



## Nobel Prize for Physics 2020

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### Why in News

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The **Nobel Prize in Physics** for the year 2020 was awarded to three astrophysicists **Roger Penrose from the UK, Reinhard Genzel from Germany, and Andrea Ghez from the USA.**

### Key Points

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- Roger Penrose received **half of this year's prize** for the discovery that a **black hole** formation is a **robust prediction of the general theory of relativity**.
  - Black holes were one of the first and most extreme predictions of Einstein's General Theory of Relativity which came in 1915.
  - The theory explains gravity, as objects try to follow a straight line through a universe whose geometry is warped by matter and energy. As a result, planets, as well as light beams, follow curving paths.
  - Dr Penrose proved that if too much mass accumulated in too small a place, **collapse into a black hole was inevitable**. At the boundary of a black hole, called the event horizon, one would have to go faster than the speed of light to escape it, which is impossible. At the centre of a black hole, where the density became infinite, the laws of physics, would no longer apply.
- **Genzel and Ghez received the second half** of the prize for the **discovery of a supermassive black hole at the centre of the Milkyway galaxy**, now known to be the **Sagittarius A\***.
  - It has a mass four million times that of the Sun and is confined to an area roughly the size of our Solar System.
  - In 2019, scientists got the **first optical image of a black hole** which is at the centre of the Messier 87 galaxy.
  - Sagittarius A\* is the second black hole whose photographs have been captured by the **Event Horizon Telescope project**. It is yet to be released.
- Dr. Ghez is only the **fourth woman to win the Nobel Prize in Physics**, following Marie Curie in 1903, Maria Goeppert Mayer in 1963 and Donna Strickland in 2018.

