

Manuscript for contribution of Eckhard Elsen at

Pan African Conference on Crystallography - PCCr2 and The African Light Source - AfLS2

I am Eckhard Elsen, Director for Research and Computing at CERN, the European Centre for Particle Physics Research in Geneva. I send my greetings from snowy Switzerland and my apologies for not being able to be with you directly. The more am I grateful for the opportunity to speak at your distinguished conference, the second in a row.

I am thrilled by the idea of an African Light Source.

I am also thrilled by the developments of this week with the announcement of President Akufo Addo to make the African Lights Source an official project of the AU.

You will wonder why somebody from CERN is to speak at a conference for crystallography and light sources. I see that an elaborate programme has been set up with distinguished representatives from light sources and instrumentation speaking.

What do I have to add following, e.g. Francesco Sette's presentation?

Well, I would like to pass a message for human curiosity, learning and collaboration - a message for fostering science.

HUMAN QUEST FOR UNDERSTANDING BASIC PRINCIPLES

Let me start at the very beginning.

When a child is born the brain is essentially a void crying to be filled with content. A child quickly learns by example in imitating the environment; foremost examples offered by parents, relatives and the neighbourhood. Out of nothing the child learns to speak a language - any language - and customs and rules and absorbs all the knowledge modern society can offer when given a chance. Growing up the child learns to eat, to care for food, to choose a profession and hopefully find employment. To lead a life.

How will this life look? It certainly depends on the environment but also on the experience the young person had. Somebody who has never left his village, never used the internet, never talked to somebody foreign will probably continue to lead a life quite similar to that of his parents and grandparents. Yet, will look at the stars at night and wonder what is behind that spectacle of light. Somebody who has received a basic understanding of astronomy will start to perceive the patterns that repeat and distinguish planets from stars. Will recognise that one can use the stars to navigate the world.

In wishing to travel one understands one can walk and use the feet. You can run and travel farther. Then somebody shows you a bicycle and you realise you can travel even farther. Next is a car and the world opens up, then plane, then rocket. The main point is you have to be exposed to new ideas to actually make progress and take the next leap. You do this by listening to others, by picking up ideas, by trying and advancing.

Solutions proposed depend on what you experience and on what you are exposed to.

Africa is a continent with lots of young talents that need to be challenged, need to be exposed to the highest standards. To learn from others and likewise inspire peers. This is at the heart of human creativity and as I believe at the heart of human well-being overall.

THE VIRTUE OF INTERNATIONAL COLLABORATION AND TRAINING

This is the origin of scientific progress.

I would like to give you the example of CERN - a research institute for particle physics. At CERN we are striving to address the fundamental questions that relate to our existence and try to find a consistent description of the world from the origin of the universe to the expanses of the cosmos of today.

Why do we want to even know that? Because in pursuit of these questions we touch upon all possible new concepts that may arise and help us improve and advance current understanding. We are pushing the envelope of technology and reinventing physical concepts.

You could say CERN is foremost an institute for engineering the future.

There are 13000 users at CERN. The Large Hadron Collider collides protons at four interaction points. At any moment in time some 3000 PhD students are active at CERN; that is a 1000 theses a year using the collider data. Some 260 summer students from all over the world spend a couple of months at CERN each year. They work side by side with their fellow students from anywhere in the world. Teacher programmes are in place to teach the teachers.

Key is to recognise and define ambitious yet reasonable goals for science. To inspire.

African countries send their students to CERN as well. A very immediate outcome is the African School of Physics which is being held on the continent every two years.

UNIVERSAL LANGUAGE OF SCIENCE

Why does this work? Science is a universal language. It is the fastest and maybe most convincing way of overcoming boundaries, often artificial, that exist in our communication. Because scientific reasoning is clear and universal it also shapes the way we react in non-scientific communication.

Open Access to scientific information is paramount. The results of the research must be accessible everywhere. This is why CERN has launched with its partners a campaign, SCOAP3, that makes peer review articles accessible everywhere and free of charge. Today, 90% of the scientific publications in HEP are Open Access.

The Digital Libraries is an initiative of UNESCO in which CERN is contributing to training students with courses in Africa and Europe to access digital information efficiently.

SOME ADVICE ON THE PATH TO AN AFRICAN LIGHT SOURCE - FROM THE DISTANCE

This may sound a bit presumptuous from the distance. Let me nevertheless try to make the case for science:

- Build constituency of researchers; find people that have a common scientific goal that they can achieve and solve in their environment.
- Start slowly.
- Form groups that propose experiments that can be carried out at external centres - such as the remote light sources or beam lines. Topics are plentiful and unique: palaeontology, crystallography and medical investigations.
- Gather political support which is much easier once you have established scientific goals for your community. Once you have built a strong community there will be an urge to take this further.
- Take responsibility for a beam line. Go for development of an instrument; tailor a beam line according to your wishes. (SESAME may be an example of a light source that has become available fairly recently and would welcome new users to help this facility to flourish.)

With a group of people determined to carry out the specific research the case will be compelling to build a light source in Africa. It is appropriate since there are many topics of relevance particular for Africa that I mentioned before.

Most importantly it is necessary to give a facility to young Africans that appeals to them for their own research.

It will be one way of recognising the brightest of minds in Africa and keeping them to advance the continent as a whole.

There may be a lot to be learnt from existing facilities, CERN included. What will count in the end is to have a facility with the same bold goals that radiates and shines over the African continent.

I wish you all the best in this bold endeavour - and CERN will favourably look at the initiative and try to help. We share a common goal - to advance science.

Geneva, Feb 1, 2019