OMICS A Journal of Integrative Biology
Volume 18, Number 7, 2014

DOI: 10.1089/omi.2014.0079

Translating Biotechnology to Knowledge-Based Innovation, Peace, and Development? Deploy a Science Peace Corps—An Open Letter to World Leaders

Nezih Hekim,[1,2] Yavuz Coşkun,[3] Ahmet Sınav,[4] Alaa H. Abou-Zeid,[5] Mehmet Ağırbaşlı,[6] Simisola O. Akintola,[7] Şükrü Aynacıoğlu,[8] Mustafa Bayram,[9,10] Nicola Luigi Bragazzi,[11] Collet Dandara,[12] Türkay Dereli,[9,13] Edward S. Dove,[14] Levent Elbeyli,[15] Laszlo Endrenyi,[16] Kamile Erciyas,[17] Jack Faris,[18] Lynnette R. Ferguson,[19,20] Fahrettin Göğüş,[10] Kıvanç Güngör,[21] Mervi Gürsoy,[22] Ulvi K. Gürsoy,[22], M. Asım Karaömerlioğlu,[23] Ilona Kickbusch,[24] Türker Kılıç,[25] Metin Kılınç,[26] Tanıl Kocagöz,[27] Biaoyang Lin,[28,29] Adrián LLerena,[30,31] Vangelis G. Manolopoulos,[32] Bipin Nair,[33] Bülent Özkan,[34] Tikki Pang,[35] Semra Şardaş,[36] Sanjeeva Srivastava,[37] Cengiz Toraman,[38] Kemal Üstün,[17] Louise Warnich,[39] Ambroise Wonkam,[12] Mustafa Cengiz Yakıcıer,[40] Ümit Yaşar,[41] and Vural Özdemir[3,33,38,42]

Abstract

Scholarship knows no geographical boundaries. This science diplomacy and biotechnology journalism article introduces an original concept and policy petition to innovate the global translational science, a Science Peace Corps. Service at the new Corps could entail volunteer work for a minimum of 6 weeks, and up to a maximum of 2 years, for translational research in any region of the world to build capacity manifestly for development and peace, instead of the narrow bench-to-bedside model of life science translation. Topics for translational research

[1]Office of the Dean, Faculty of Medicine; [4]Office of the President, SANKO University, Gaziantep, Turkey.
[2]Inovita Knowledge Platform for Open Innovation; [23]The Atatürk Institute for Modern Turkish History, Boğaziçi University, Istanbul, Turkey.
[3]Office of the President; [8]The Glaucomics and Personalized Medicine Research Program, Department of Medical Pharmacology, Faculty of Medicine; Faculty of [38]Communications and of [15]Medicine, Office of the Dean; [9]The Technology Transfer Office (TARGET-TTO), Departments of [10]Food Engineering and [13]Industrial Engineering, Faculty of Engineering; [17]Department of Periodontology, Faculty of Dentistry, Gaziantep University, Gaziantep, Turkey.
[5]Public Health Department, Faculty of Medicine, Cairo University, Cairo, Egypt.
[6]Department of Cardiology, Faculty of Medicine; [36]Faculty of Pharmacy, Marmara University, Istanbul, Turkey.
[7]Department of Private and Business Law, University of Ibadan, Ibadan, Nigeria.
[11]School of Public Health, Department of Health Sciences (DISSAL), University of Genoa, Genoa, Italy.
[12]Division of Human Genetics, Faculty of Health Sciences, University of Cape Town, Observatory, Cape Town, South Africa.
[14]Independent Scholar in Socio-legal Studies, Montreal, Quebec, Canada.
[16]Department of Pharmacology, Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada.
[18]The Fearey Group, Seattle, Washington.
[19]Discipline of Nutrition, The University of Auckland, Auckland, New Zealand.
[20]Nutrigenomics New Zealand, New Zealand.
[21]Department of Ophthalmology, the Glaucomics and Personalized Medicine Research Program, Faculty of Medicine; [26]Office of the Physician-in-Chief, University Hospital, Gaziantep University, Gaziantep, Turkey.
[22]Department of Periodontology, Institute of Dentistry, University of Turku, Turku, Finland.
[24]Global Health Programme, Graduate Institute of International and Development Studies, Geneva, Switzerland.
[25]Faculty of Medicine, Office of the Dean, Bahçeşehir University, Istanbul, Turkey.
[27]Department of Medical Microbiology, School of Medicine, and [40]Department of Genetics, Acıbadem University, Istanbul, Turkey.
[28]Swedish Medical Center, University of Washington, Seattle, Washington.
[29]Systems Biology Division, Zhejiang-California International Nanosystems Institute (ZCNI) of Zhejiang University, Hangzhou, China.
[30]CICAB Clinical Research Center, Extremadura University Hospital and Medical School, [31]RIBEF Ibero-Latinoamerican Network of Pharmacogenetics and Pharmacogenomics, Badajoz, Spain.
[32]Laboratory of Pharmacology, Medical School, Democritus University of Thrace, Alexandroupolis, Greece.
[33]Office of the Dean, School of Biotechnology, Amritapuri Campus, Amrita University, Kerala, India.
[34]Silkroad Development Agency, Gaziantep, Gaziantep, Turkey.
[35]Lee Kuan Yew School of Public Policy, National University of Singapore, Singapore.
[37]Proteomics Laboratory, Indian Institute of Technology Bombay, Powai, Mumbai, India.
[39]Office of the Dean, Faculty of Sciences, Stellenbosch University, South Africa.
[41]Department of Pharmacology, Faculty of Medicine, Hacettepe University, Ankara, Turkey.
[42]Data-Enabled Life Sciences Alliance (DELSA Global), Open Innovation Platform, Seattle, Washington.

