CR Rao wins International Prize in Statistics

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In news– The Indian-American statistician Calyampudi Radhakrishna Rao has been awarded the 2023 International Prize in Statistics, which is statistics' equivalent of the Nobel Prize.

CR Rao and his contributions-

- Prof. Rao, who is now 102 years old, is a **'living legend' whose work has influenced, in the words of the American Statistical Association**, not just statistics" but also **"economics, genetics, anthropology, geology, national planning, demography, biometry, and medicine**.
- **Rao's groundbreaking paper, '*Information and accuracy attainable in the estimation of statistical parameters*', was published in 1945 in the Bulletin of the Calcutta Mathematical Society,** a journal that is otherwise not well known to the statistics community.
- The paper was subsequently included in the book Breakthroughs in Statistics, 1890-1990.
- This was an impressive achievement given Rao was only 25 at the time and had just completed his master's degree in statistics two years prior.
- He would go on to do his **PhD in 1946-1948 at King's College, Cambridge University, under the supervision of Ronald A. Fisher, widely regarded as the father of modern statistics.**
- **The Cramér-Rao inequality is the first of the three results of the 1945 paper.**
- Rao's work provided a lower limit on the variance of an unbiased estimate for a finite sample.
- The result has since become a **cornerstone of mathematical statistics;** researchers have extended it in

many different ways, with applications even in quantum physics, signal processing, spectroscopy, radar systems, multiple-image radiography, risk analysis, and probability theory, among other fields.

- **The second outcome of the 1945 paper was the Rao-Blackwell Theorem**, which offers **a method to improve an estimate to an optimal estimate.**
- The Rao-Blackwell theorem and the Cramér-Rao inequality are both related to the **quality of estimators.**
- A new interdisciplinary area called **'information geometry' was born as a result of the paper's third finding. This field integrated principles from differential geometry into statistics**, including the concepts of metric, distance, and measure.
- So overall, Rao's 1945 paper made an outstanding contribution, boosting the development of modern statistics and its widespread application in modern research.
- One of Rao's papers in 1948 offered **a novel generic approach to testing hypotheses, now widely known as the "Rao score test".**
- In fact, the three test procedures – the likelihood ratio test of Jerzy Neyman and E.S. Pearson (1928), the Wald test (1943) of Abraham Wald, and the Rao score test (1948) – are sometimes called **"the holy trinity"** of this branch of statistics.
- **Rao also contributed to orthogonal arrays,** a concept in combinatorics that is used to design experiments whose results are qualitatively good, as early as 1949. A 1969 Forbes article described it as "a new mantra" in industrial establishments.

About the Prize-

- The **International Prize in Statistics is awarded every two years to an individual or team** for major **achievements using statistics to advance science,**

technology and human welfare.

- The International Prize in Statistics, along with the COPSS Presidents' Award, are the two highest honours in the field of Statistics.
- **The prize is modelled after the Nobel prizes, Abel Prize, Fields Medal** and Turing Award and comes with a monetary award of $80,000.
- The award ceremony takes place during the World Statistics Congress.
- The prize recognizes a single work or body of work, representing a powerful and original idea that had an impact in other disciplines or a practical effect on the world.
- The recipient must be alive when the prize is awarded.
- T**he prize is awarded by the International Prize in Statistics Foundation**, which comprises representatives of the following major learned societies:
    - American Statistical Association.
    - International Biometric Society.
    - Institute of Mathematical Statistics.
    - International Statistical Institute.
    - Royal Statistical Society.
- In addition to recognizing the contributions of a statistician, the Foundation also aims at educating the public about statistical innovations and their impact on the world and gaining wider recognition for the field.