Source : www.thehindu.com Date : 2019-04-14

SEEING DARKNESS: THE FIRST IMAGE OF A BLACK HOLE

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On April 10, the Event Horizon Telescope collaboration showed the world the 'unseeable': **the very first image of a black hole.** Of course, the black hole itself cannot be seen, because light cannot escape its intense gravitational attraction. The so-called event horizon that envelops the black hole is the point of no return and any object transgressing this boundary is lost. Just outside is a region where a photon (light quantum) can orbit the black hole without falling in. This is called the 'last photon ring', and this is what the EHT imaged, seeing in effect the silhouette of a black hole. About a hundred years after the black hole made its way into physics through Albert Einstein's general theory of relativity, soon after the LIGO collaboration first directly observed the gravitational waves made by the merging of two black holes, the 'dark star' had finally been imaged. The Higgs boson was detected 50 years after it had been postulated, and gravitational waves were observed a century after Einstein predicted them. Visual proof of the existence of black holes comes a century after they appeared in scientific literature. In a collaborative effort, eight telescopes around the world were used for the experiment. The challenges included making each observe the same broad range of wavelengths around 1.3 mm and having precise atomic clocks at each location, so the data could be combined.

A black hole marks the end of spacetime as commonly understood, and nothing that enters it can escape from the tremendous gravitational attraction. However, this is no real danger, as black holes are located at distances that humans do not have the power to scale. The EHT set out to image two candidate supermassive black holes — Sagittarius A*, which is 26,000 light years from the earth, at the centre of the Milky Way, and another which is 55 million light years away at the centre of the Messier 87 galaxy in the Virgo galaxy cluster. But the first image was of the more distant one. The very long baseline interferometry technique linked radio dishes of telescopes across the world to produce a virtual telescope the size of the earth. This was needed to obtain the high resolution required for this measurement. Combining data from telescopes, each with different characteristics, was a separate challenge. Cutting-edge developments from computer science related to image recognition were used. As Katie Bouman, Assistant Professor at the California Institute of Technology, who led the efforts to develop an algorithm to put the data together and create the image, said in a TEDx talk, projects such as the EHT succeed owing to interdisciplinary expertise that people bring to the table. This experiment endorses the diversity of collaboration just as much as it does unrelenting patience and good faith in the power of science and reason.

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