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5. 3D printing

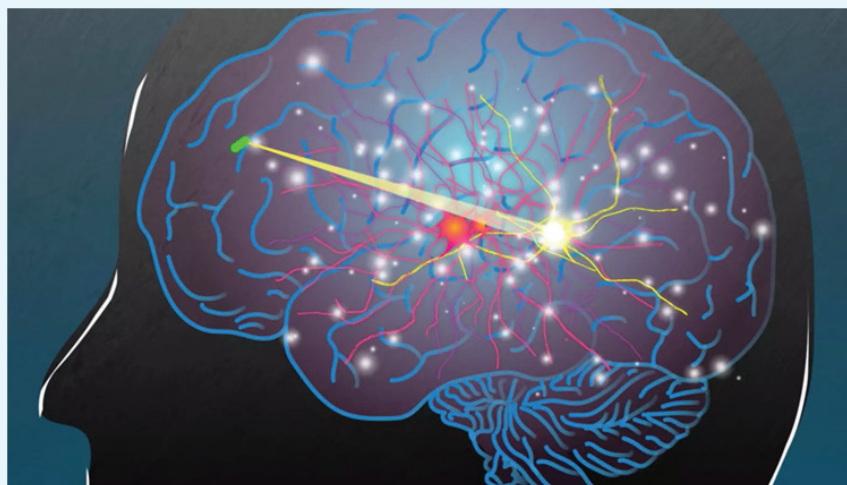
Advanced 3D printer systems and materials assist physicians in a range of operations in the medical field from audiology, dentistry, orthopedics and other applications.



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6. Wireless brain sensors

Wireless brain sensors monitor intracranial pressure and temperature and then are absorbed by the body. Hence there is no need for surgery to remove these devices.



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7. Robotic surgery

Robotic surgery is a type of surgical procedure that is done using robotic systems. Robotically-assisted surgery helps to overcome the limitations of pre-existing minimally-invasive surgical procedures and to enhance the capabilities of surgeons performing open surgery.



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8. Smart inhalers

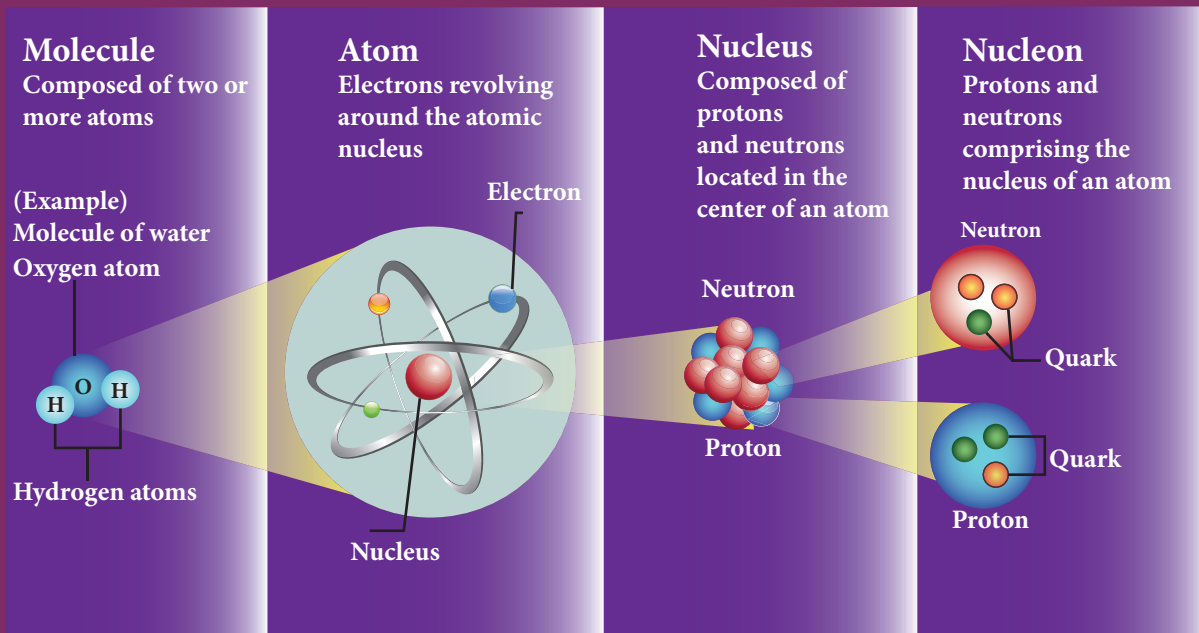
Inhalers are the main treatment option for asthma. Smart inhalers are designed with health systems and patients in mind so that they can offer maximum benefit. Smart inhalers use bluetooth technology to detect inhaler use, remind patients when to take their medication and gather data to help guide care.



