LARGE HADRON COLLIDER

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The Large Hadron Collider (LHC) is the world's largest and highest-energy particle accelerator. It is a gigantic scientific instrument near Geneva, where it spans the border between Switzerland and France about 100 m underground. It is a particle accelerator used by physicists to study the smallest known particles – the fundamental building blocks of all things. It will revolutionize our understanding, from the minuscule world deep within atoms to the vastness of the Universe.

Two beams of subatomic particles called 'hadrons' – either protons or lead ions –travel in opposite directions inside the circular accelerator, gaining energy with every lap. Physicists use the LHC to recreate the conditions just after the Big Bang, by colliding the two beams head-on at very high energy. Teams of physicists from around the world will analyse the particles created in the collisions using special detectors in a number of experiments dedicated to the LHC.

The Large Hadron Collider that was built by the European Organization for Nuclear Research (CERN) has the intention of testing various predictions of high-energy physics, including the existence of the hypothesized Higgs boson and of the large family of new particles predicted by super symmetry.

The LHC accelerates bunches of protons to the highest energies ever generated by a machine, colliding them head-on 30 million times a second, with each collision spewing out thousands of particles at nearly the speed of light.

Physicists hope that the LHC will help answer the most fundamental questions in physics, questions concerning the basic laws governing the interactions and forces among the elementary objects, the deep structure of space and time, especially regarding the intersection of quantum mechanics and general relativity, where current theories and knowledge are unclear or break down altogether.

The collider is contained in a circular tunnel, with a circumference of 27 kilometers (17 mi), at a depth ranging from 50 to 175 metres (160 to 570 ft) underground.

The six experiments at the LHC are all run by international collaborations, bringing together scientists from institutes all over the world. Each experiment is distinct, characterised by its unique particle detector.

The first beam was circulated through the collider on the morning of 10 September 2008.
The first p-p collisions at energies higher than Fermi lab's Tevatron p-pbar collisions have been published on arXiv, yielding greater-than-predicted charged hadron production.
Data produced by LHC as well as LHC-related simulation will produce a total data output of 15 petabytes per year.
The LHC Computing Grid is being constructed to handle the massive amounts of data produced.
Thousands of scientists around the world want to access and analyse this data, so CERN is collaborating with institutions in 34 different countries to operate a distributed computing and data storage infrastructure: the Worldwide LHC Computing Grid (WLCG).
The distributed computing project LHC@home was started to support the construction and calibration of the LHC.
The size of the LHC constitutes an exceptional engineering challenge with unique operational issues on account of the huge energy stored in the magnets and the beams.
The Large Hadron Collider has gained considerable attention from outside the scientific community and its progress is followed by most popular science media.
The LHC has sparked the imaginations of authors of works of fiction, such as novels, TV series, and video games, although a description of what it is, how it works, and projected outcomes of the experiments are often only vaguely accurate, occasionally causing concern among the general public.
There are many theories as to what will result from these collisions, but what's for sure is that a brave new world of physics will emerge from the new accelerator, as knowledge in particle physics goes on to describe the workings of the Universe. For decades, the Standard Model of particle physics has served physicists well as a means of understanding the fundamental laws of Nature, but it does not tell the whole story. Only experimental data using the higher energies reached by the LHC can push knowledge forward, challenging those who seek confirmation of established knowledge, and those who dare to dream beyond the paradigm.

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