Science as an instrument for development

A culture of scientific learning needs to be fostered in Africa if we are to keep up with international developments, writes **Nithaya Chetty**

ONE hundred years ago, Albert Einstein had a miraculous year when he published three fundamental papers on three separate topics that, to this today, remain pillars of our scientific understanding of the world around us.

The United Nations declared 2005 the International Year of Physics to celebrate Einstein's momentous contributions. This was an opportune time to refocus our attention on the importance of science in society.

Poor performance and interest in science has become a universal problem. Even highly developed countries are battling to reinstill in their youth an interest in science. South Africa is not alone in this.

Science is rooted in clear, logical thinking. There is an appreciation of cause and effect. There are underlying principles that are universal – physical phenomena measured in Pietermaritzburg, Paris or Pluto are all governed by the same principles. This universal nature is one of the triumphs of science.

Scientists of all hues and creeds have contributed to this vast body of knowledge over the centuries.

Many of the principles by which science is governed are relevant to society at large. The quest for mutual respect, and an appreciation for people's abilities and contributions that are independent of their backgrounds, are ideals we must all strive for in this world. These attitudes are central to building democratic societies. In this way, science has an important role to play in the development of Africa.

Africa must participate in its technological development and not be entirely dependent on foreign input. Africa must utilise its natural resources optimally, and pay more attention to its environment and to safety. All of these factors impact on its economic well-being, which ultimately creates jobs and alleviates poverty.

Science is an intrinsic part of the culture of all of humanity. Human beings have been curious about the world they live in (and beyond) since time immemorial. It is precisely this curiosity that has led humans to harness energy, understand our environment and develop the technical applications that are the hallmarks of modernity. Africa cannot afford to continue to be marginalised in this domain.

Effort

It is clear that a proper environment and culture must be established in Africa for pursuing science more seriously. There is no endemic reason why Africa should fare poorly.

For those who care about our continent and its people, a more serious effort must be made to help create the conditions for which mathematics and science can thrive.

If we do not make significant inroads in the near future, then other endeavours will not be able to make the anticipated strides. It has been suggested, for example, that the 21st century belongs to the biological sciences. However, it is generally not appreciated that significant achievements in these disciplines will not be made without the involvement of mathematics and physics.

Researchers with strong mathematical, physical and computational skills, working in close collaboration with biologists, are absolutely essential if this vision is to be realised. Africa must continue to invest in the basic sciences if it is going to compete on equal terms with the rest of the world. We cannot apply science if we do not have the basic sciences to apply.

The growth potential of the computational sciences in Africa, for example, is enormous and yet to be fully realised. At present, our universities do not have a strong culture of hands-on computing. This lack of capacity is reflected in our society, where there is an over-reliance on expensive, commercial software to solve computational problems.

Africa must make more use of freeware software. In South Africa, Mark Shuttleworth, the first African in space, has very generously supported the use of Open Source. Several universities, including UKZN, have benefited from substantial donations from his foundation. Needless to say, computational physicists are at the very forefront when it comes to using these new facilities in an innovative way. The potential spin-offs are tremendous, with local government and businesses showing a keen interest in going the Open route.

The African Advanced Institute for Information and Communication Technology is being set up in Pretoria. This has the potential to boost African research in the computational sciences.

The Centre for High Performance Computing is being established in Cape Town. This will make resources available to scientists on a competitive basis for computational projects.

Southern Africa has invested significantly in the field of observational astronomy. The South African Large Telescope, the Hartebeeshoek Radio Observatory, the High Energy Stereoscopic System in Namibia, and the proposed Square Kilometre Array demand competent African graduates to maintain a high level of research productivity for the future. This is creating greater incentives for students to take physics.

The recently concluded international review of physics in South Africa (see www.saip.org.za) has given

much impetus to the discipline, not only in South Africa but also on the rest of the continent.

The proposed National Institute of Theoretical Physics has reached an advanced stage of planning and is due to be launched this year.

The South African government has required that the institute set the development of quality black graduates in mathematics and theoretical physics as a high priority. In addition, the government has ordered that the institute make an impact on the continent.

Discussions

Discussions are under way to establish a South African synchrotron light source (giant X-ray research beam) as well as a high-powered laser facility. Both of these will create more opportunities for African and international research collaborations.

The National Research Foundation has supported the creation of Centres of Excellence in various fields, including materials science.

These large-scale, so-called flagship projects have been funded because they are a mechanism to bootstrap scientific development in the country.

There are a number of pan-African initiatives that have come to fruition over recent times: The African Institute for Mathematical Sciences, The African Laser Centre and The African Materials Research Society.

More funding has been made available by the Southern African Development Community, the New Partnership for African Development and the African Union.

The physics community in South Africa is actively reaching out to physicists elsewhere in Africa, who often toil under extraordinarily isolated circumstances.

The declaration by SADC to increase to 1% of the GDP the amount of money set aside for research and development means that we need to substantially increase our number of graduate students.

The physics community has been championing the cause of scientific development as a vehicle for progress at all levels within society, including educational, commercial, industrial and governmental arenas. In this landscape physics is beginning to establish itself as an instrument for change, and government is beginning to listen.

As newly graduated matriculants contemplate their future, it is hoped that they will fully explore the breadth of new possibilities that are emerging in the scientific domain, where they can have a rewarding career as well as make meaningful contributions to the development of our country.

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