are envisioned to include all fields of life sciences and medicine, as long as they are linked to potential or concrete endpoints in development, foreign policy, conflict management, post-crisis capacity building, and/or peace scholarship domains. As a new instrument in the global science and technology governance toolbox, a Science Peace Corps could work effectively, for example, towards elucidating the emerging concept of ''one health''—encompassing human, environmental, plant, microbial, ecosystem, and planet health—thus serving as an innovative crosscutting pillar of 21st century integrative biology. An interdisciplinary program of this caliber for development would link 21st century life sciences to foreign policy and peace, in ways that can benefit many nations despite their ideological differences. We note that a Science Peace Corps is timely. The Intergovernmental Panel on Climate Change (IPCC) of the United Nations released the Fifth Assessment Report on March 31, 2014. Worrisomely, the report underscores that no person or nation will remain untouched by the climate change, highlighting the shared pressing life sciences challenges for global society. To this end, we recall that President John F. Kennedy advocated for volunteer work that has enduring, transgenerational, and global impacts. This culminated in establishment of the Peace Corps in 1961. Earlier, President Abraham Lincoln aptly observed, ''*nearly all men can stand adversity, but if you want to test a man's character, give him power.*'' We therefore petition President Barack Obama, other world leaders, and international development agencies in positions of power around the globe, to consider deploying a Science Peace Corps to cultivate the essential (and presently missing) ties among life sciences, foreign policy, development, and peace agendas. A Science Peace Corps requires support by a credible and independent intergovernmental organization or development agency for funding, and arbitration in the course of volunteer work when the global versus local (glocal) value-based priorities and human rights intersect in synergy or conflict. In all, Science Peace Corps is an invitation to a new pathway for competence in 21st century science that is locally productive and globally competitive. It can open up scientific institutions to broader considerations and broader inputs, and thus cultivate vital translational science in a world sorely in need of solidarity and sustainable responses to the challenges of 21st century science and society.

> ''*Let me say in conclusion, this University is not maintained by its alumni, or by the state, merely to help its graduates have an economic advantage in the life struggle. There is certainly a greater purpose, and I'm sure you recognize it. Therefore, I do not apologize for asking for your support in this campaign.*''
>
> **President John F. Kennedy**
> **On the occasion of the Peace Corps Campaign,**
> **On the steps of the University of Michigan Union**

Translating Science to Innovation in Africa—But to What Ends?

