

Zeitschrift: Helvetia : magazine of the Swiss Society of New Zealand
Herausgeber: Swiss Society of New Zealand
Band: 78 (2012)
Heft: [6]

Artikel: Swiss "atomic" news : CERN
Autor: [s.n.]
DOI: <https://doi.org/10.5169/seals-944079>

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Swiss "atomic" news: CERN

CERN in a nutshell

CERN, the European Organization for Nuclear Research, is one of the world's largest and most respected centres for scientific research. Founded in 1954, the CERN Laboratory sits astride the Franco-Swiss border near Geneva. It was one of Europe's first joint ventures and now has 20 member states.

Its business is fundamental physics, finding out what the Universe is made of and how it works. At CERN, the world's largest and most complex scientific instruments are used to study the basic constituents of matter - the fundamental particles. By studying what happens when these particles collide, physicists learn about the laws of nature.

The instruments used at CERN are particle accelerators and detectors. Accelerators boost beams of particles to high energies before they are made to collide with each other or with stationary targets. Detectors observe and record the results of these collisions.

A subatomic venture

"Imagination is more important than knowledge."

These were the words of the famous physicist Albert Einstein, who went on to say that *"Knowledge is limited. Imagination encircles the world."*

If you venture into the subatomic world in an attempt to unveil its inner workings, possession of all the knowledge in the world is not enough. Instead, invite your imagination to serve as a guide, because many rules as we know them no longer apply. Just like the story of *Alice In Wonderland*, this new world may look familiar but it is not fully comprehensible. Scales shift and matter transforms. Transitory twins appear and extra dimensions hide.

The Large Hadron Collider

The Large Hadron Collider (LHC) is a gigantic scientific instrument near Geneva, where it spans the border between Switzerland and France about 100m underground. It is a particle accelerator used by physicists to study the smallest known particles – the fundamental building blocks of all things. It will revolutionise 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.

Discovery of the Higgs Boson?

On 4 July 2012, CERN reported that its experiments have revealed a particle consistent with long-sought Higgs boson, deemed to be a vital piece of the puzzle to explain the working of the Universe. The so-called Standard Model of physics successfully describes all of the elementary particles we know to exist and how they interact with one another. But our understanding of nature is incomplete. In particular, the Standard Model cannot answer one basic question: Why do most of these elementary particles have masses?

Without mass, the universe would be a very different place. For example, if the electron had no mass, there would be no atoms. Hence there would be no ordinary matter as we know it, no chemistry, no biology and no people. In addition, the sun shines thanks to a delicate interplay among the fundamental forces of nature, which would be completely upset if some of those force particles did not have large masses. The Higgs boson is thought to provide the necessary clues to the conundrum.

Where the web was born

Tim Berners-Lee, a scientist at CERN, invented the World Wide Web (WWW) - the Internet - in 1989. The Web was originally conceived and developed to meet the demand for information sharing between scientists working in different universities and institutes all over the world - and of course now many of us are part of it!

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