

Interview with Professor Agnieszka Zalewska

CERN – Europe’s Treasure-Trove



Jakub Ostrowski

Prof. Agnieszka Zalewska from the PAS Institute of Nuclear Physics in Kraków has recently been elected as President of the Council of the European Organization for Nuclear Research (CERN)

Academia: What made you decide to study physics at university?

Agnieszka Zalewska: I was born in Kraków, and my education and professional activities have always been closely tied with the city. I had an excellent physics teacher at school, who really believed in practical demonstrations and experiments. It was extremely important to see how everything worked, and I was fascinated by so many things; I was doing a lot of reading, mainly popular-science books, and I was dreaming of becoming an inventor. I just didn't know what I wanted to invent yet.

Physics crystallized in my mind around halfway through high school. My school tended to focus on the humanities, but the physics teacher was really dedicated. He was able to show us that it's possible to use mathematics to describe the world around us and show various connections within it. Choosing physics seemed like a natural choice after that, and of course I had the excellent Jagiellonian University on my doorstep. I chose the specialization very carefully, and made a conscious decision to study particle physics. It was experimental particle physics; I didn't really have the temperament to be a theoretician. The University did have a specialist department, but Prof. Marian Mięsiowicz's excellent group was closely linked with the AGH University of Science and Technology, the Institute of Nuclear Research, and later with the Institute of Nuclear Physics. It was my ambition to join it; fortunately I managed to gain a place, and I have been with the Institute of Nuclear Physics ever since. And of course the Institute has been a part of the Polish Academy of Sciences for almost a decade.

This past September, you became the President of the Council of the European Organization for Nuclear Research (CERN). You've had close ties with CERN for many years.

Yes; ever since I completed my Master's degree, I've been working on data from the two meter long bubble chamber at CERN. I was conducting research into the

interactions between kaons and protons at energy of 8 GeV. My PhD focused on the same experiment, except this time I was using events with high numbers of particles in the final state. After I completed my PhD, my husband and I went to CERN for a year. He had an internship there, while I was working on an experiment using electronic techniques, collaborating with Prof. Krzysztof Rybicki's group from Kraków.

In the early 1980s, a few research teams formed at the Large Electron-Positron Collider (completed in mid-1989) at CERN. I remember when Prof. Michał Turała arrived from CERN and told us, "Listen, we have an opportunity to join one of the experiments at LEP, but we have to bear in mind that there won't be any publications for some time." I was then a young mother, and I thought the project sounded great: as my children

visory scientific committees, are aimed at finding the most interesting research topics. This focus on key science brings real results. Also, I personally really enjoy the international environment. Of course I had to get over my own worries, such as whether I'll be understood, or whether I know enough. It's great working in a team where different people bring such a wide-ranging input. It's definitely an advantage, not a barrier.

You've overcome certain barriers yourself, to become a member of the CERN Council.

Until the end of 2012, I served as the Polish Scientific Delegate to the CERN Council. I joined the Council at short notice following the sudden passing of Prof. Jan Nassalski in the summer of 2009.

I'm aware that leading the CERN Council is a huge responsibility. The relevance of me personally is increasingly being replaced by the importance of Poland

grew up, I'd have more time to devote to the experiment as it was developing... And it turned out to be the right decision. We even managed to publish quite a few papers: I was with a group conducting pioneering research on silicon detectors with microelectronic readouts used in experiments at the Collider. It was a fantastic opportunity, because I had my own input into pioneering studies. The LEP experiments finished in 2000, but I continued with another interesting project studying applications of silicon detectors in medicine. However, I was starting to switch to neutrino physics, my specialization until the present day, and I started my adventure with CERN's scientific committees.

CERN is a huge, multinational organization; have you found this to be a problem?

Actually, that has been and is a great thing about CERN: it means that everyone's efforts, especially those of the ad-

My senior colleagues felt that my familiarity with CERN could prove to be very useful. At the time I was still a member of the Scientific Policy Committee, providing advisory to the CERN Council. It includes 15 physicists selected personally rather than by country quota. I spent six years there, and my second term was just coming to an end. I think that was a major reasoning behind me taking over Jan's position.

How are you finding your current role?

I'm a little overwhelmed by the response, and it's beginning to sink in that it really is a major distinction. I'm delighted, of course, but I'm also aware that it's a huge responsibility. The relevance of me personally is increasingly being replaced by the importance of Poland. In short, I need to rise to the challenge and continue Poland's outstanding track record in particle physics; build upon it. Let's be honest: my presidency of the Council is the result

of work carried out by three generations of Polish physicists, starting with Professors Marian Danysz and Jerzy Pniewski in Warsaw, and Prof. Marian Mięśowicz in Kraków.