Knowledge-based innovations do not come to being in a vacuum. Africa is no exception, but it is in need of a better innovation climate. A scientometric and bibliometric analysis of the Web of Science (WoS) database has found that the contribution of Africa to the world's global scientific output has shown little change over the past 30 years (1980 to 2009), remaining at a mere 1% (Science Metrix, 2010). Africa has recently become, however, an epicenter of omics research investments: the Human Heredity and Health in Africa (H3Africa) Initiative, enabled by international partners such as the Wellcome Trust in the UK and the National Institutes of Health (NIH) in the US, aims to bridge the research, expertise, and infrastructural gaps that Africa currently faces in omics science and technology (Adoga et al., 2014; Rotimi and Jorde, 2010).

Africa is the cradle of mankind and thus is central to a deep understanding of the pathophysiology, prevention, and treatment of human diseases, not to mention ecosystem health. Chief among the elements of an optimal innovation climate in Africa would be a ''mixer'' function to move from data to knowledge to innovation (and vice versa) along a nonlinear trajectory to bring about a positive change locally. ''Mixer'' governance instruments can materialize in the form of innovation observatories across the continent. Innovation observatories accelerate responsible and robust innovation attuned to local societal norms while preventing the risk of replicating, within the African continent, the current vast global disparities in health outcomes, as well as in research and innovation capacity.

Understanding the complex processes of translating science to innovation has been of interest from antiquity to modern day 21st century integrative biology (Büttner, 2014; Dove and Özdemir, 2014a). For example, the unequal-armed balance, one of the most widespread and frequently used mechanical precision instruments in antiquity and late antiquity, served as midwife for the birth of the science of mechanics in the 4th century BC, and later contributed to various forms of innovation in daily life in late antiquity (Büttner, 2014). Scholars have long understood that the process of innovation cannot be separated from the ends to which it is intended to serve. These ends are often articulated under the bench-to-bedside model of translational research dominant since the second half of the 20th century. But there are signs that this classic (yet narrow) biomedical model is no longer sufficient to fully realize the promises of 21st century science. For example, the world is increasingly in need of adequate responses to ecosystem challenges and societal conflicts. The American Association for the Advancement of Science (AAAS), a global nonprofit organization founded in

1848 and dedicated to advancing science around the world, posed a salient question in its 2012 Annual Meeting. In reference to *broader* outcomes for science, and with the participation from more than 50 nations, it asked:

> *Why is it that so many around the world remain unconcerned about global challenges such as climate change, water scarcity and polluted oceans?*
>
> (Federoff, 2012).

Similarly, on March 31st, 2014, the Fifth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (IPCC) alarmingly noted that no person or nation will remain untouched by climate change (IPCC, 2014). Together, these two statements suggest that actionable and timely responses can only be designed by rethinking translational science to include outcomes that were hitherto overlooked. This requires, in part, bridging the epistemological gaps among life sciences, social sciences, development, and foreign policy so that translational science can impact tangibly how we live on a day-to-day basis as a global society, and respond to emerging socio-technical challenges such as climate change.

OMICS 2.0: A Broader Mandate for Translational Science

Having served as an independent, progressive, peer-reviewed knowledge platform for over a decade, *OMICS: A Journal of Integrative Biology* endorsed in January 2013 a new editorial vision entitled ''OMICS 2.0'' (Özdemir, 2013).

This editorial mandate supports a translation-oriented broader focus, as seen through a crucial postgenomics technology and political science lens, and strives for ''triple triangulation,'' reporting on the *biological*, *social,* and *political* determinants of postgenomics medicine and integrative biology from around the world. Scholars have rightly noted that omission of any one of these three pillars of the life sciences inquiry adds uncertainties to the enormous promise offered by science and biotechnology in the 21st century (De Vries, 2004; Dove and Özdemir, 2013a, 2013b; European Commission, 2007; Kickbusch, 2005; Özdemir et al., 2014; Rajan, 2013; Terry, 2013; Thoreau and Delvenne, 2012; Wynne, 2009).

