

Repositioning the Chemical Sciences for African Development



by Berhanu M. Abegaz

The beginnings of chemistry may be traced to ancient Egyptians nearly 4000 years ago. Evidence for this comes from the so-called *Ebers papyrus* found near Luxor, the old capital of Egypt in the Middle Nile area. This 110-page document, dating to 1550 BC offers much information, referring to up to 700 preparations of various substances. A lot of scientific knowledge that was developed in Egypt, the Middle East, and North Africa formed the basis for the development that emerged in Western Europe during the Renaissance.

Despite these early beginnings, modern chemistry, as it relates to higher education and research, in Africa is no more than 100 years old. For example, the South African Chemical Institute is celebrating its centennial this year. In Africa, much of the teaching of chemistry in the first half of the 20th century followed Western standards, with little done to adapt or modify it for relevance to African situations. What little serious research was conducted in Africa was aimed at attaining the quality of research conducted at parent institutions in Europe, Russia, and the USA. Not surprisingly, the pioneers who started this teaching and research in chemistry introduced what they knew best.

The chemical industry and applications of chemistry, which were created and developed in the West, provided so many useful products that to the rest of the world seemed to be just short of miracles. After all, it was the contributions of chemistry that allowed the USA to produce, for the first time, surplus agriculture in the 1950s and 1960s through the use of fertilizers, pesticides, and insecticides. Chemistry gave rise as well to drugs like antibiotics and other medicines and much, much more. Based on these experiences with chemistry, it was believed that economic development in Africa could be created through technology transfer or development assistance from the West. We know this didn't work; it's now clear that technology transfer alone is a faulty approach for bringing about lasting development anywhere, including Africa.

Whether it is in Africa or elsewhere, chemistry needs to redefine and reposition itself. I am not at all sure that we chemists have gone far enough to correct the love-hate relationship with chemistry that exists throughout much of the world. On the one hand, people tend to appreciate the contributions of chemistry, while on the other hate chemicals and the risks associated with them (and not without good reason).



Young Ambassadors for Chemistry in Grahamstown, South Africa, in March 2007 (see July 2007 CI, p. 21).

The International Year of Chemistry 2011, with its slogan "Chemistry—our life, our future," gave a huge boost to the image of chemistry among the general public. Chemistry must be relevant and understood by society. Some 25 years ago, an article entitled "The Chemist and His Mother" appeared in *Solutions* (the newsletter of the Chemical Society of Ethiopia), which was written by chemistry school teacher Yohannes Balcha. The article was a conversation between a chemistry student and his mother. The mother, sensing her son's stress as he prepared for exams, decided she should find out what chemistry was all about, thinking she might be able to alleviate some of his stress. The son tried very hard to explain what chemistry was all about, that it deals with understanding the composition and properties of matter . . . , but the mother, who listened with much patience and

eagerness, did not understand what her beloved son was talking about. In her unwavering determination to gain more insight, she decided to find out what this “chemistry of his” would eventually qualify him to be. So, she asks “Will the study of chemistry make you a builder?” “No!” he says to her, those who build roads study civil engineering and are called engineers. “Are you going to be a doctor?” “No! To be a doctor one studies medicine,” he replies. The conversation continues in this way, with the son eloquently explaining what chemistry is not, but not succeeding in describing what it is, with the now distressed mother becoming increasingly frustrated. I think the conclusions from this little story are that we need to better explain what chemistry is all about to society.

In 1969, a major conference was held in Kwame Nkrumah’s capital, Accra, spearheaded by the Association of African Universities and under the auspices of the Organization of African Unity. The purpose was to establish the African University instead of simply a University in Africa. This debate and intellectual discourse led to recommendations to establish the African University, which was unfortunately derailed by the political and economic problems that Africa faced in the subsequent two decades. But the spirit and essence of that debate is as relevant today as it was 40 years ago. Nevertheless, the succeeding decades witnessed the expansion of higher education.

In the mid-1960s, Africa probably had fewer than 70 universities, now it has close to 700. This massive expansion of higher education resulted in the dilution of the quality of education. Universities focused more on teaching and less on research. Very little effort went into establishing endogenous world-class institutions that would generate new knowledge and undertake serious research to find solutions to the problems of African communities. For many African chemistry departments and research institutions, success is often measured against sets of external standards, such as how they compare to elite institutions outside

the continent. As a result, they try to mimic European and North American institutions. This has led to two negative consequences: a lack of relevance and a failure to be innovative. As a result, with very few exceptions, chemistry research in Africa may have made small contributions to global science, but it has not delivered many products for use by the poor people on the ground.