So what are your plans?

To be honest, a lot of the plans are already in place. My task is to ensure the smooth running of the CERN Council. I do have a few ideas of my own, though: I want to get the best out of the Member States, and to make them feel they are an important part of CERN. It's essential for us all to be aware that CERN is a European treasure we must all care for, and that it is instrumental in the development of science and technology in the Member States. That's a more general aim. In terms of the program, the Council has two main tasks: looking after the Laboratory, and coordinating European efforts in particle physics. The CERN Council also approves the Laboratory's budget and mid-term plans, and annually confirms the the Director's proper performance of duties. Of course the Director of CERN is highly autonomous, and

not actually employed by CERN, and is only reimbursed for travel and accommodation costs. It is important that the President is independent.

How many Polish researchers work at CERN?

There are around 260 people registered as users. Once again, we should recall the history of Polish particle physics research: during the 1950s, in CERN's early days, our leading professors were asked to send their best students, and by the 1960s, whole Polish teams worked together with CERN. Poland became an observer country in 1963. We were unable to provide financial input, but we built equipment which was used in experiments being conducted at CERN. Prof. Turata from Kraków was the first to build gas wire chambers, allowing Polish researchers to work in detector physics. The work of Prof. Tomasz Hofmokl from Warsaw contributed to the use of Polish lead from Szopienice in the construction of a major part of an electromagnetic calorimeter for the DELPHI study. And there are many more examples.

The World Wide Web was developed at a center doing basic research, not a commercial company. It was given to the world for free

is directly responsible for running the Laboratory. Suggestions for the future generally result from the European Strategy for Particle Physics.

Specific immediate task include finalizing the gathering of LHC data at the current energies of proton-proton and proton-lead collisions. This February, the LHC will close for around two years for refurbishment, aiming to almost double the available energy to 14 TeV. It should be remembered that the CERN Council doesn't operate in isolation; it supported and advised by the Scientific Policy Committee and the Finance Committee. It is also worth noting that the President of the Council is

It was completely natural for Poland to be the first country from the former Communist Bloc to join CERN in 1991. Polish physicists were notable; Prof. Ryszard Sosnowski was the Vice-President of the CERN Council, Prof. Turata was the leader of one of the CERN divisions and chairman of the Scientific Committee on Detector R&D, and Profs. Stefan Pokorski, Lena Białkowska, Jan Nassalski, Maria Różańska and I worked at other task force committees. My predecessors at the Scientific Policy Committee were Prof. Andrzej Kajetan Wróblewski and Prof. Krzysztof Rybicki. My selection as President is simply the continuation of this beautiful tradition.

The Polish community at CERN is strong...

Yes; this is because of our ongoing physics research. We should talk about it and be proud of it. The ongoing criticism of the condition of Polish science seems to be unfair; I get the impression that the concerns are frequently voiced by people who know very little about research, and simply enjoy complaining.

There are growing numbers of women working in physics. Have you ever felt that you are working in a world dominated by men?

It's not something I notice day to day. I have always felt that competence is far more important, but perhaps it's been easier for me, since for a long time I was the only girl in my family. I grew up surrounded by boys, climbing trees, and catching critters, so I didn't see anything unusual when my work environment also mainly involved men. In Polish tradition, women have long played an important role; we had Marie Skłodowska-Curie, and emancipation was widely socially accepted. There have always been proportionally more female physicists at CERN from Poland than from other countries.

Which CERN project do you recall the most fondly?

The DELPHI experiment played a very important part in my life. I was involved for 18 years, from the planning stages to the final data collection, including the previously mentioned work on the silicon detectors with microelectronic readout. We also built all the accompanying equipment, conducted tests, developed software, and expanded and upgraded the detector. There was a sad incident: the physicist responsible for expanding the detector in 1996 died in a mountaineering accident. We were devastated, but after a few days the colleague who was overseeing the entire project said, "We have four months. We need to complete the work." And

