CERN's next director-general on the LHC and her hopes for international particle physics

Fabiola Gianotti talks to Nature ahead of taking the helm at Europe's particle-physics laboratory on 1 January.

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Maximilien Brice/CERN

Fabiola Gianotti is the incoming director-general of CERN.

Fabiola Gianotti, the Italian physicist who announced the discovery of the Higgs boson in 2012, will from 1 January take charge at CERN, the laboratory near Geneva, Switzerland, where the particle was found.

Gianotti spoke to *Nature* ahead of taking up the post, to discuss hints of new physics at the upgraded Large Hadron Collider (LHC), China's planned accelerators and CERN's worldwide ambitions — as well as how to deal with egos.

How excited should we be about the latest LHC results, which already hint at signals that could turn out to be due to new physics phenomena?

At the moment, experiments are seeing some fluctuations and hints, which, if they are due to signals from new physics, will next year consolidate with the huge amount of data the LHC will deliver. On the other hand, if they are just fluctuations, they will disappear. We have to be patient. In addition to looking for new physics, we are going to study the Higgs boson with very high precision.

Will any of the hints that we've already seen be directing the physicists' searches?

I don't think that the direction of exploration is being guided by the hints people see here and there. The correct approach is to be totally open and not be driven by our prejudices, because we don't know where new physics is, or how it will look.

Following the LHC's energy upgrade, data collection in the 2015 run has been slower than hoped. How would you characterize it so far?

Run 2 has been extremely successful. We have recorded about 4 inverse femtobarns of data [roughly equivalent to 400 trillion protonproton collisions]. The initial goal was between 8 and 10 femtobarns, so it's less. However, a huge number of challenges have been addressed and solved. So for me, this is more important than accumulating collisions. We could have accumulated more, but only by not addressing the challenges that will allow us to make a big jump in terms of intensity of the beams next year.

In 2015, one LHC paper had more than 5,000 authors. There must be some people on such experiments who want more credit for their efforts. How do you deal with the clash of egos?

I think the collaborations accept very well this idea that everybody signs the paper, and I am also a strong supporter of that. The reason is simple: you can be the guy who has a good idea to do a very cute analysis, so get very nice results. But you would not have been able to do the analysis if many other people had not built the detectors that gave you the data. None of these experiments is a one-man show, they are the work of thousands of people who have all contributed in their domain and all equally deserve to sign the paper.

I hope that universities, advancement committees and boards that hire people understand that just because there are many authors, that does not mean the individual did not make an important contribution.

CERN is currently at the heart of international particle physics, but China is designing a future collider that could

succeed the LHC after 2035. Do you think that China could become the world's centre for particle physics in the 2040s? At the moment there are many conceptual design studies for future big accelerators around the world. Of course conceptual studies are important, but there is a big step between studies and future reality. I think it is very good that all regions in the world show an interest and commitment to thinking about the future of particle physics. It's a very good sign of a healthy discipline.

Is there a chance that China might become a CERN member?

Before becoming a full member, you become an associate member, and associate membership is something that can be conceived [for China]. So we will see in the coming years if this can become a reality. It's an interesting option to explore.

Do you plan to encourage more countries to become CERN members?

Of course. A lot has been done since 2010 to enlarge CERN membership, in terms of associate members in particular, but also [full] members: we got Israel, for instance, and soon we will get Romania. I will continue along this direction.

Some people think that future governments will be unwilling to fund larger and more expensive facilities. Do you think a collider bigger than the LHC will ever be built? And will it depend on the LHC finding something new?

The outstanding questions in physics are important and complex and difficult, and they require the deployment of all the approaches the discipline has developed, from high-energy colliders to precision experiments and cosmic surveys. High-energy accelerators have been our most powerful tools of exploration in particle physics, so we cannot abandon them. What we have to do is push the research and development in accelerator technology, so that we will be able to reach higher energy with compact accelerators.

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