The Changing Architecture of Global Science

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The emerging political economy of global science is a significant factor influencing economic, social and cultural development, building national systems of innovation, and the rise of new multinational corporate, private/public and community involvement. It is only since the 1960s with the development of research evaluation and increasing sophistication of bibliometrics that it has been possible to map this emerging economy of global science on a comparative national and continental basis.

Increasingly, both firms and higher education institutions are emphasizing the economics and productivity of science as policy-makers and politicians seek to foster innovation and draw strong links between scientific performance and emerging economic structures (Crespi & Geuna, 2004, 2005). In these policy discussions the accent often falls on measuring scientific productivity; “intellectual property” and the codification of knowledge; and research collaboration and cooperation in regional, national and international contexts. Investment in science, engineering and technology receives strong attention from governments as the basis of the “knowledge economy,” and most governments now look to their international science policy strategy to reinforce national competitive advantage and encourage research collaboration.

The older liberal meta-narrative of science has been submerged by official narratives based on an economic logic linking science to national purpose, economic policy, and national science policy priorities. As a result, there are now concerns about the fate of traditional peer-reviewed scientific publishing. The rise of digitized publications has led to a counter-revolution in scholarly publishing where actual sales are recast into licenses and commercial publishers are taking advantage of the growth of open archives (Guédon, 2001). The Select Committee on Science and Technology in the United Kingdom

1 This paper draws on material from Peters, 2006. This Policy Brief essay has been extracted from a longer article published as an Occasional Paper by the Center for Global Studies (url).
2 The Science Citation Index provides bibliographic and citational information from 3,700 of the world’s scientific and technical journals covering over one hundred disciplines. The expanded index available in an online version covers more than 5,800 journals. Comparable “products” in the social sciences (SSCI) and humanities (A&HCI) cover, respectively, bibliographic information from 1,700 journals in fifty disciplines and 1,130 journals.
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Building Knowledge Cultures (with Tina Besley) (2006)
Education, Globalisation and the State in the Age of Terrorism (2004)

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Parliament (2003), for example, urged adoption of a new government strategy to address the problem of increasing journal prices imposed by commercial publishers, by recommending “all UK higher education institutions establish institutional repositories on which their published output can be stored and from which it can be read, free of charge, online.”

Global science, as a term, describes the emerging geography of scientific knowledge and collaboration as an aspect of globalization and interconnectedness within a globalized world. This is a distinctly new phenomenon, although it still reflects strong Western bias, is heavily nationalistic, and is seen as a vital part of national culture and state economic policy. In modern Baconian statecraft, science belongs to a knowledge economy and is the source of innovation and growth in productivity. To a large extent, the infrastructure of global science is an outgrowth of earlier historical conditions, yet the emergence of “global science” also reflects new global exigencies, new global problems, and an enhanced global network of science communicative practice.

Today, “big science” projects require massive state and intergovernmental funding support in an era of intense international competition for knowledge assets; these dynamics have forced governments and institutions to collaborate on pressing global issues that run across borders. The term “big science” actually dates back to the late 1950s when it was used to herald the transition from individual to team research and development. The term was employed to refer to large scale, instrument-expensive, government-funded projects in areas of basic science (such as high-energy physics), space research, and military science. The term also heralded shifts in science policy and funding after WWII. Derek J. de Solla Price (1963) in Little Science, Big Science applied publications analysis to science communication practices, providing the first systematic approach to the structure of modern science, and helping establish bibliometrics and scientometrics as essential to evaluating the productivity of scientific research.

Global science per se does not reduce simply to “big science,” even though it may account for genuine attempts to build international cooperation and adopt a strategic approach to collaborative partnerships at the extra-national level. Bilateral and regional science and technology relations go back a long way, relatively speaking. In the early 1950s, the European Laboratory for Particle Physics (CERN) in Geneva was the result of cooperation among European governments which now has member scientists from both European and non-European countries. The European Science Foundation (ESF) was created in 1974 and established a scientific network in the early 1980s for the coordination of European science, and in the early 1990s, the ESF set up research linkages with Asia, and the Asia-Pacific Economic Cooperation (APEC) established protocols for scientific cooperation among its members. Scientists, sponsored by world organizations like UNESCO and Food and Agriculture Organization (FAO), set up global research programs; earth scientists, in particular, have been instrumental in establishing international research programs dealing with the dynamics of...
the earth system such as the Global Climatic Observation System, the Global Ocean Observation System and the Global Terrestrial Observation System.7

Yet these recent examples of extra-national scientific collaboration do not take account of the many smaller institutional exchanges, such as university consortia for across-the-board cooperation, or firm/university partnerships. Nor does it take account of the increasingly multinational corporate nature of international research undertaken by world conglomerates like Monsanto and other biotech companies or large pharmaceutical companies. Some of these partnership arrangements and examples of multinational science probably fit better into theories of globalization than traditional university-based collaborations.

The emergence of global science, thus, conforms to both a business model based on the market and a science model based on free exchange of give and take. The development economist, Amartya Sen (2002) makes the following observation, which is essential to understanding the different kinds of associations needed for development: “Contrast the sharing that underpins science with the transactional nature of market relations. The market mechanism is not only an important social institution it is also an organizational ideology. Its success—perceived as well as real—can help stifle independent thinking about interactive relations of other kinds, including that of give and take. The gaps it leaves are worth filling since sharing is not only crucial to science, it is also central to development.”

Sen argues for a position that views science as a global tradition, but does not contemplate the rise of global science or the complex ways in which it proceeds on mixed models that integrate traditional “science sharing” (as he calls it) and market relations. Such models are especially evident in the emerging international regime of “intellectual property” rights through the World Trade Organization (WTO). In an age of knowledge capitalism where knowledge is the basis of national competitive advantage, emphasis falls on policing and reinforcing intellectual property rights. In a sense, Sen avoids the difficult question of scientific hegemony based on private and cultural ownership of scientific discoveries, inventions, and insights (see e.g. Tudge, 2004).

Concluding thoughts Diverse forms of global science have emerged from existing political infrastructures and histories, such as the industrial-military research complex, or projects that link science to social democracy efforts in the service of global civil society. Universities encourage both competitive and non-competitive forms of international collaboration. Increasingly, however, with the decline of state funding of higher education in the U.S. and the development of nearly 200 science research parks nationwide, the latter is giving way to the former as institutions struggle to diversify their funding bases with venture capital funding spin-off companies, patenting university discoveries, and attracting leading multinationals to campus. A major question is whether the funds accrued from competitive forms of collaboration will be used to help support non-competitive forms of collaboration. In other words, can the university subscribe to twin legitimating discourses that embrace social justice goals as well as accommodate for-profit motives? It may well be that technology dependent “sharable goods” as one form of social production and exchange (Benkler, 2004), alongside the state and the market, will emerge as a third mode of organizing science production, bringing in its wake changes in the conditions of production of the networked information economy that encourage non-propriety forms of academic production and facilitate international research collaboration.


References


Tudge, C. (2004, April 26). “The honesty of science is being compromised at every turn: can we still rely on what scientists tell us? Alas, no. Their conferences and papers are sponsored by industry, their bad results are concealed, their jobs are threatened if they step out of line.” New Statesman, 133, 29–32
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