Other recent developments in physics

Particle Physics

Particle physics deals with the theory of fundamental particles of nature and it is one of the active research areas in physics. Initially it was thought that atom is the fundamental entity of matter. In 1930s, it was established that atoms are made up of electrons, protons and neutrons.



In the 1960s, quarks were discovered and it was understood that proton and neutron are made up of quarks. In the meantime, the particle physics research gained momentum and has grown exponentially both in theoretical and experimental perspective. Later it was found that the quarks interact through gluons. It is the field which received more number of noble prizes. Recently in the year 2013, famous 'Higgs particles' also known as "God" particles were discovered and for this, Peter Higgs and Englert received noble prize in physics. It is the 'Higgs particle' which gives mass to many particles like protons, neutrons etc.

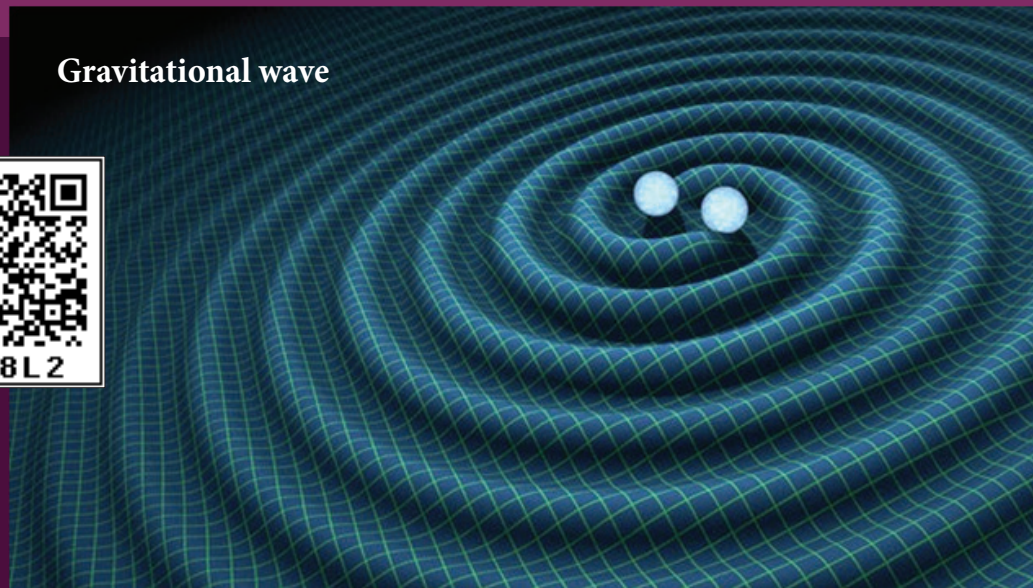


Cosmology

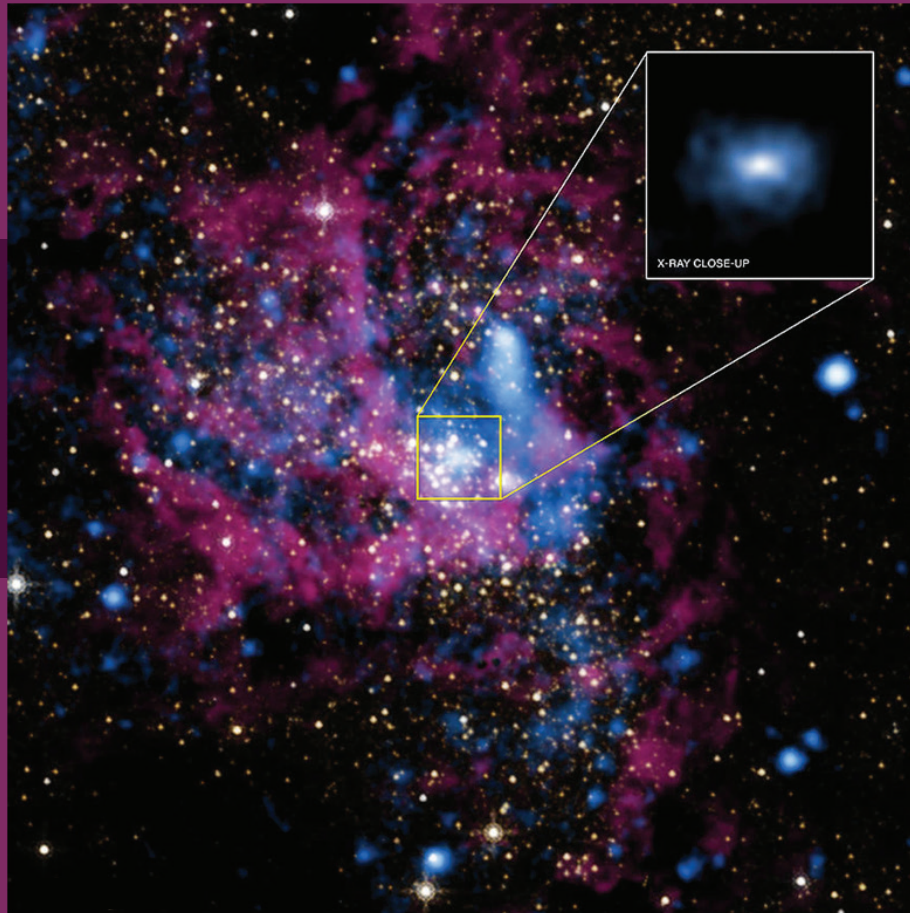
Cosmology is the branch that involves the origin and evolution of the universe. It deals with formation of stars, galaxy etc. In the year 2015, the existence of “gravitational waves” was discovered and noble prize was awarded for this discovery in the year 2017.

Gravitational waves are the disturbances in the curvature of space-time and it travels with speed of light. Any accelerated charge emits electromagnetic wave. Similarly any accelerated mass emits gravitational waves but these waves are very weak even for masses like earth. The strongest source of gravitational waves are black holes. The discovery of gravitational waves made it possible to study the structure of black holes since it is the strongest source of gravitational waves. In fact, the recent discoveries of gravitational waves are emitted by two black holes when they merge to a single black hole. In fact, Albert Einstein theoretically proposed the existence of ‘gravitational waves’ in the year 1915. After 100 years, it is experimentally proved that his predictions are correct.

Gravitational wave



Black holes are end stage of stars which are highly dense massive object. Its mass ranges from 20 times mass of the sun to 1 million times mass of the sun. It has very strong gravitational force such that no particle or even light can escape from it. The existence of black holes is studied when the stars orbiting the black hole behave differently from the other stars. Every galaxy has black hole at its center. Sagittarius A* is the black hole at the center of the Milky Way galaxy.



Black hole sagittarius A*

The famous physicist Stephen Hawking worked in the field of black holes.



