Peter Scholze | University of Bonn, Germany | University of Bonn, Germany | "For transforming arithmetic algebraic geometry over p-adic fields through his introduction of perfectoid spaces, with application to Galois representations, and for the development of new **cohomology** theories." |

| Ye ar | ICM location | Medalists [21] | Affiliation (when awarded) | Affiliation (current/ last) | Reasons |
|---|---|---|---|---|---|
| 2018 | Rio de Janeiro, Brazil | Akshay Venkatesh | Stanford University, US | Institute for Advanced Study, US | "For his synthesis of analytic number theory, homogeneous dynamics, topology, and representation theory, which has resolved long-standing problems in areas such as the equidistribution of arithmetic objects." |
| 2014 | Seoul, South Korea | Artur Avila | University of Paris VII, France CNRS, France Instituto Nacional de Matemática Pura e Aplicada, Brazil | University of Zurich, Switzerland Instituto Nacional de Matemática Pura e Aplicada, Brazil | "For his profound contributions to dynamical systems theory, which have changed the face of the field, using the powerful idea of renormalization as a unifying principle." |
| 2014 | Seoul, South Korea | Manjul Bhargava | Princeton University, US | Princeton University, US | "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." |
| 2014 | Seoul, South Korea | Martin Hairer | University of Warwick, UK | Imperial College London, UK | "For his outstanding contributions to the theory of stochastic partial differential equations, and in particular for the creation of a theory of regularity structures for such equations." |
| 2014 | Seoul, South Korea | Maryam Mirzakhani | Stanford University, US | Stanford University, US | "For her outstanding contributions to the dynamics and geometry of Riemann surfaces and their moduli spaces." |
| 2010 | Hyderabad, India | **Elon Lindenstrauss** | Hebrew University of Jerusalem, Israel | Hebrew University of Jerusalem, Israel | "For his results on measure rigidity in ergodic theory, and their applications to number theory." |

| Ye ar | ICM location | Medalists [21] | Affiliation (when awarded) | Affiliation (current/ last) | Reasons |
|---|---|---|---|---|---|
| | | | Princeton University, US | | |
| 2010 | Hyderabad, India | Ngo Bao Chau | Paris-Sud 11 University, France<br><br>Institute for Advanced Study, US | University of Chicago, US<br><br>Vietnam Institute for Advanced Study, Vietnam | "For his proof of the Fundamental Lemma in the theory of automorphic forms through the introduction of new algebro-geometric methods." |
| 2010 | Hyderabad, India | Stanislav Smirnov | University of Geneva, Switzerland | University of Geneva, Switzerland<br><br>St. Petersburg State University, Russia | "For the proof of conformal invariance of percolation and the planar Ising model in statistical physics." |
| 2010 | Hyderabad, India | Cedric Villani | École Normale Supérieure de Lyon, France<br><br>Institut Henri Poincaré, France | Lyon University, France<br><br>Institut Henri Poincaré, France | "For his proofs of nonlinear Landau damping and convergence to equilibrium for the Boltzmann equation." |

# <u>CONCLUSION</u>

Abel prize & Field medals are complementary to Nobel prizes. Abel prize was constituted by the government of Norway in 2001. Fields medals described as Mathematician Nobel prize are constituted by Canadian government to encourage young Mathematicians below 40 years of age. It was a proud feeling to find an Indian born Mathematician in the prize group for their contributions in the field of Mathematics. It was a tremendous effort by all of us in gathering the information about these laureates. We have come across great personalities in Mathematics and their inventions / contributions for the growth of the subject. In the process, inadvertently, have gained knowledge and the nuances of Mathematics towards their goal reaching. The project has definitely instilled a kind of interest and enthusiasm towards learning the concepts of Mathematics and enhanced inclination towards taking up research activities. We thank one and all for providing us an opportunity in working on this project to supplement our knowledge in Mathematics.