
Introduction

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Biographical notes: Calestous Juma is a Professor of the Practice of International Development and the Director of the Science, Technology and Globalization Project at Harvard University's Kennedy School of Government. He is a Foreign Associate of the US National Academy of Sciences; and a Fellow of the Academy of Sciences for the Developing World (TWAS) and the World Academy of Arts and Sciences. He co-chairs the High-Level African Panel on Modern Biotechnology of the African Union (AU) and the New Partnership for Africa's Development (NEPAD) and coordinated the Task Force on Science, Technology and Innovation of the UN Millennium Project.

The life sciences are exerting an impact of Copernican proportions on the global community. The mechanistic worldview that has for centuries dominated the conduct of human affairs is being replaced by a new outlook governed by interactions between advances in biology and society. This issue of the *International Journal of Biotechnology* serves as a keyhole that allows us to observe the unfolding of the 'biosociety'. These papers from the Canadian Program on Genomics and Global Health (CPGGH) of the University of Toronto are an incredible mapping of the contours of this new terrain and will offer new guideposts for those wishing to provide more detail of this emerging field.

The global scenario is far from perfect. Life expectancies continue to rise in industrialised countries and fall in a number of developing countries. Although a wide variety of factors underlie these differences in life expectancies – including issues in governance and financing – science, technology and innovation play a key role. To understand and harness this role, innovative policy research will need to be developed, discussed and disseminated to those who are responsible for making the necessary changes to ensure the divides of the world today do not widen.

The CPGGH is perhaps the leading policy research group in the world focused on harnessing the advances in life sciences for global health equity. They have worked with me and the Task Force on Science, Technology and Innovation of the UN Millennium Project as the Genomics and Nanotechnology Working Group. This group was instrumental in providing valuable knowledge towards our recent report entitled *Innovation: Applying Knowledge in Development*, which culminated from their previous research of identifying the top biotechnologies and nanotechnologies for improving health in the developing world and the role of developing countries in doing so.

In January 2003, the Bill and Melinda Gates Foundation and the US National Institutes of Health announced 14 'Grand Challenges for Global Health' that, if solved, would lead to important advances in diseases that disproportionately affect the poorest 2 billion people in the world. The CPGGH assisted in identifying the 14 Grand Challenges' through a selection panel (scientific board) of 20 scientists and public health experts from 13 countries, including several from the developing world. This led to the development of 43 research projects totalling US \$437 million to address the 14 identified Grand Challenges.

The scope of their impact also includes the Canadian Federal Government, where the CPGGH are helping to shape the bold commitment of the former Prime Minister Paul Martin to devote not less than 5% of Canada's research and development spending on health, environmental and learning technologies for the developing world.

In this issue, they offer nine papers from their leading edge work. Firstly, to address the health needs of developing countries, it is necessary to build and strengthen knowledge societies using transformative steps and concrete mechanisms. *Enabling knowledge societies in developing countries: the example of genomics* aims to inform policy makers of how to enable knowledge societies to improve health for developing countries while becoming more sustainable.

Health biotechnology publishing takes-off in developing countries studies the pattern of health biotechnology publications in some of the leading developing countries in this field. The main findings are: there is a significant growth in health biotechnology publications in developing countries. Their growth in this field was larger than the growth in industrialised countries but the visibility of their research was limited. Contrary to other work on health research in developing countries, the study suggested that developing countries' research was focused on local health needs.

Biotechnology patenting takes-off in developing countries studies patterns of health biotechnology patenting in some of the leading developing countries in this field. The main findings are: developing countries have increased their biotechnology patenting during the period with the leading countries, demonstrating inventive strengths in this field. It remains to be seen if the increased patenting will foster biotechnology innovation.

In *Regenerative medicine: new opportunities for developing countries*, the authors emphasise the need for developing countries to develop innovative solutions to the growing epidemic of non-communicable diseases they face. The authors highlight a potential role for the emerging field of regenerative medicine to help address these health needs and present a survey of regenerative medicine activities currently underway in developing countries. They assert an understanding of how certain developing countries are harnessing regenerative medicine that can assist other countries, which wish to become active in the field.

Mobilisation of sound scientific knowledge is a critical component in addressing pressing world issues such as poverty, disease, the effects of globalisation and economic transformation and highlights the importance of developing partnerships between the world's scientific communities to help bring the benefits of science and technology to the entire global community. In the paper titled *Scientific diasporas as an option for brain drain: re-circulating knowledge for development*, the role of scientific diasporas as significant partners in international development is reviewed. The authors emphasise that since developed countries receive skilled émigrés, and hence benefit from this skilled

labour force, they should share in the responsibility to foster international partnerships between developing countries and their skilled diasporas.

Developing countries can exploit the expertise, resources and relationships of its domestic private sector to translate innovative research and development into accessible and affordable health products prioritised to their own specific health and development needs. *The role of the domestic private sector in developing countries for addressing local health needs* introduces a study that will analyse how the domestic health biotechnology sectors of four developing countries – India, China, Brazil and South Africa – address local and global health needs and will present preliminary results from their analysis of health biotechnology firms in India.

Corporate Social Responsibility (CSR) mechanisms of bioscience companies aimed at the developing world was examined through a multiyear study that interviewed over 100 managers and executives to uncover what ethical issues they face and what mechanisms they are using to address these issues. *Corporate social responsibility strategies aimed at the developing world: perspectives from bioscience companies in the industrialised world* reports on six CSR mechanisms that companies within this study address regarding global health problems in the developing world. These mechanisms are described in detail and the analysis in this paper offer ideas and models from which other companies can learn.

Increasing human security through biotechnology examines the bright and dark side of emerging technologies, through the lens of human security. This paper discusses the threats and opportunities to attain human security in various domains such as disease, hunger, environment, poverty and bioterrorism and explores the implications for actions such as the use of networks of leaders from developing and industrialised countries and/or a more effective use of existing instruments of the UN. The key question this paper addresses is whether or not we can come together as a global community to harness significant technological developments and minimise their risks, for the betterment of all.

Finally, *Realising the promise of genomics: exploring governance* outlines the need for governance mechanisms that maintain a balance between the global public goods characteristics of genomics knowledge and the private goods nature of its application. This paper argues that the tremendous potential of genomics to contribute to significant healthcare innovations in the developing world will not be realised without attention to governance. Governments, industries and citizens will encounter numerous ethical issues in achieving a balance between risk management and the promotion of the benefits of genomics.

This special issue provides a snapshot of the innovative and leading edge research currently performed by the CPGGH. I am proud to feature the work of this group in the *International Journal of Biotechnology*.