WHAT CAN BE DONE TO ENHANCE COLLABORATION ON ACCELERATOR R&D IN EUROPE?

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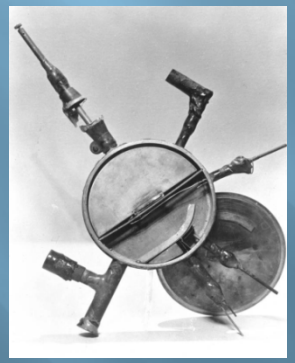
Question;

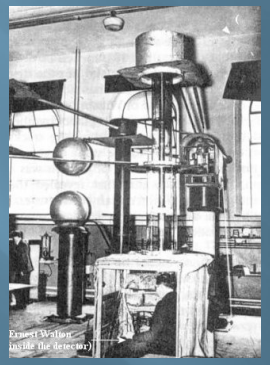
How can the development of new accelerators be further enhanced in Europe and in the world?

Nuclear and particle physics science has, since its inception in the early 20th century, been the principle driver behind the development of new accelerators.

The reason for this is plain to see; to resolve smaller and smaller structures in micro-cosmos, shorter and shorter waves are required - to create fundamental particles of even higher mass, even higher energies and higher luminosities are required.



Lawrence 1930



Cockroft-Walton 1932

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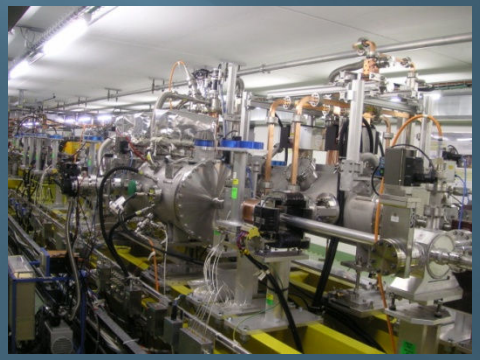


CLIC Test Facility

Plasma acceleration

As the accelerators grew larger, they would no longer fit into the university campuses and dedicated national, and later international, accelerator laboratories were created. These large laboratories employed accelerator physicists to develop further the accelerators as well as instrumentation physicists to develop particle detectors and computer specialists to develop the computers. The academic nuclear and particle physics research staff, on the other hand, became visitors, or "users", of the accelerators, detectors and computers.

CERN

Fermilab

Personally, I dislike to be called "a user" – it sound passive. And I find this splitting up of the High Energy Physics research activity on parallel lines unfortunate.

I therefore welcome the trend, that we have all seen, of involving the academic, i.e. university based, research teams not only in data analysis but also, since a few decades, in the development and building of new detectors, and since less than a decade, in the development of new accelerators.

The CTF3 Collaboration became maybe the first concrete example of this new trend. I remember helping in drafting the constitution of the CTF3 Collaboration at its creation in 2005 using the DELPHI and ATLAS Collaboration constitution as templates. And CARE/EUROTeV and EuCARD are of course other prominent examples, in this case of collaborations encompassing a broad range of accelerator development areas.

In EuCARD about half of the 37 member groups come from large laboratories and the other half from universities. One may ask if that is the right mix?. Many of the relevant large European accelerator laboratories are part of the collaboration and obviously that needs to be so in view of their large technical facilities and experience.

On the other hand the number of universities, out of all European universities that could be part of such a collaboration, is still quite small. It seems to me that there is quite a large intellectual, and also material, reserve at the European universities, which could be used to further enhance accelerator development in Europe.

Now, what would be required to have more universities committed to accelerator physics? I believe this is, at least partially, a question of academic culture.

Within the field of particle physics, development and use of theory and data analysis have come to represent "the physics", where as development and use of instrumentation, computers and accelerators have come to represent "the technology". And till now, if you wanted to make an academic career it was "the physics" that counted, not "the technology".

I find this narrow-minded view regrettable. I maintain that we should entertain a broad concept of what is Physical Science and encompass all its elements on an equal footing!

We already see the first signs of such a broadening of the academic culture happening through the participation of a significant, but still modest, number of European universities in front-line accelerator development.

I believe that the Universities start to realize that if they cannot take part in and contribute to all essential aspects of Big Science, they will not be able to maintain their classical role as centers of excellence in frontline science.

In order to stimulate this development further we need to establish accelerator physics as an academic discipline. One important step in that direction is to offer university students education in accelerator physics. We already have international schools in accelerator physics but we need to also introduce accelerator physics courses in the university curricula.

Maybe EuCARD could mediate contacts between accelerator physicists who volunteer to give lectures in accelerator physics at universities who have no staff active in the field?

CERN offers Research Fellowships in a recently created Graduate Engineering Training program
https://ert.cern.ch/browse_www/wd_pds?p_web_site_id=1&p_web_page_id=7731&p_no_apply=&p_show=N
and also, since some time already, Technical and Doctoral Student fellowships, which can be used for accelerator training work at CERN.

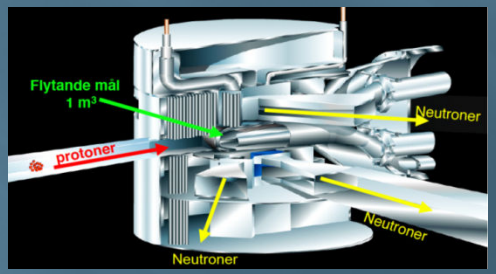
Maybe EuCARD could see fore that these opportunities be more widely announced at the European universities?

One way for a university to attain a critical mass in the collaboration with large national laboratories is to federate with other universities. An example of that is that the universities in Oslo, Uppsala and Helsinki have joined in a NorduCLIC Consortium for their work in CFT3. Another example is that 7 Nordic universities have formed a consortium that is represented by one partner in TIARA. Likewise 7 Polish universities have formed a consortium that is represented by one partner in TIARA.

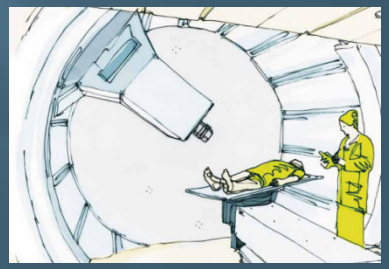
High Energy Physics needs, and therefore drives, the development of new accelerators. It should therefore be in the interest of the university HEP sub-departments to introduce accelerator physics in the curriculum. It should also be in their interest to contact colleagues in the sub-departments of microwave technology, surface physics, nano-technology etc. to take part in the development of new accelerators.

My general claim is that accelerator physics should profit from being better integrated as a natural part of the general academic culture. Accelerators science is indeed, as we all know, playing an important role in the development also of other sciences than high energy physics as well as in our society at large.

Diamond



European Spallation source



Proton Therapy

Let me end this presentation by pointing out one more rôle that accelerator science can play, which is less often thought of; that of "Science for Peace".

The SESAME Collaboration in the Middle East aims at constructing an 2.5 GeV synchrotron light source in the region. The SESAME member counties are Bahrain, Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, Palestine and Turkey. I believe SESAME is the only project in which all of these countries are working together in unison!

I would like to suggest that EuCARD see if there is any useful service that it could offer this unique project among the Middle East countries.

SESAME

Question:

How can the development of new accelerators be further enhanced in Europe and in the world?

One answer is;

There is significant potential in stimulating the European universities to augment their involvement in accelerator physics.