As we move towards omics applications in the clinic and society across the globe, the time is right for a fresh and substantively broader perspective (OMICS 2.0) on translational research. First, the framing of scientific translation beyond the traditional bench-to-bedside model is gaining increasing traction with global issues such as climate change, and bodes well with recent advances on the technical front. The human genome can now be sequenced in about 24 hours for less than $5000 (Collins and Hamburg, 2013). This opens up broad and exciting vistas for novel diagnostics and therapeutics for human diseases, not to mention the possibility to realize the full potential of new postgenomic fields such as pharmacogenomics, vaccinomics, nutrigenomics, agrigenomics, and ecogenomics. Emerging results suggest that integrative biology research can improve health outcomes through preventive medicine and novel diagnostics in Africa (Wonkam et al., 2014).

Second, a broadly framed translational agenda dovetails with the ethos of the ''*World Conference on Science for the Twenty-First Century: a New Commitment,*'' held by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and the International Council for Science (ICSU) in 1999 in Budapest, Hungary (http://www.unesco.org/science/wcs/index.htm). That conference addressed nearly all stakeholders with a vested interest in science. With participation of over 1800 delegates from 155 countries and 80 Ministers of Science and Technology, the World Conference on Science thus endorsed, at the turn of the century, the value of *science for societal development*, something frequently overlooked by the scientific community in the rush to quickly adopt the narrow bench-to-bedside model of translational research. Moreover, health sciences are often under-represented in efforts to translate science to development, and far fewer development professionals have a strong background in health.

Third, in addition to a broader approach, it is time to rethink the efficiency and success of translational research thus far in regards to disruptive innovation and relevancy for end-user communities. Indeed, a scoping analysis of 344 studies in health and allied sciences addressing patients', clinicians', and researchers' priorities for research found that only nine considered the extent to which questions posed by researchers match questions of relevance to patients and clinicians (Oliver and Gray, 2006; Chalmers and Glasziou, 2009).

If we are to achieve efficient, relevant, and ethical scientific outcomes, we need new governance instruments to steer global science towards a broadly conceived and inclusive agenda for translation.

Steering Innovations: Push and Pull Strategies

The life sciences community has long framed translation of discovery science as though new findings can be brought to practice primarily by ''push factors'' such as evidence-based medicine, education of users, and accelerating ''one-way diffusion'' from lab to society. But knowledge end users and other experience-based experts such as patients, clinicians, and nurses represent the neglected ''pull factors'' for translating scientific discoveries to knowledge-based innovation. The latter type of innovation actors has valuable insights that contribute not only to adoption but also to design of scientific experiments (Özdemir et al., 2014). In our January issue, we shared with our readership the inspiring story of Kelvin Doe, aged 16 and native of Sierra Leone, who is the youngest ever ''visiting practitioner'' with the Massachusetts Institute of Technology (MIT) International Development Initiative (Özdemir et al., 2014). Equipped with a deep understanding of the local resource-limited context and of basic human needs in that situation, Kelvin built homemade batteries and a youth radio station from scrap material such as metal, soda, and acid collected from local garbage. Had it not been for his keen understanding of the local context where his innovations would be applied, as well as the veritable need for electricity and extended public space for youth in Sierra Leone, Kelvin's inventions and radio station might have taken an entirely different trajectory, or might not have materialized at all.

Science Peace Corps

A new "pull factor" for knowledge-based innovation

Community service is well known everywhere in the world. In the U.S., for example, Benjamin Franklin helped form the first volunteer fire department in Philadelphia in 1736. More than two centuries later, on October 14, 1960 at

2:00 AM, Senator John F. Kennedy (JFK) addressed students on the steps of the University of Michigan Union. He challenged the students to spend two years of their lives to help people in countries of the developing world.

Rather than focusing university education narrowly on graduating employable students, JFK underscored in his speech that universities ought to be a place for reflexively trained scholars who are cognizant of broader questions and global citizenship—whether because of substantive philosophical reasons, pragmatic realism that calls for collective action in an interdependent world, or both. And so the seeds of the Peace Corps were sown on that day.

