

Interview FOM expres 1 -July 2015
Section 'Women in Physics' - English version

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Ana Achúcarro investigates the origins of the universe
Deeply rooted curiosity

She studied in Bilbao, where she still holds a zero-time appointment. After gaining her PhD at Cambridge she was a postdoc in London and Boston. Since 2002 she has been a professor in the Particle Physics and Cosmology Group at Leiden University. There, in a recently awarded Vrije-FOM programma, Ana Achúcarro (1962) is trying to reconstruct what the universe looked like during the first moments after the Big Bang.

"My work is exactly what I dreamed about when I was seven years old", says Ana Achúcarro over the telephone, while colleagues and students continually walk in to briefly discuss something with her. "Back then I already knew that I wanted to become a scientist. Since my early childhood I have enjoyed thinking about why things are the way they are. In my work I am privileged to be able to do the very things I enjoy the most." Achúcarro is a theoretical physicist with a special interest in string theory, black holes and the early universe. She recently received a Vrije-FOM programma grant of 2.3 million euros as a project leader in that last subject. "It is quite unique that FOM has awarded a grant to programme so focused on cosmology", she says with a certain amount of pride. In the programme, theoretical physicists, high-energy physicists and astronomers from Leiden University, the University of Amsterdam, Utrecht University, the University of Groningen and FOM institute Nikhef are collaborating intensively, says Achúcarro. "We already saw each other every month during our joint Theoretical Cosmology Meetings. And as the distances are not so large here in the Netherlands, it is easy for the PhD researchers to travel around."

Looking at the past

The programme focuses on one of the most fundamental questions that we pose as human beings: where do we come from and what is the origin of the universe? To answer that question the theoreticians are building further on observations. "Since its earliest existence, the universe has stored information for us. The deeper you look into the universe the further you look into the past. Light simply needs time to reach us. You can therefore literally see the universe as a layered registration of what has happened in the past. What I find most fascinating is that in the cosmic background radiation you can recognise the signature of the quantum world that was present in a fraction of a fraction of the very first second. You can never recreate that situation here on earth, not even with the best accelerators. We are now combining the knowledge that we have about the universe in its current form with the variations that we observe in the background radiation that arose about 300,000 years after the Big Bang. From this we are trying to derive what happened right at the very start of the universe."

That seems to be an impossible task but that is not the case, she says enthusiastically. "Right

at the very start the universe was incredibly boring. It was completely homogenous, with very minimal fluctuations. But if you wait for long enough then even these very minimal disruptions can nevertheless have large consequences. From that homogenous start the current universe emerged, which contains very empty spaces and locations that are incredibly full with clusters of galaxies. We are searching for the origin of the fluctuations that could have caused our current universe. This means that we have to think about subjects such as cosmic inflation, neutrinos, dark energy and dark matter."

People in physics

Although she is happy to cooperate with an interview for FOM expres, Achúcarro does not see the need for it to be in a section entitled 'Women in physics'. "I have lived in many different places in the world and have experienced many forms of discrimination: positive discrimination, negative discrimination, no discrimination... I continue to be surprised that in some places the fact you are a woman appears to be so interesting. In the past, in Spain, I did not even notice that I was a girl as opposed to a boy and my parents and teachers mainly saw a brain that needed to be educated. Only when I arrived in Cambridge did the fact I am a woman become an issue."

However, now that she has been given a podium here, she would like to draw attention to something. "The fact that I ended up here in Leiden was the result of a 'two body' problem, something that everyone encounters if they want to combine two careers in science. For many years my husband held an appointment in Groningen, whereas I worked in Bilbao, even though we had a family with children. Having said that, I am quite happy here. The Netherlands combines the European mentality with the American flexibility and ambition. That is a fantastic combination." (SK)

Dutch TV programme 'Bonte Vrouwen' about women in science

Two female researchers from respectively AMOLF and Nikhef took centre stage in the Dutch TV programme 'Bonte Vrouwen' that was broadcasted on 14 June. The episode was about the dilemmas and challenges that women can encounter when trying to develop a career in science. The episode was realised with input and financial support from NWO and FOM. The programme followed physicist Anouk de Hoogh who is a PhD researcher at AMOLF. She talked with Els Koffeman, researcher at Nikhef and Extraordinary Professor of Instrumentation in Particle Physics at the University of Amsterdam. 'Bonte Vrouwen' is a six-part series in which young, female professionals are followed in their work and are brought into contact with female role models. With their contribution to the TV series, NWO and FOM are drawing attention to the unequal balance between men and women in Dutch science. You can watch it (in Dutch) via:

➔ <http://www.ntr.nl/Bonte-vrouwen/12>