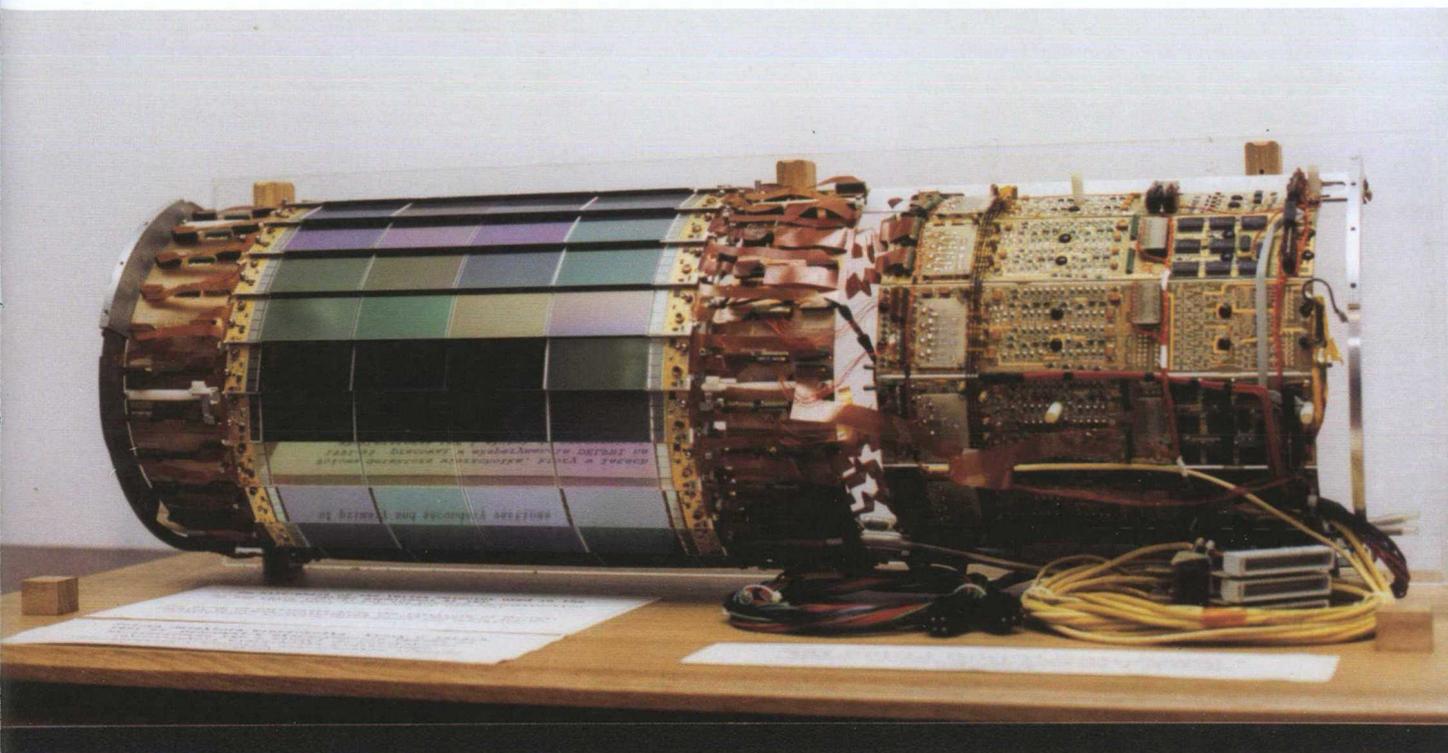


Photo of a section of the silicon apex detector from the DELPHI experiment at LEP1, held at the PAS Institute of Nuclear Physics

suddenly I became responsible for the detector's cooling system. I have great memories of that time, because the physics was really interesting: I had to plan the amount of water required, pressure, diameter of pipes, size of the vats... It was as though we were designing a home.

Sounds a lot like engineering work.

Yes, but it was still physics; I calculated everything myself, and it was very enjoyable. We needed to design the heat exchange, the power of the cooler, and calculate the flow rate required to get rid of the heat emitted by the electronic components. I worked with engineers from CERN and from Kraków, and one of my German colleagues said, "Really? A lady working on a project like this?" But it was clearly a friendly comment. Later came a night when I realized that in spite of the experts' opinion, the system might turn out to be unstable, and the detector could sustain damage. So I took a folding chair over to the laboratory in the middle of the night, where

I tested, rechecked, measured, calculated... I already had a report ready for that day's meeting, and we introduced the necessary corrections. But the thing I regard as the most important in my work is linked with Poland, and remains incomplete. I was working on the LAGUNA project - another great time in my professional life - which involved searching for a location for a major new neutrino physics laboratory. It requires the construction of giant detectors, significantly larger than the existing Super-Kamiokande in Japan. One of the locations we were reviewing was the Sieroszowice mine owned by the KGHM copper holding. It is a great site, and we hoped we'd be able to reach the next stage. Unfortunately this was not the case, and a decision was made to focus on an alternative location in Finland; there were good reasons, some of which included geopolitics. But we weren't successful, and it was difficult for me personally.

