CERN: close by for 70 years

This year, the European research center CERN will celebrate its 70th anniversary. The lab made particle physics big, also in the Netherlands.

Photos: CERN

No one knows exactly how close the Dutch really came. But the fact is that the Netherlands had a serious chance in the early 1950s to host the European organization for nuclear research CERN. The Arnhem area was seen as a suitable location for that. At least by the Dutch.

At a meeting on Oct. 1, 1952, at the Trippenhuis in Amsterdam, the initiators for the European research lab nevertheless decided that the Geneva region would be the best location for the project. A Danish and French proposal also fell through.

Groundbreaking was in March 1954, near the village of Meyrin, just outside Geneva. The year before, the twelve founding members, including the Netherlands, had signed the CERN convention in Paris for a lab that would conduct nuclear research without any military applications. The Netherlands ratified it on June 15, 1954, and pledged to bear 3.65 percent of the cost. On Sept. 29, 1954, CERN was officially established.

This year, CERN's 70th anniversary (1954-2024) will be celebrated extensively. With much emphasis on its scientific achievements, inventions and discoveries. But certainly also with emphasis on the importance of international scientific cooperation, of which CERN has always been a textbook example.

Collaboration

Even during the Cold War of the last century, Russians and Americans worked together fraternally here to study the inner workings of matter. In recent years, the war in Ukraine truly, and sometimes painfully, challenged that conciliatory principle for the first time in decades.

In fact, when the atomic bombs on Japan mark the end of World War II, CERN's history begins. Those bombs were the work of physicists who, after 1945 also realized how dangerous their knowledge could be. To curb that danger, many argue ▶

for international openness in nuclear research. Among them Robert Oppenheimer, who gradually ran into problems with this politically.

On top of that, little remained of scientific research in battered Europe after the war. Pierre Auger and Niels Bohr, among others, were deeply concerned about this. In 1949, French physicist Louis de Broglie pleads for European cooperation to turn the tide.

In 1950, American Nobel laureate Isodor Rabi (Oppenheimer's teacher) proposed to UNESCO that a joint laboratory for nuclear research in Europe should be supported. That resolution is adopted in 1951, and just two months later, twelve countries establish the *Conseil Européen pour la Recherche Nucléaire*, a council to develop the lab proposal.

Accelerators

The lab's first accelerator comes into operation on May 11, 1957: a synchrocyclotron, the SC, which will remain in operation for no less than 33 years. Two years later, PS also comes into operation, a proton synchrotron with a circumference of 628 meters that will remain for some time the most powerful particle accelerator in the world. Proton beams are used to bombard solid targets.

In the process, attention soon shifts from nuclear physics to elementary particles. In the 1950s and 1960s, the lab rapidly builds equipment to study the most fundamental building blocks of matter. Smaller than the atomic nucleus it had begun to study not long before.

In the 1970s, the PS accelerator becomes the supplier of particles for the lab's new even larger accelerators. In the new 300 metres diameter Intersecting Storage Rings (ISR) for the first time in 1971, experiments are conducted with direct collisions of protons chased around in two directions from the PS. The ISR project yields much new physics, but certainly as much technical knowledge and inventions that prove important in later accelerators. For example, Dutch engineer Simon van der Meer tests his ideas on taming proton beams there, the stochastic cooling that will prove crucial for a larger accelerator, the super proton synchrotron SPS. In 1984, he received a Nobel Prize for his invention, which paved the way to the discovery of the W and Z bosons.

With this 7-kilometer circumference SPS accelerator, CERN also broke through another boundary in the 1970s: the circular tunnel no longer fit on Swiss territory alone and, after negotiations, was built partly under French farmland. Initially protons collide in the accelerator, later protons and antiprotons as well. Among other things, the research helps prove that protons consist of even smaller particles: quarks.

The SPS is the prelude to the really big work. In 1988, the tunnel is completed for LEP, a 27-kilometer accelerator that shoots electrons and positrons at each other. With more than 5,100 electromagnetic steering magnets and nearly 130 accelerator cavities, it is the largest machine on Earth, spanning two countries. It began operation on July 14, 1989, and remained in service for 11 years. In 2000, the accelerator was scrapped and in the same tunnel came into being the Large Hadron Collider, a proton accelerator with thousands of superconducting magnets and unprecedented energy. The LHC has been CERN's workhorse ever since, its main trophy being the Higgs particle whose discovery was officially announced on July 4, 2012 by the two largest detectors at the lab: ATLAS and CMS.