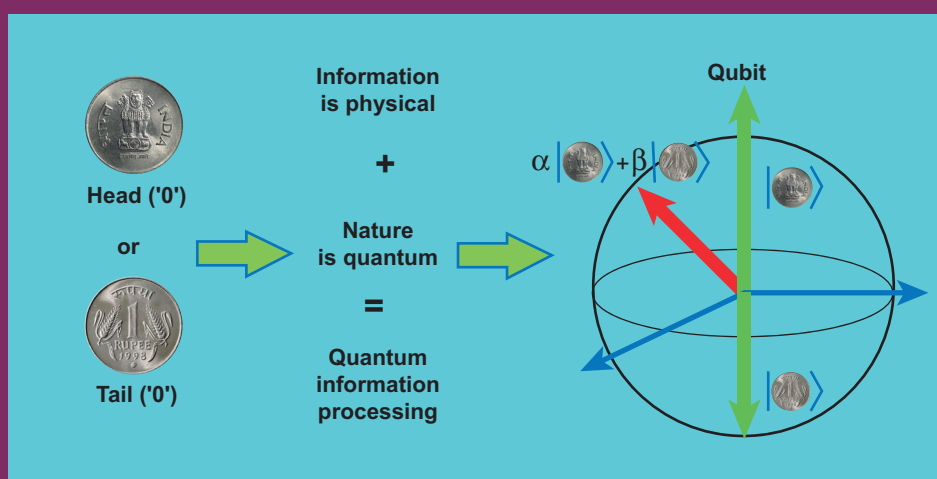
Actual photograph of a super massive black hole M87*

Super computers and eight telescopes stationed on five continents (EVENT HORIZON TELESCOPE) were used to develop a huge data to accomplish this. It has once again confirmed the Einstein's theory of general relativity.

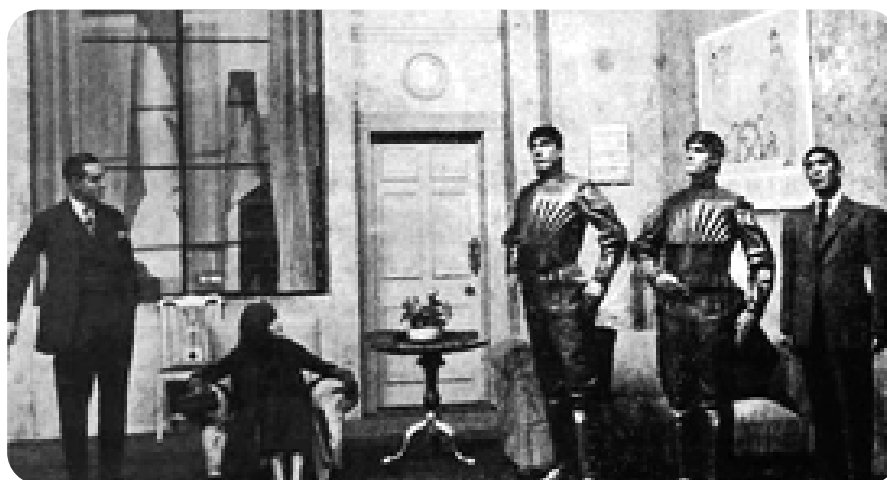


Quantum information theory (Not for examination)

It is another fast developing research area which deals with improving the information storage using quantum computers. The present computers store information in the form of 'bits' but quantum computers store information in the form of 'qubits'. 'qubit' refers to quantum bit and it is the basic unit of quantum information. Classical bit implies either 0 or 1. But qubit not only includes 0 or 1 and also linear superposition of 0 and 1. This technology reduces the calculating time exponentially. This research field has very promising application in future.



Many striking innovations and discoveries originate from scientific fictions. Robots are also no exception to this. The word robotics was derived from the word robot. It was introduced in the play 'Rossum Universal Robots' by the Czech writer Karel Capek in 1920. The word robot comes from the Slavic word rabota, which means labour or work. The play begins in a factory that makes artificial people called robots. They looked like creatures that can be mistaken for humans (picture shown). These characters were very similar to the modern ideas of androids.



(A scene from the play Rossum Universal Robots, showing three robots)