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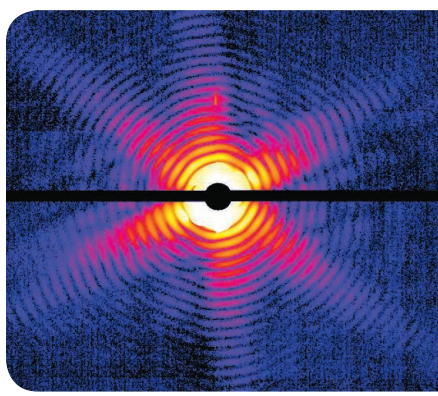
Crystallography and Geopolitics

DEVELOPED AND DEVELOPING NATIONS RECOGNIZE THAT INNOVATION IS KEY TO THEIR ECONOMIES. Connecting this with the discipline of crystallography may not seem immediately apparent, but during the past century, understanding the structure of matter has transformed industries and created new frontiers, from the design of new medicines and materials to assessing the mineral content of Mars. The future global economy will be determined by progress in cutting-edge fields. However, the playing field is not level in crystallography, which is why the International Union of Crystallography (IUCr) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) have marked 2014 as the International Year of Crystallography. The aim is to improve public awareness of the field, boost access to instrumentation and high-level research, nurture "home-grown" crystallographers in developing nations, and increase international collaborations for the benefit of future generations.

The development of scientifically influential ideas is most prominent in wealthy countries. Those nations should continue to invest in science to remain economically advanced. They should not try to live off their existing scientific capital and hope to compensate for future shortfalls through business, management, and outsourcing to ostensibly "cheaper" countries. A developing country, on the other hand, needs to invest in science to define its own technologies and find a voice in international forums. But any country, wealthy or not, that lacks a healthy native scientific enterprise cannot make up the deficit by importing science from more scientifically advanced nations. Such attempts can never lead to a stable scientific culture or society. Embracing the relevance of science in one's life and growing science locally are the true measure of a country's scientific success, not the number of Nobel Prizes that have been given to people who were born, lived, or worked in that country.



The newly advancing economies of Brazil, Russia, India, China, and South Africa (the so-called BRICS nations) are investing heavily in science and technology. As a result, crystallography's future may well lie in these parts of the world, which have people power and increasing economic muscle. By 2030, China, India, and the African continent will have 1.5 billion people each, most of whom will be educated. All of the Western world will by then have just 1 billion people. This means that "Chindiafrica," with its 4.5 billion people, could exert a substantial geopolitical and scientific influence in the world, with the focal point being the Indian Ocean rather than the northern Atlantic.

The International Year of Crystallography has placed a special focus on Africa, Latin America, and Asia. The efforts include a plan for "open laboratories" that, in partnership with industry, will enable students in far-flung lands to have hands-on training in modern techniques and expose them to cutting-edge research in the field. Open labs in Uruguay, Ivory Coast, and Algeria are already on the anvil. The IUCr also is running a training program in crystallography, in which students from sub-Saharan Africa can obtain a Ph.D. in the field in more advanced locales, such as the Universities of the Witwatersrand and Cape Town in South Africa.

More-powerful synchrotrons and free-electron laser facilities will be needed to determine increasingly complex structures. IUCr and UNESCO hope that setting up such facilities will assist in expanding and strengthening crystallography beyond 2014. A good example of this is in Jordan, where governments are working together to construct the Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME). Brazil has impressive synchrotron facilities where collaboration among scientists from other Latin American countries is encouraged. More forums to guide research priorities, multinational partnerships, and funding arrangements are needed. What is most important is for scientists to interact seamlessly with the enormous amounts of data that will be generated in crystallography so that anyone, anywhere, can get any kind of structural information and use it profitably. Crystallography is a facilitating discipline, and this is why it will always endure.

– Gautam R. Desiraju

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