RHODES UNIVERSITY

Science graduation address: Thursday, 12th April 2012

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Chancellor, Vice-Chancellor, Fellow Honorary Graduands, Senior University Officials, Parents and Friends, Fellow Graduands.

It is my honour to address you this evening.

My father was an artist and my mother an inspiration, and, as a youth, I accompanied them on trips into deep rural parts of the Eastern Cape. My father would set up his easel and capture the traditional way of life of the Bhaca people on his canvas, and I, as a budding naturalist, would, of course, collect beetles, rocks, skulls and the occasional fossil. Most importantly, I would witness the way of life of Bhaca boys and girls.

In my second year of Science at Rhodes, we were allowed to choose an art subject, and I chose social anthropology. Although I regretted not having physics later in my career, and had to swat it up privately, social anthropology allowed me to develop an interest in the interface between science and society.

When my mentor, Professor Brian Allanson, then Head of Zoology at Rhodes, gave me the opportunity to conduct research at Lake Sibaya in Maputaland, a remote part of northern Zululand, I was able to develop this interest further. Lake Sibaya was my 'Cruise of the Beagle' as it helped me to incubate ideas on animal life-history strategies as well as interact with the local amaThonga people and further develop my interest in the multi-cultural roots of science and technology.

Many years later, when I developed the contents for an interactive museum on Islamic contributions to science, this interest was re-ignited. I learned about inspirational scientists, discoveries and inventions that were largely excluded from books published in English in the West, and realized that we are the poorer for it.

I learned about

- the three Banu Musa brothers, 10th century mathematicians and engineers in the first House of Wisdom in Baghdad, who made ingenious mechanical devices in order to teach children and adults about the fundamentals of engineering over 1000 years ago
- the remarkable engineer, al-Jazari, who invented some of the first robotic machines, including his famous 'Elephant Water Clock', and introduced the crank, slider arm, reciprocating piston and camshaft into complex machinery in the early 13th century in Turkey
- Al-Jahiz, the pioneering Iraqi zoologist who was already studying advanced concepts such as food webs, pollination, predator-prey relationships and parasitism in the 9th century
- The great polymath Ibn al-Haitham, who not only pioneered optics but also outlined the basics of the scientific method centuries before Bacon or Newton.

An indifference to the history of non-Western ideas is a kind of cultural barbarism of which we are sometimes guilty in the West. Modern science is not only a Western construct but the product of many cultures over several millennia. Young scientists would, I believe, be enriched if they learned more about the pioneers in their fields, both in the West and the East, as well as in the Islamic world in between.

Science lives in the domain of the mind, and progress in science is driven by individual curiosity and by the innately restless personality of scientists, ill at ease with the *status quo*. Immanuel Kant spoke of the 'restless endeavour' to reveal the truth. I think that we all agree on that.

The goal of science is to develop a better understanding of the natural world, not only by individual scientists, or by an educated elite, but by society as a whole. Based on this definition, research is an important early link in the chain, but not the only link. Science journalism, formal and informal science education and related fields are equally important links.

Education is not only about conveying information – as information is readily available to nearly everyone today – but about guiding thoughts and encouraging reflection. In fact, education is mostly about creating a context for motivation. It is about *why* we should learn, not only *what* we should learn.

Since leaving Rhodes I have been involved primarily in informal science education, in the interrelated worlds of the aquarium, museum and interactive science centre.

These are educational institutions that place themselves close to the heart beat of a fast-changing environmental and technological world. They are places where scientific and technological advances are understood in their appropriate contexts, and where the construction of meaning takes place.

They focus on promoting dialogue and debate while learning, and endeavour to promote social engagement across generations and cultures, as well as an ethos of lifelong learning.

Furthermore, they have a point of view about the value of science and the limitations of technology. This is a point of view that favours ideas that make sense, one that challenges us to rethink the ways in which we normally conduct ourselves, and encourages us to lead sustainable lives.

They back up their institutional views with meticulously researched exhibitions and programmes that are the products of their own insights and of their continued dialogue with the scientific sector. In the case of science centres, they reach more than 310 million people each year in more than 90 countries worldwide.

An important role that science centres and museums play is to help the public overcome their skepticism about science and technology. They recognize that this skepticism not only derives from a relative lack of knowledge about science but may also be a consequence of different ethical or religious beliefs or personal perspectives and experiences.

It is now widely accepted that the best antidote to this public skepticism is to genuinely engage with the public and take their different views into account. Museums and science centres are uniquely equipped to do this. I encourage you, no matter what career you follow, to allocate some time and energy to promoting public understanding of science.

This could be done through your institution or company, or through science centres and museums that are specifically designed for this purpose. This approach will enable us to jointly reduce the so-called ‘science deficit’ and allow everyone to benefit from the understanding that science provides.

The retention of a childlike curiosity in adults is vital for the incubation of new ideas and technological solutions. This is why an enlightened society should support the blue sky thinking

of scientists, but also why we should appreciate the value of informal educational institutions, such as museums and science centres, that stimulate that curiosity in the first place.

One lesson that I have learned in the science centre world is that it is wrong to 'dumb down' science. Likewise, in research, it is wrong to avoid questions whose answers are difficult to quantify. My experience has lead me to the conclusion that, at least in the public eye, we may be oversimplifying the important concept of animal diversity, which is traditionally regarded simply as the number of different species. It was recently announced, rather triumphantly, that an international study had revealed that there are about 7.77 million animal species on Earth, of which only about 953 000 have been described – but surely this is the crudest measure of this important concept?

Every animal with different life-history stages is more than one ecological species and should be counted several times. Biodiversity should also include the variation within species and especially the extent and nature of the interactions between species, even if it is difficult to measure. Biodiversity isn't a simple, hierarchical tree but a complex interlinked web. Perhaps our pattern–forming minds tend to underestimate the messy complexity, and subtlety, of Nature.

In fact, biodiversity should be everything that we lose when a species goes extinct, all its interconnectedness as well as the biological memory of the millennia of 'R&D' that took place to make it a species in the first place. Defined in this way, we are still a long way from describing the extent of animal diversity, and measuring our impact on it.

Developing a formula that predicts the true complexity of Nature would be the biological equivalent of the physicist's 'Theory of Everything'. I encourage you to confront big problems, like this one, that are relevant to society, and to recognize that you are most likely to solve them in multi-disciplinary teams.

I would like to conclude by saying that, internationally, South Africans are highly respected for their strong work ethic, can-do spirit and innovativeness. We have invented and discovered a disproportionate number of things that have changed the world.

Our inventions include the first controlled use of fire, earliest mathematical device, first abstract art work, some of the earliest stone, bone and metal tools, the device for drilling the tunnels for the London Underground, and, in the modern era, rooibos tea, the dolos, CATscanner, Computicket and MXIT. Wherever one travels, one encounters South Africans in positions of authority and respect. It is in our DNA to find solutions and make a difference.

You have the potential to be important agents of change in modern society – grasp this opportunity with both hands. Along the way, I urge you to acknowledge the multi-cultural roots of science, to pursue big ideas, to take delight in communicating your excitement in science to others, and, above all, to live a story worth telling.

Mike Bruton

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