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SA scientists playing their part in Large Hadron Collider research

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SEEKING ANSWERS: Glyn Kirby, lead engineer in the design of super electromagnets for the Large Hadron Collider. Picture: SARAH WILD

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SOUTH African scientists are involved in two of the biggest science experiments on earth: trying to discover the Higgs Boson particle and recreating the Big Bang at the European Organisation for Nuclear Research's (CERN's) Large Hadron Collider.

"This is one way of retaining talent," says Zebon Vilakazi, director of the iThemba

Laboratory of Accelerator-Based Sciences (iThemba Labs). "If we hadn't been participating in this enterprise, young scientists wouldn't have invested their science future in this country."

iThemba Labs is a major contributor in SA's CERN programme, along with the University of Johannesburg, Wits University, the University of KwaZulu-Natal and the University of Cape Town.

SA has a history of activity in particle physics, albeit from a small scientific community, such as the iThemba accelerators in Johannesburg and Cape Town, as well as nuclear science.

The Large Hadron Collider (LHC) is a massive particle accelerator that straddles the border between France and Switzerland. The accelerator, which is about 100m underground, is owned by CERN, and there are four collaborative experiments placed around the 27km ring of super-conducting magnets.

"The aim of CERN is to provide the accelerators, and then physicists around the world make the experiments through collaboration," says Jean Cleymans, co-ordinator of the SA-CERN collaboration.

There are two beams of particles - protons and lead atoms - that are accelerated around the collider, and crash together at the four experiments. SA is involved in two of these experiments: Atlas (A Toroidal LHC Experiment) and Alice (A Large-Ion Collider Experiment).

The Atlas experiment - the largest on the LHC, involving about 3000 scientists from 172 institutes in 37 countries - aims to investigate the standard model of physics, including the existence of the Higgs Boson particle, sometimes called the "God particle", which is thought to give matter its mass. It is the only particle in this model that scientists have not detected.

"Every member of the group has to do science work (as well as their own research), such as doing shifts working on the experiments and contributing to software development," says Sahal Yacoob, a South African scientist working on the Atlas project.

Dr Yacoob will return to SA this year to take up a teaching post at the University of KwaZulu-Natal.

"We're proud of South African involvement. SA has been involved in Atlas for two years. There were South Africans in the field, but at different universities. There has been a lot of growth since we joined," he says.

In the Alice experiment, physicists collide lead atoms to try and recreate the Big Bang, which is one possible theory of how the universe began. Though much smaller than Atlas, Alice is a collaboration of more than 1000 scientists from 105 institutes in 30 countries.

"For SA, it's a way to become part of the (science) family, to collaborate with the rest of the world, and see how they're doing it. It raises the level, but it isn't cheap," says Dr Cleymans.

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Though South Africans have been working with CERN since 2002, the country only officially joined as a collaborator thanks to Department of Science and Technology funding in 2007-08.

The current R10m three-year grant from the department falls under its infrastructure programme, and comes to an end in March next year.

"We are putting together a long-term plan for South African involvement at the Large Hadron Collider," Dr Vlakazi says.

"It is a magnet for students who are attracted by the exciting science," he says.

"Over the last two to three years, top-class experts and young scientists from abroad have joined South African institutions to be part of this programme."

Dr Cleymans says that SA's collaboration with CERN is important because "it raises the level" and shows South Africans what it is like to work at an international science facility.

This sentiment is echoed by Dr Vlakazi, who worked at CERN as a physicist before he took over as director of iThemba Labs : "Working at CERN helped me prepare for my career. It is not just about the physics, but working in a highly intellectual, high-intensity environment.


"South Africans work in a multilingual, multicultural environment and are taken seriously, raising the profile of SA's science abilities," says Dr Vlakazi.

However, the project is under pressure to deliver results.

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