Published in final edited form as:

Eur J Dev Res. 2010 February ; 22(1): 3–9. doi:10.1057/ejdr.2009.47.

Scientific Responsibility and Development

Catherine Rhodes¹ and John Sulston¹

¹University of Manchester, Manchester

‘A problem – which could also be seen as an opportunity – is that too little of the great power of modern S&T has been directed at development.’ (CSTD, Chapter 6)

Introduction

Science is vital to addressing the major global challenges humanity faces currently and those it will face in the future. All of these challenges have development impacts and are likely to disproportionately affect the poor.

This paper addresses the subject of scientific responsibility and development. It uses the terms ‘scientific responsibility’ and ‘scientific community’ in a similar way to Henk Verhoog in his 1981 article ‘The Responsibilities of Scientists’. Responsibility is not used with the meaning of ‘to be the cause of’, but rather ‘obligations incumbent on’ (Verhoog, p. 582). He further describes it as involving:

‘a permanent moral duty of all scientists to participate in discussions about the role of science in society... to reflect on the practical consequences of scientific discovery and to render evaluative judgements on them and even to undertake political action to affect those consequences’ (p.594)

The scientific community is described as ‘the community of scientific workers wherever they are in the world, sharing the same general conception of nature and the same basic methodological norms’ (ibid, p.583). The obligations of the scientific community are variously owed to science as an institution, to the community itself, to government, to citizens of a particular state, and in the case of development to individuals in all states and to the global community of scientists (ibid, p.582).

The scientific community is not unaware of the problems associated with poverty and underdevelopment or of the vital contributions science and technology can make to addressing them. There is a connected moral responsibility to participate in discussions about the role of science in development and to reflect on and critically evaluate the processes through which the beneficial potential of science is promoted or obstructed.

Scientific Responsibility and Achievement of Basic Human Needs

Scientific responsibility includes the responsibilities of scientists towards science and their fellow scientists – doing good science requires, for example, appropriate application of scientific methods, accurate reporting of results, and open dissemination of findings. It is now widely accepted that scientific responsibility extends beyond this and requires some consideration be given to the outcomes and consequences of research. Interpretation and determination of such responsibilities is frequently based on moral considerations.

In relation to the public and decision-makers who influence the direction and application of science and technology – the scientific community has responsibilities because it is in a unique position to present information and knowledge that it is developing about the challenges which face humanity and how they might be addressed. This role is often taken on at the international level by science academies, which issue collective statements on matters of shared concern (examples of such statements are provided under further reading).

The major global challenges facing humanity today – including poverty, climate change, emerging infectious diseases, resource needs of a growing population, the deepening knowledge divide, and financial management – interact strongly with development processes and have the potential to push millions more people into poverty if they are not adequately addressed (suggestions for further reading on global challenges are provided at the end of this article). Science and technology are vital for addressing existing and emerging challenges.

The Commission on Science and Technology for Development argues in its 1997 report *Assault on Poverty: Basic Human Needs, Science and Technology* that the scientific community has a particular responsibility in relation to achieving basic human needs, stating on page 11 that:

‘The process of combating basic-needs deficits is value-laden: ethics and attitudes influence the chances and extent of success. A primary ethical element is the challenge to the global S&T community to recognize that with the capacity to make significant contributions to resolving basic-needs problems comes an associated responsibility and a moral obligation.’

Basic human needs are described in the report as:

‘the minimal requirements to sustain life – adequate nutrition, health care, water and sanitary facilities – as well as access to education and information that enable individuals and communities to be productive and make rational use of the available basic goods and services’ (CSTD, p.3)

While development and the contributions science can make to it encompass more than this; the description of basic human needs and an understanding of current deficits provide a very stark illustration of the fundamental differences appropriately applied science and technology can make to the lives of millions of people globally. Substantial progress has been made in development over the past few decades, but poverty and the related inability to meet basic human needs remain major problems, and in some areas the situation (both

relatively and absolutely) is worsening. Just a brief overview of some of the figures is sufficient to demonstrate the scale of the problems. There are now estimated to be over 1 billion undernourished people worldwide (FAO, June 2009); and 1.4 billion are living below the World Bank's poverty line of \$1.25 a day (<http://go.worldbank.org/C9GR27WRJ0>).

The problems are greatly worsened by increasing population. Yet there is fear in countries that have attained zero population growth (ZPG) of the economic effects of a top-heavy demography. There is a pressing need to address more openly the taboo the equitable attainment of ZPG.