In this regard, the rather slow-to-take-off initiative of the African Union—The Pan-African University—is an important step toward establishing a teaching and research institution more focused on African needs. The university is to be hosted by various countries in the five regions of the continent. Each institution will have a distinct focus area:

- basic sciences, technology, and innovation—Jomo Kenyatta University of Agriculture and Technology in Kenya
- earth sciences—Ibadan
- political science and governance—Yaounde
- water sciences—Algeria
- space sciences—Southern Africa

Pan-African bodies like the African Academy of Sciences and the Association of African Universities are expected to be intimately involved with these initiatives. The African Academy of Sciences participated in the curriculum development of the Pan-African University and argued for the inclusion of the Millennium Development Goals in the discussions. Signed by African heads of state in 2000, the target year for achieving these goals is 2015. Although many countries may be on course to achieve them, it is quite

Benefits of Water Harvesting and Conservation
by Joy Mwende Kioko, 15, Machakos Girls High School, Kenya, part of Our Children on Water International Art Exhibition. Organized by the Royal Society of Chemistry in celebration of the International Year of Chemistry, the exhibition featured works from European and African schoolchildren who were asked to express their feelings about water.

www.chemistry2011.org/participate/featured-ideas/our-children-on-water





clear that many poor countries in Africa are unlikely to meet the goals. Therefore, they will remain as the key drivers for sustainable development for some years to come.

Of the eight Millennium Development Goals, six are clearly science driven and would involve chemistry. Scientists have a responsibility to respond appropriately to a world under stress from the effects of climate change. It is important to note that Africa is most vulnerable to these effects, although it may not have contributed as much as other regions to the causes of climate change. Scientists should adopt a broader science platform and engage in a more effective integration and collaboration with other disciplines and knowledge systems.

African scientists should highlight indigenous knowledge systems and strive for effective modernizations and inclusive innovations. There is a need for a new vision of science for sustainable development, which will demand a complete re-engineering of science education and research in Africa. Instead of teaching in fragmented disciplines, sustainable science would be unified and transdisciplinary. Sustainable science would include the epistemology of systems thinking and would encourage inclusive and responsible innovation.

This new thinking and re-engineering has been a subject of much intellectual discourse in recent times. Many pan-African institutions (such as the African Academy of Sciences, Network of African Science Academies, African Technology Policy Studies Network, and the Pan African Chemistry Network) have been engaging in such debates. These discussions were stimulated during the Mandela era and the subsequent integration of South Africa into the African Union. The emergence of progressive African leaders at the turn of the 20th century (e.g., Thabo Mbeki of South Africa who proposed the Millennium Africa Recovery Plan, Abdoulaye Wade who came up with the Omega plan) paved the way for articulating a new vision for African development, popularly referred to as the New Partnership

for African Development (NEPAD). This partnership resulted in the Consolidated Plan of Action, which includes several Flagship Programs, which are being implemented on regional and subregional levels.

Flagship Programs include such transdisciplinary fields as: biodiversity, biotechnology and indigenous knowledge; energy, water, and desertification; material sciences, manufacturing, laser, and post-harvest technologies; mathematical sciences; and information, communication, and space science technologies. African leaders have endorsed these programs and have established an African Ministerial Committee for Science and Technology, which meets regularly to monitor their progress. NEPAD has now been incorporated into the African Union under the name NEPAD Planning and Coordinating Agency.

Finally, a key issue for Africa's future is the need to encourage young people to become involved in science. Africa's population is now 1 billion, approximately 14 percent of the global population. Of importance, 71 percent of this population is below 25 years of age. This is both a challenge and an opportunity. A challenge for Africa's strategic planning is how to unleash the power of the youth to bring about the continent's development. The African Academy of Sciences has identified engaging the younger generation as a key strategic vision over the next decade. In this regard, it is important that they have role

models in the scientific community for them to believe that they can help turn things around in Africa. 🌍

This commentary is based on the author's presentation at the World Chemistry Leadership Meeting held 2 August 2011 in San Juan during the IUPAC General Assembly (see Mar-Apr 2012 *CI*, p. 12).

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Young Ambassadors for Chemistry in Kasulu, Tanzania, in April 2012, moving tables to stage the public event held in the nearby football stadium—see feature p. 7.