(cntn'd from p. 2)

RDH – We did not have yet the heavy ion beam inside the LHC but such a beam was at the entrance to the LHC, passed the injectors and the transfer lines. The machine people do not expect big problems with the heavy ion beams; it should go relatively smoothly. Three of the detectors, ATLAS, ALICE and CMS, will also look after the experiments with heavy ion beams.

AMK – *Perhaps the LHC will take over from the Relativistic Heavy Ion Collider (RHIC) in the United States?*

RDH – It could well be so…

AMK – *Do you have any priorities for the experiments, or will all of them proceed simultaneously: search for the Higgs, the supersymmetric particles and thus the dark matter?*

RDH – All at the same time. The densities of the two beams are sufficient and the beams are immediately refocused after the collisions inside the detectors. These experiments are very big and many, many people are involved in them. Some people will study process "a", some process "b", etc.

AMK – *The next generation linear colliders like the ILC and/or the CLIC are close to the final design stage. You had worked on the ILC concepts. I know future decisions depend on the results from the LHC. How do you perceive the future for the ILC or the CLIC?*

RDH – Whatever we know on the Standard Model we do only because of the use of two types of colliders: proton colliders and lepton colliders. We do need input from both types of colliders, a synergy between them. Like in astronomy we need data in visible light, ultraviolet, infrared, radio wavelength, gamma rays. The same is the case with the types of colliders. I'm convinced that whatever the LHC finds, it will need to be complemented by results from a linear collider. The big question is: At what energy? Therefore we have to wait for the results from the LHC.

However, we have to have a concept that we have proven it can be built. The right moment to talk with politicians and funding agencies about the next linear collider would be when the LHC will have demonstrated exciting and amazing discoveries. Then we'll have a good justification for the next collider capable of still higher energies.

AMK – *It may come rather sooner than later…*

RDH – I can tell you my wishful thinking: I should like it comes before 2013 – because it is when my mandate at CERN ends – in order to determine the future of particle physics. It could be the ILC, it could be the CLIC – depending which energy we'll need at the new machine. Secondly, it will depend on how the technology is developing. Thirdly, perhaps most importantly, how much it would cost.

AMK – *The higher and higher beam energy will always be needed – but we'll never get with accelerators to the neutrino, GUT, and Planck scales.*

RDH – Of course not. But nonetheless, for any new project, one has to have a very good argumentation as to why a certain energy is better, sufficient, etc.

AMK – *There is another class of facilities particle physicists and astrophysicists want to expand: underground huge--mass detectors mostly for neutrino physics and astrophysics, and search for proton decay. People involved in this area in the USA, Canada, Japan, and Europe have big expectations. Currently, the LAGUNA Project makes feasibility studies for a pan-European underground laboratory with huge-mass detectors of three kinds. Do you consider it a complementary field?*

RDH – Definitely, it is complementary within the same field – it is particle physics, which looks into the microcosm and the Universe. It is necessary that one performs such experiments or observations but – clearly – it is also competition for funding. Therefore, one has to think carefully what one could do with one or two of such facilities in Europe. Can one do both neutrino physics and proton decay with a single large detector?

AMK – *Two days ago, at the Cracow Epiphany Conference, Dr. S. Parke from FermiLab talked about their plans for a muon collider and a neutrino factory that may be built at FermiLab.*

RDH – This is the field of particle physics the United States could take the lead. But don't forget Japan. They also have a very good program in neutrino physics.

AMK – *Yet there is an interest in such a program in CERN too.*

RDH – There is surely an interest. But, I reiterate, we have to carefully look at what we can do. With the LHC we have already a lot on our shoulders. CERN has to perform forefront science in a leading role. We have to carefully check out the CERN program to see how it can suite different tasks.

AMK – *If they find the proton decay – that would be the forefront science…*

RDH – Yes. But the question is who would be the first…

AMK – *Incidentally, in December 2009 there was an announcement from the Soudan mine facility in Minnesota that they had detected two events that might be attributed to the dark matter. Can one event be enough, if proved?*

RDH – Definitely, you need more than one event… You need a more general framework. Another group has to confirm it.

AMK – *Does CERN support other branches of physics and information technology?*

RDH – We at CERN can support only projects directly connected to our main program. However, we try to be more involved in some applications where we can help other facilities. One example is hadron cancer therapy. With our expertise we help developing hadron therapy centers.

AMK – *In your public lecture yesterday you brought up one generally unnoticed point: We have antimatter in the hospitals – positron emission tomography (PET).*

RDH – Yes. One has to realize that! That's antimatter, I simply spelled it out.

AMK – *You said at CERN people of 97 nationalities are registered.*

RDH – Science is a global language. Everybody can speak science. It should be open to everybody. Science, research and education are the bridge between nations.

AMK – *Good luck to you, Sir, with the LHC. It's been a privilege to me to talk to you.*

The interview held in Cracow, Poland, Jan. 8, 2010;
the text authorized by R.-D. Heuer at CERN, Jan. 12, 2010.