Dutch contribution

The ever-expanding accelerator park has made CERN an inevitable headquarters of particle physics, European and also worldwide. Dutch physicists interested in subatomic physics have been closely involved in experiments at the lab since its inception in the 1950s. Since 1975, this has been done under the national umbrella of Nikhef, which gives researchers and universities much more clout than they would have individually in Geneva.

The Dutch have often played prominent roles at the lab. Cornelis Bakker led the construction of the lab's first accelerator, the SC synchrocyclotron, and in 1955 became the lab's second director general (DG). In 1960, he was killed in an airplane accident in New York. In the late 1970s, theoretician Leon van Hove, born in Brussels but previously working in Utrecht for many years, was DG in Geneva for five years, born in Brussels but previously working in Utrecht for many years. Walter Hoogland, former Nikhef director was scientific director of CERN from 1989-1994. From 2004-2008, former Nikhef director and later NWO president Jos Engelen was also scientific director and deputy DG of CERN in Geneva. Nijmegen physicist Sijbrand de Jong chaired the CERN Council, the lab's highest governing body, from 2016-2018. Nikhef researcher Marco van Leeuwen is currently spokesperson for the ALICE experiment.

Formally, the Netherlands is involved in three of the four major experiments at the LHC accelerator at CERN. For ATLAS, LHCb and ALICE, Dutch physicists and technicians build and improve advanced components and systems, analyze data and publish results. In addition, Dutch scientists participate in numerous smaller or exploratory experiments. This concerns about half of the more than two hundred Nikhef researchers, including PhDs and postdocs. With results. The Netherlands publishes one and a half times more in particle physics than might be expected of such a small country.

Nikhef's data center at Amsterdam Science Park, meanwhile, is one of the hubs in the international storage and distribution of measurement data and computing power around CERN. The Nikhef computer group has the fastest data connection in Europe between Amsterdam and Geneva: 800 Gigabits per second, comparable to a hundred full DVDs per hour. A CERN on the Veluwe never succeeded, but CERN is actually closer than ever. ◀

The Battle of Arnhem

As plans for a European non-military institute for atomic research take shape around 1950, consideration is also given to the location. A list of criteria is drawn up. These seem tailor-made for Geneva, capital of international cooperation in neutral Switzerland. But the patriarch of European physics Niels Bohr throws a spanner in the works. He wants the institute in Copenhagen, Denmark. Then France (with Longjumeau, near Paris) and the Netherlands (selecting the war-ravaged Arnhem area) also submit proposals. These are discussed in early October 1952 at a four-day meeting in a packed Trippenhuis in Amsterdam.

What follows is an "amazing battle," Dutch representative Jan Hendrik Bannier later recalled, according to official CERN history. All four proposals meet the technical requirements, everyone agrees after a day of presentations. But then a dizzying political game ensues.

In it, first Denmark withdraws, considered too decentralized, cold and distant, and also a bit too much Bohr's domain. The British, initially Bohr's allies, on second thought also find Denmark too close to Russia. The Danes withdraw on condition that Copenhagen becomes a center for European theory.

France is the next to drop out, mainly because many countries would rather see the institute in a smaller and less dominant country anyway.

What remains after a day of talks, CERN historians write, is a tough battle between Geneva and Arnhem. Arguments go back and forth. Italy and France openly support the Swiss in the debate, the northern countries feel strongly about Arnhem, as do the British and Germans (with Werner Heisenberg in the delegation). The Netherlands is closer to them than Switzerland, and there are traditionally good relations with Dutch physicists. Bohr's right-hand man, for example, is Dutchman Hendrik Kramers.

But in the end, Geneva wins. Delegate Bannier, top official and physicist and later president of the CERN Council, remembered it this way thirty years later: "If the fight had continued for a long time, the French delegation would have walked away. (...) Continuing to insist on Arnhem might have jeopardized the whole project." The Netherlands withdraws its candidacy, and the meeting in Amsterdam decides that Geneva will be it. Unanimously, the minutes say.

Which, incidentally, is not the end of the matter. In the canton of Geneva, the news initially causes great unrest. Is such a nuclear laboratory safe? Does it not undermine Swiss neutrality? The local Communist party in particular, but also the Red Cross, for example, campaign fiercely against it. Late June 1953, in a referendum the population nevertheless votes with a two-thirds majority in favor of CERN coming to Geneva. The rest, as they say, is history.

Source: A. Herman et al, History of CERN, Vol.1, North Holland 1987.


Meeting in the Trippenhuis in Amsterdam, 1952


Works start in Meyrin, 1954


The proton-synchrotron, 1959