Building on foundational elements of the Peace Corps concept, we propose a policy innovation for translational science: a Science Peace Corps. Service at the Corps would entail volunteer work for a minimum of 6 weeks, and up to a maximum of 2 years, for translational research in any region of the world (including Africa and the Middle East), as a junior or senior scientist, to build capacity manifestly for development and peace, instead of the narrow bench-to-bedside model of life science translation. Topics for translational research are envisioned to include all fields of life sciences and medicine, from internal medicine to psychiatry to surgery. The main requirement is that they are linked to potential or concrete endpoints in development, foreign policy, and/or peace scholarship domains.

The present Peace Corps program encompasses a constituency spread over 65 countries with a younger age group (average age of volunteers as of 2013 was 28.7) (http://files.peacecorps.gov/multimedia/pdf/about/pc_facts.pdf). The proposed Science Peace Corps could conceivably recruit a more senior and experienced professional group of scientists, together with junior recent graduates keen to serve in global science settings.

Provision of due professional credits for service at the Science Peace Corps can be considered, for example, during faculty promotions to incentivize scientists to serve at the new Corps. Senior scientists close to the retirement age, or those already retired might find a renewed sense of purpose and meaning, professionally and personally, in a world that is sorely in need of solidarity and sustainable responses to medical and ecosystem challenges that crucially rest not only on technology but also on diplomacy and peace.

As a new instrument in the global science governance toolbox, a Science Peace Corps could also work towards ''one health''—encompassing human, environmental, plant, microbial, ecosystem, and planet health—thus serving as an innovative crosscutting pillar of the 21st century integrative biology, human development, foreign policy, and peace agendas.

A Science Peace Corps requires support by a credible and independent intergovernmental organization for funding (e.g., health, safety and security of the volunteers, administration of the program), and in the course of volunteer work as an ambulatory scientist when local/global pragmatic priorities and human rights might intersect in synergy or conflict (Dove and Özdemir, 2014b). An interdisciplinary program of this caliber for development would link 21st century life sciences to foreign policy in ways that can benefit many nations despite their ideological, political, and cultural differences.

Several co-authors of this petition letter are situated in Gaziantep in southeast Turkey, where the current conflict in Syria has spilled over the borders and launched a veritable refugee crisis. Training medical professionals to provide high quality health services in an active conflict zone and equipping them with diagnostics that can help prevent or alleviate the prevailing diseases both in refugee camps and amongst local citizens could serve towards the aims of addressing human suffering, societal development, foreign policy, and peace building agendas. Yet much of the biomedical translational research agenda around the world is geared towards innovation that can be used in a standard hospital or tertiary care setting in developed countries. Health personnel and scientists are not always keen for working in resource-limited settings for capacity building. To counter this inclination requires a professional and global citizenship outlook as suggested by the then Senator Kennedy at the University of Michigan in 1960. Looking further into the 21st century, it is instructive to bear in mind that 4.8 billion people currently live in developing countries, and 2.7 billion live on less than two U.S. dollars a day. We know very little about how and to what extent the biomedical products translated from bench to bedside in resource rich countries might (or might not) address the local needs or appeal to the world population.

No doubt, new science governance instruments such as the Science Peace Corps could serve as a ''mixer'' function to facilitate locally attuned innovations while observing, in person, by an ambulatory scientist Peace Corps the local needs in diverse world regions and thus serving the equally legitimate needs of clinical translation, development, diplomacy and peace.

Embedding Science Peace Corps in R&D Observatories

Innovation observatories are new instruments to examine science and technology trajectories ''from outside'' at arm's length so that scientific knowledge co-production can be steered towards responsible innovation. In other words, innovation observatories are built to be context sensitive and responsive. For example, the UK Government Foresight Horizon Scanning Centre was created in 2005 for strategic future(s) thinking ''to promote robust decision-making and public policy that is resilient to future uncertainties and cognizant of the wider societal values that crucially shape technology and innovation futures'' (Government of United Kingdom, 2014). The idea of innovation observatories thus acknowledges a co-productionist view of scientific knowledge and collective innovation. The World Health Organization (WHO), for example, has begun a process for the laudable proposal to establish a Global Observatory for Health Research and Development (R&D), with a draft working paper published in 2013 (WHO, 2013). An important focus of the proposed observatory will be developing new ways to link R&D flows to product pipeline(s).

