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BLACK HOLE

Physics

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A black hole is a region of spacetime exhibiting gravitational acceleration so strong that nothing—no particles or even electromagnetic radiation such as light—can escape from it.[6] The theory of general relativity predicts that a sufficiently compact mass can deform spacetime to form a black hole.[7][8] The boundary of the region from which no escape is possible is called the event horizon. Although the event horizon has an enormous effect on the fate and circumstances of an object crossing it, no locally detectable features appear to be observed.[9] In many ways, a black hole acts like an ideal black body, as it reflects no light.[10][11] Moreover, quantum field theory in curved spacetime predicts that event horizons emit Hawking radiation, with the same spectrum as a black body of a temperature inversely proportional to its mass. This temperature is on the order of billionths of a kelvin for black holes of stellar mass, making it essentially impossible to observe. Objects whose gravitational fields are too strong for light to escape were first considered in the 18th century by John Michell and Pierre-Simon Laplace.[12] The first modern solution of general relativity that would characterize a black hole was found by Karl Schwarzschild in 1916, although its interpretation as a region of space from which nothing can escape was first published by David Finkelstein in 1958. Black holes were long considered a mathematical curiosity; it was during the 1960s that theoretical work showed they were a generic prediction of general relativity. The discovery of neutron stars by Jocelyn Bell Burnell in 1967 sparked interest in gravitationally collapsed compact objects as a possible astrophysical reality. Black holes of stellar mass are expected to form when very massive stars collapse at the end of their life cycle. After a black hole has formed, it can continue to grow by absorbing mass from its surroundings. By absorbing other stars and merging with other black holes, supermassive black holes of millions of solar masses (M?) may form. There is consensus that supermassive black holes exist in the centers of most galaxies. The presence of a black hole can be inferred through its interaction with other matter and with electromagnetic radiation such as visible light. Matter that falls onto a black hole can form an external accretion disk heated by friction, forming some of the

brightest objects in the universe. Stars passing too close to a supermassive black hole can be shred into streamers that shine very brightly before being "swallowed."[13] If there are other stars orbiting a black hole, their orbits can be used to determine the black hole's mass and location. Such observations can be used to exclude possible alternatives such as neutron stars. In this way, astronomers have identified numerous stellar black hole candidates in binary systems, and established that the radio source known as Sagittarius A*, at the core of the Milky Way galaxy, contains a supermassive black hole of about 4.3 million solar masses. On 11 February 2016, the LIGO collaboration announced the first direct detection of gravitational waves, which also represented the first observation of a black hole merger.[14] As of December 2018, eleven gravitational wave events have been observed that originated from ten merging black holes (along with one binary neutron star merger).[15][16] On 10 April 2019, the first ever direct image of a black hole and its vicinity was published, following observations made by the Event Horizon Telescope in

SDL GAME DEVELOPMENT

Computing

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CORONAVIRUS PANDEMIC LEADING TO HUGE DROP IN AIR POLLUTION

Divers

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The coronavirus pandemic is shutting down industrial activity and temporarily slashing air pollution levels around the world, satellite imagery from the European Space Agency shows. One expert said the sudden shift represented the "largest scale experiment ever" in terms of the reduction of industrial emissions. Readings from ESA's Sentinel-5P satellite show that over the past six weeks, levels of nitrogen dioxide (NO2) over cities and industrial clusters in Asia and Europe were markedly lower than in the same period last year. Nitrogen dioxide is produced from car engines, power plants and other industrial processes and is thought to exacerbate respiratory illnesses such as asthma. Advertisement While not a greenhouse gas itself, the pollutant originates from the same activities and industrial sectors that are responsible for a large share of the world's carbon emissions and that drive global heating. Paul Monks, professor of air pollution at the University of Leicester, predicted there will be important lessons to learn. "We are now, inadvertently, conducting the largest-scale experiment ever seen," he said. "Are we looking at what we might see in the future if we can move to a low-carbon economy? Not to denigrate the loss of life, but this might give us some hope from something terrible. To see what can be achieved." Monks, the former chair of the UK government's science advisory committee on air quality, said that a reduction in air pollution could bring some health benefits, though they were unlikely to offset loss of life from the disease. Sign up to the Green Light email to get the planet's most important stories Read more "It seems entirely probable that a reduction in air pollution will be beneficial to people in susceptible categories, for example some asthma sufferers," he said. "It could reduce the spread of disease. A high level of air pollution exacerbates viral uptake because it inflames and lowers immunity." Agriculture could also get a boost because pollution stunts plant growth, he added. The World Health Organization

describes NO2 as "a toxic gas which causes significant inflammation of the airways" at concentrations above 200 micrograms per cubic metre. Pollution particles may also be a vector for pathogens, as well as exacerbating existing health problems. The WHO is now investigating whether airborne pollution particles may be a vector that spreads Covid-19 and makes it more virulent. One of the largest drops in pollution levels could be seen over the city of Wuhan, in central China, which was put under a strict lockdown in late January. The city of 11 million people serves as a major transportation hub and is home to hundreds of factories supplying car parts and other hardware to global supply chains. According to Nasa, nitrogen dioxide levels across eastern and central China have been 10-30% lower than normal.