Science and technology can make vital contributions to all aspects of basic needs fulfilment – and are essential to progress in most of them. The definition CSTD provides of basic human needs is useful because it does not ignore the role of education and information. It is not only the end products of scientific research that influence development prospects – it is also the sharing of basic knowledge, experience, skills and tools, and their adaptation to local needs and capacities:

‘A nation's ability to solve problems and initiate and sustain economic growth depends partly on its capabilities in science, technology and innovation. Science and technology are linked to economic growth; scientific and technical capabilities determine the ability to provide clean water, good health care, adequate infrastructure and safe food.’ (Juma et al, p.20)

Some of the social, political and economic processes that need to be encouraged for successful use of science and technology for development are outlined in Chapter 1 of the CSTD Report. The scientific community can play a direct or indirect role in several of these processes:

‘The evidence from successful initiatives suggests that meeting basic needs is intrinsically related, among other things, to making significant investment in education and health and to having clear priorities, including the targeting of the appropriate groups. Other contributing factors are the promotion of technology generation and R&D; diffusion and wider application of R&D results; development of infrastructure, support services, and adequate delivery systems; and a favourable macroeconomic environment.’

The Social Context of Science

The ways in which science and technology are directed and applied worldwide are deeply influenced by political and economic conditions. In turn, science and technology shape society, often profoundly. Patterns relating to science and technology capacities, infrastructure, knowledge flows, etc. can influence and reinforce political and economic structures.

Given awareness of the huge beneficial potential of their work, the scientific community has a responsibility to promote its work in ways beneficial to development. Since poverty is a primary cause of human suffering, the situation of the world's poor should arguably be

central to science, given its underlying motivation to benefit humanity through increased knowledge.

Scientific responsibility should also incorporate consideration of the processes through which scientific knowledge and technology are directed, disseminated and applied, and of the effects of such processes on the selection of what research gets done and on the outcomes that are achieved, because these processes can facilitate or impede achievement of the goal of benefiting humanity.

It is appropriate to reflect upon the fact that basic scientific research is overwhelmingly concentrated in developed countries – 95% of basic scientific research takes place in OECD member states representing 18% of the global population (OECD, 2003) – because in such circumstances it is obvious that particular care is needed to ensure benefits of this research do not remain concentrated in these states, as they are presently. The same situation applies in health R&D (97% is estimated to take place in high-income countries – WHO, 2002) and agricultural R&D. This trend has been exacerbated in recent years by the increasing proportion of R&D that is funded by private investment, which necessarily seeks rich markets for financial return.

Concerns about the clash between the values of science and the operation of the market system have been expressed by several authors and science and development groups¹. William Maker, for example, raises the following question: ‘now that scientific knowledge itself and not merely technology is a valuable commodity and the process of its production is brought under market controls and market principles, can science continue to maintain its claim – and its social responsibility – to serve universal ends?’ (1994, p.233).

As more and more scientific research is privately funded in whole or in part, the operation of the market system is having an increasing influence on which groups benefit from this research – predominantly developed states. This strongly suggests a need for external measures to ensure benefits of science and technology are more equitably distributed. Actions by the scientific community to build local capacities and increase international collaboration are examples of such measures. Reinforcement of core scientific principles such as open dissemination of research results will also be useful in resisting domination of research agendas by private interests.

A Global Responsibility

Scientific responsibility, now more than ever, is a global responsibility. It is a global responsibility because the scientific community is global and needs support and strengthening to be fully effective; and it is a global responsibility because societies are now so deeply interconnected – current global challenges affect us all and need global scientific efforts (funded by non-profit or low-profit investment) to be effectively addressed. The

¹ See, for example: Siekevitz, P. (September 1970) Scientific Responsibility. *Nature*, Vol.227: 1301-1303; Maker, W. (1994) Scientific Autonomy, Scientific Responsibility. In: D. E. Wueste *Professional Ethics and Social Responsibility*. London: Rowman and Littlefield; South Centre – Li, X. and Correa, C. (eds.) (February 2009) *How Developing Countries Can Manage Intellectual Property Rights to Maximise Access to Knowledge*. Geneva: South Centre; The Royal Society (April 2003) *Keeping Science Open: the Effects of Intellectual Property Policy on the Conduct of Science*. London: The Royal Society.

global aspect of scientific responsibility is increasingly recognised by scientific societies, academies and funding bodies, and by international institutions responsible for various aspects of development.