Seen in this contemporary light, a Science Peace Corps would present timely and natural synergy with a global observatory on life sciences research. Headquartered in such a global or regional observatory or a development agency, the ''new Corps'' could travel both ways bi-directionally not only from rich to poor but also from poor to rich countries. This would enable a steady flux of knowledge, science, and innovation for the express goal of projects tailored for development and peace and not only for academic or laboratory interest.

A Petition to World Leaders and Development Agencies

JFK campaigned for volunteer work that has had enduring, transgenerational, and global impacts. It culminated in the establishment of the Peace Corps in 1961. An earlier American President, Abraham Lincoln, once aptly observed, ''*nearly all men can stand adversity, but if you want to test a man's character, give him power.*'' We therefore petition President Barack Obama, other world leaders, and development agencies in positions of power around the globe, to consider deploying a Science Peace Corps.

For too long, scientific practice has been separated by a rigid line from broader possible science and technology outcomes such as impacts on societal development, foreign policy, and peace (Dereli et al., 2014). While the 20th century modernist-positivist scientific practice subscribed to a firm fact/value or science/policy divide, the proposed Science Peace Corps invites us to reconsider the highly porous nature of the line among scientific laboratory, human values, political science, foreign policy, peace, and societal development.

Twenty-first century science requires reaching out to the majority forced to the margins in the developing world, including the millions of actual or potential innovators around the world. In an era marked by increasing tension between the centripetal force of homogenizing globalization and the centrifugal force of local identity (Dove and Özdemir, 2014b), a Science Peace Corps is an invitation to rethink translational research—so that it can embody the twin scholarship of life sciences and societal development. We are committed to seeing this through.

Acknowledgments

All authors are listed alphabetically, except the corresponding authors. On the occasion of the OMICS IN AFRICA special issue, this is a bottom-up policy development article and open letter from under-represented communities and peoples to the current world leaders and international development agencies supporting the concept of a Science Peace Corps. No funding was received in support of this article or the proposed policy innovation framework to broaden the agenda for 21st century translation science to reflexively integrate the shared life sciences, societal development, peace, and foreign policy priorities. The views expressed are the personal opinions of the authors only and do not necessarily reflect those of their affiliated institutions. We thank Professor Banu Onaral for helpful discussions on the subject matter.

Authors' contributions: The idea of a Science Peace Corps was conceived by Dr. Vural Özdemir in Gaziantep in January 2014. Özdemir discussed the concept first with Dr. Nezih Hekim. Together, they developed the full article with discussions and petitions from the coauthors as a transdisciplinary international collaboration to bring together medical scholarship, life sciences, development and societal innovation. Dr. Özdemir is the recipient of a returning senior scholar award from TÜBİTAK, Ankara, Turkey.

Author Disclosure Statement

The authors declare that there are no conflicting financial interests.

References

Adoga MP, Fatumo SA, and Agwale SM. (2014). H3Africa: A tipping point for a revolution in bioinformatics, genomics and health research in Africa. Source Code Biol Med 9, 10.

Büttner J. (2014). *Project: ''Between Knowledge and Innovation: the Unequal-Armed Balance.''* Max Planck Institute for the History of Science, Berlin, Germany.

Chalmers I, and Glasziou P. (2009). Avoidable waste in the production and reporting of research evidence. Lancet 374, 86–89.

Collins FS, and Hamburg MA. (2013). First FDA authorization for next-generation sequencer. N Engl J Med 369, 2369–2371.

Dereli T, Coşkun Y, Kolker E, Güner O, Ağırbaşlı M, and Ozdemir V. (2014). Big data and ethics review for health systems research in LMICs: Understanding risk, uncertainty and ignorance-and catching the black swans? Am J Bioeth 14, 48–50.

De Vries R. (2003). How can we help? From 'sociology in' to 'sociology of' bioethics. J Law Med Ethics 32, 279–292.

Dove ES, and Özdemir V. (2013a). 'Regular science' is inherently political. EMBO Rep 14, 113.

Dove ES, and Özdemir V. (2013b). All the post-genomic world is a stage: The actors and narrators required for translating pharmacogenomics into public health. Pers Med 10, 213–216.