I still hope that one day we'll have an underground laboratory in Poland. Not a giant one, but nevertheless able to

conduct significant research. I have a sense that my most important work is perhaps still ahead for me.

Will you have time to work on your own projects?

My research focuses on neutrino physics. Right now I'm working on two experiments: ICARUS (with a neutrino beam from CERN to Gran Sasso) and T2K (experiment with a neutrino beam from the JPARC center at Tokai to Kamioka). In both cases, we are studying oscillations and interactions of neutrinos. The CNGS project (neutrinos from CERN to Gran Sasso) rose to fame for its reported discovery of faster-than-light neutrinos as part of the OPERA project. The ICARUS experiment resulted in an accurate measurement of the speed of light; it was a great feeling to have been the first. The T2K experiment was the first to measure, although with a limited accuracy due to the earthquake in March 2011, the last unknown angle of neutrino oscillation. It's an extremely important measurement, since it could determine the future

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direction of neutrino physics research. My sense is that I work in a fascinating field of particle physics. I don't intend to stop working completely, but for the T2K project, I have already completed my projects for 2013.

How do you perceive the situation of science in Poland?

Fortunately the percentage of GDP dedicated to research is growing, albeit slowly. It is essential to invest in research; I always recall the statement by Bernardo

that Poland's research budget grows fast enough for us to catch up with the rest of the world.

So, to sum up, you have a large family as well as having a very successful scientific career. How have you managed to balance these two worlds?

I think I've generally been very lucky, but I have also worked hard to get to where I am.

You think good luck is important?

kids." His words really took me aback, and now I'm really grateful that he was so supportive at the time.

Of course I really value my family life; it allows me to take a step back, and it will always remain the most important. We now have four grandsons, and just one granddaughter - Alusia. We try to find as much time for them as we can, and we try to maintain the tradition of family Sunday lunches. They will be a bit fewer and farther between now, as - sadly - there isn't a TGV line connecting Geneva to Kraków.

Interview by Anna Zawadzka and Agnieszka Pollo
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Prof. Agnieszka Zalewska with her husband, Prof. Kacper Zalewski, and their children (from left): Anna, Andrzej, Lidia, and Mikołaj

Agnieszka Zalewska (b. 1948), professor of physical sciences. She graduated from the Jagiellonian University in 1971. She gained her PhD from the same university in 1975, then her DSc (habilitation). from the PAS Institute of Nuclear Physics in 1995, with her thesis "Silicon vertex detectors in the DELPHI experiment: from concept to results." Since 1971, she has been working with the PAS Institute of Nuclear Physics, where she rose through the academic ranks until gaining the title of professor in 2000. She has also lectured at the Jagiellonian University (from 1971 to the present, with intervening breaks). She has held several placements abroad, having been associated with CERN since the mid-1970s. Her research focuses on high-energy physics. Served two terms as a member of the Scientific Policy Committee, providing advisory to the CERN Council. Elected to the position of President of the CERN Council in 2012. She was awarded the Gold Cross of Merit in 2005.

Houssay, Nobel Prize laureate for medicine: "There is no applied science, if there is no science to be applied."

Fundamental research is just as important as applied research, since you never know what you're going to get. One of the directors of CERN once said that he would be interested to know how many times over the annual CERN budget has been saved because the World Wide Web was developed at a center conducting basic research instead of at a commercially-driven company. One of my colleagues stressed that moreover access to it has always been free, unlike for operating systems such as Windows or software such as Office. This was an extremely important step along the path of human development. Let us hope, then,

Of course! The greatest luck of my life has been meeting my husband, Professor Kacper Zalewski, himself a physicist and member of the Polish Academy of Sciences. He has a refreshingly modern approach to women and our role in society. I went through a major crisis at one point, and announced that since I quite like looking after my home, perhaps I should just quit research. We ended up having a serious discussion, and my husband said, "Of course you can do what you like. But you should keep in mind that the role of women in society is changing, and you might end up regretting it in a few years' time." And he went on to say, "Also, if something were to happen to me, it would be better if you were able to look after yourself and our four