How is this global responsibility to be fulfilled? At the level of individual incentive there is no dearth of motivation. Many young scientists are eager to contribute to a better world, and will do so if opportunities are available. The limitation is funding, much of which, as we have seen, is bound up with increasing national wealth in the richer countries and is unavailable for more global problems. Thus most scientists in richer countries are constrained to work on local problems. The best scientists in less developed countries often face a stark choice of either emigration or a frustrating career at home on inadequate resources. Yet such people are essential to their countries' development. Initiatives, such as those outlined in Figure 1, to build scientific capacity and create centres of excellence in developing and least-developed countries, are therefore of great value, but need to be built on by governments to grow infrastructure, services, and industries that exploit the scientific talent.

The immediate responsibilities of individuals therefore differ somewhat according to their location, even if (as we hope) all share the same ethical principles. The resulting tensions can ultimately be resolved only by progress towards a more evenly endowed world. This requires goodwill by everyone, not just scientists, to temper national ambitions sufficiently.

Conclusion

Scientific responsibility extends beyond how science should be done, to consideration of how it is and ought to be applied. This is because science has a fundamental social role – the science that is done and the way it is used have substantial impacts on society. The scientific community does not exist in separation from society and its needs and demands, nor should it do so. The community is global and there are responsibilities within the community that relate to / impact upon development prospects – e.g. to strengthen science capacities in developing countries and to openly and widely disseminate research.

As scientists we should be interested in the outcomes of our research, how these are disseminated, and whether they reach those that need them most. We should be aware of and as a community willing to comment on, and where necessary challenge, the political and economic processes which affect the application and distribution of research outcomes. We should continue to develop and strengthen the global scientific community and reflect on and interpret what our responsibility to development requires and how best to fulfil it. In our response to current challenges, we need to resist being solely representative of national interests of rich states.

Acknowledging the global dimension compels us to recognise development as a priority issue for science. Chronic poverty and underdevelopment cause many specific problems, including poor health, malnutrition, high mortality rates, and environmental degradation, and are among the most urgent issues to address to improve the human condition. But in

addition, extreme inequality is inherently destructive of welfare and happiness, and its elimination is essential if we are to work towards a more equitable and stable world.

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Further Reading

- Joint policy statements of science academies: Network of African Science Academies Joint Statement to African Science Ministers and Heads of States and Governments: Building Science Technology and Innovative Capacities in Africa. Nov.2006 Available through http://www.aasciences.org/index.php?option=com_docman&Itemid=99
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International Council for Science (ICSU) – ICSU capacity building activities include a grants programme, visiting scientists programme, and provision of online resources. Much of this work is done through its three regional offices (ICSU, 29.11.07; 11.08.09).

Interacademy Panel on International Issues – A core element of the Interacademy Panel's work is to 'build the capacities of young academics, particularly those in developing countries, to strengthen their role in providing independent advice to governments on issues of national and global concern' (<http://www.interacademies.net/CMS/Programmes/3128.aspx>).

Wellcome Trust – The Wellcome Trust has a range of initiatives related to building biomedical research capacity in developing countries, including: funding of specific projects/programmes; funding for biomedical research fellowships in cooperation with India's Department of Biotechnology; and fellowships for research and training in public health and tropical medicine for workers in developing countries. Information on all of these can be found on the Trust's website – www.wellcome.ac.uk.

International initiatives for free or low-cost access to scientific journals – Collaborations between international organisations and publishers are facilitating free or low-cost online access to journals for developing countries. This is done with recognition that 'access to scholarly literature is critical to the innovation process, as it represents an important source of scientific and technical knowledge' (WIPO). These include: Access to Research for Development and Innovation – www.wipo.int/ardi/en; Health Internetwork Access to Research Initiative (www.who.int/hinari/en); Access to Global Online Research in Agriculture (www.aginternetwork.org/en); and Online Access to Research in the Environment (www.oaresciences.org/en/).

African Ministerial Council on Science and Technology (AMCOST) – Part of the African Union's New Partnership for African Development, AMCOST promotes regional and international cooperation for science and technology capacity building. As well as efforts to improve R&D facilities and infrastructure and to train more scientists, AMCOST works towards creating political, economic and civil society processes and structures supportive of science and technology (www.nepadst.org/aboutus/priorities.shtml).

Figure 1. Capacity Building Initiatives in Science and Technology