Dove ES, and Özdemir V. (2014a). The epiknowledge of socially responsible innovation. EMBO Rep 15, 462–463.

Dove ES, and Özdemir V (2014b). Glocal bioethics: When international IRB collaboration confronts local politics. Am J Bioeth 14, 20–23.

European Commission. (2007). EUR 22700—Science & Governance—Taking European knowledge society seriously. Luxembourg: Office for Official Publications of the European Communities.

Fedoroff NV. (2012). The global knowledge society. Science 335, 503.

Government of United Kingdom. (2014). The Foresight Horizon Scanning Centre for Strategic Futures Thinking, Available from: http://www.bis.gov.uk/foresight/our-work/horizon-scanning-centre; Accessed May 28, 2014.

IPCC. (2014). The Intergovernmental Panel on Climate Change (IPCC), Fifth Assessment Report, United Nations. ''*Climate Change 2014: Impacts, Adaptation and Vulnerability*.'' Available from: http://www.ipcc.ch/report/ar5/wg2/; Accessed May 28, 2014.

Kickbusch I. (2005). Tackling the political determinants of global health. BMJ 331, 246–247.

Oliver S, and Gray J. (2006). *A Bibliography of Research Reports about Patients', Clinicians' and Researchers' Priorities for New Research*. London: James Lind Alliance.

Özdemir V. (2013). OMICS 2.0: A practice turn for 21(st) century science and society. OMICS 17, 1–4.

Özdemir V, Kolker E, Hotez PJ, et al. (2014). Ready to put metadata on the post-2015 development agenda? Linking data publications to responsible innovation and science diplomacy. OMICS 18, 1–9.

Rajan KS. (2013). Questions of critique for big biology: Conjuncture, agency and the global postcolonial. BioSocieties 8, 486–490.

Rotimi CN, and Jorde LB. (2010). Ancestry and disease in the age of genomic medicine. N Engl J Med 363, 1551–1558.

Science Metrix. (2010). 30 years in science. Secular movements in knowledge creation. Science Metrix 2010. Available from: http:// www.science-metrix.com/30years-Paper.pdf; Accessed May 17, 2014.

Terry SF. (2013). Disease advocacy organizations catalyze translational research. Front Genet 4: 101.

Thoreau F, and Delvenne P. (2012). Has STS fallen into a political void? Depoliticisation and engagement in the case of nanotechnologies. Política Sociedade 11, 205–226.

Wonkam A, Rumaney MB, Ngo Bitoungui VJ, Vorster AA, Ramesar R, and Ngogang J. (2014). Coinheritance of sickle cell anemia and α-thalassemia delays disease onset and could improve survival in Cameroonian's patients (Sub-Saharan Africa). Am J Hematol 89, 664–665.

World Health Organization. (2013). Draft working paper. A Global health R&D Observator—Developing a Case for Its Development. Geneva, Switzerland.

Wynne B. (2009). Daring to Imagine. New Delhi: Seminars. Available from: http://www.india-seminar.com/2009/597/597_brian_wynne.htm; Accessed May 28, 2014.

Address correspondence to:
Nezih Hekim, PhD
Associate Dean, Faculty of Medicine
Associate Professor of Clinical Biochemistry
SANKO University
Gaziantep 27310
Turkey

E-mail: nezihhekim@gmail.com

or

Yavuz Coşkun, MD
President and Professor
Gaziantep University
Gaziantep 27310
Turkey

E-mail: dryavuzcoskun@gmail.com

or

Ahmet Sınav, MD, CMI
President and Professor
SANKO University
Gaziantep 27310
Turkey

E-mail: ahmet.sinav@yahoo.com

or

Vural Özdemir, MD, PhD, DABCP
Editor-in-Chief
OMICS: A Journal of Integrative Biology
140 Huguenot Street
New Rochelle, New York, USA 10801

Associate Professor, School of Journalism
Faculty of Communications
Advisor to President for International Technology and Innovation Policy
Office of the President
Gaziantep University
Gaziantep 27310
Turkey

E-mail: OJIB@liebertpub.com