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Why Do We Need Open Access to Science? A Developing Country Perspective

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The past two days we have been talking about different aspects of access to knowledge. In this session we are looking at access to scientific knowledge, and in particular access to knowledge by scientists and students of science.

Science as Knowledge Commons

Scientific knowledge is created by researchers working in different settings: academic institutions, laboratories owned by for-profit corporations, laboratories set up by governments, hospitals and so on. Some work with pencil and paper and produce theories; most work in laboratories or fields and carry out experiments and collect data.

Scientific research is not done in isolation. Science is a communal activity. Scientists do research and communicate results to other scientists. They build on what is already known, on what others have done – the 'shoulders of giants' as Newton had said. It is therefore important that knowledge flows freely without any barrier.

Scientists publish their findings in professional peer reviewed journals. Indeed research is considered incomplete until it is peer reviewed and published. These journals are run by government agencies, scientific societies and scholarly academies, universities and private publishing companies.

Remember that the research, writing and reviewing are all done by scientists and when they get their work published in professional journals normally they do not get paid. The prestige associated with publishing research papers itself is considered more than adequate reward.

Till recently print-on-paper journals dominated the scholarly communication scenario and they have served us well for more than three centuries. But they had their limitations. With the advent of the Internet and the web technologies, we can overcome all these limitations and make knowledge flow freely and unfettered.

If science is about sharing, then the Net has liberated the world of science and scholarship and has the potential to make it a level playing field. The Net and the Web are not merely replacing print by speeding up things but have inherently changed the way we can do science (e.g. eScience and Grid computing), we can collaborate, we can datamine, and deal with data sets of unimaginable size.

But the potential is not fully realized, largely because most of us are conditioned by our past experience and are inherently resistant to change. We are never contemporaneous with time, as Che Guevera would say. Our thinking and actions are conditioned by the print-on-paper era, especially in India!

Often research is supported by public funding. Today, for example, the world's largest experimental setup, viz. the large hadron collider, is opened in this city, at CERN. It costs billions of Euros and no single government could afford to invest that kind of money. CERN received financial support from many governments and stakeholders.

In the past two decades, journal prices grew at a rate much faster than the general inflation making it difficult for research institutions to subscribe to all the journals they needed. A leading commercial publisher of scientific journals makes a profit of US $1,500 per minute. Furthermore, journal publishers retain the copyright to the work performed by scientists and supported by the taxpayers.

The primary goal of science is the creation of new knowledge for the benefit of humanity and not to increase the profit of commercial publishers. But we have allowed much of the knowledge produced by scientists around the world in the past few centuries and recorded in journals to be enclosed and commodified. We have allowed the copyright laws to protect the interests of publishers, who are intermediaries in the scholarly communication process, rather than protect the interests of the knowledge creators, viz. the authors of research papers, who give away their knowledge for free.

Emergence of open access

The past two decades have seen the emergence of a movement that seeks to restore the knowledge commons back to the knowledge creators, through facilitating open access. Although the open access movement began before the advent of the Internet, it would not be an exaggeration to say that it would not have grown but for the emergence and widespread use of the Internet.

This movement, like everything else, is uneven. It has done well wherever the stakeholders were able to ensure certain degree of collective action, self-governing mechanism and social capital. For example, physicists started technology-enabled sharing of preprints about two decades ago whereas chemists are even now unable to get out of the shackles imposed by one of their own societies.

Some countries like the UK, the Netherlands and the USA have made some progress, whereas many other countries are lagging far behind. Among the developing countries, Latin America and notably Brazil have done better than others.

Developments in India

Let us look at developments in India with emphasis on the policy front.

India has a large community of scientists and scholars and Indian researchers perform research in a wide variety of areas including science, technology, medicine, humanities and social sciences. They publish their research findings in a few thousand journals, roughly half of them in Indian journals and the rest in foreign journals, most of them low-impact journals.

Indian scientists publish about 30,000 papers a year in journals indexed in the *Web of Science*. India now accounts for 3.1% of journal papers abstracted in *Chemical Abstarcts*; a few years ago the figure was a rather poor 2.4%. But these are not well cited. India, after near stagnation, is now on the growth path. In the past two years the government has increased investments on both higher education and R&D.

Indian scientists face two problems common to scientists everywhere, but acutely felt by scientists in poorer countries : **Access** and **Visibility**

1. They are unable to access what other scientists have done, because of the high costs of access. With an annual per capita GDP well below US $1,000, most Indian libraries cannot afford to subscribe to key journals needed by their users. Most scientists in India are forced to work in a situation of information poverty.

2. Others are unable to access what Indian researchers are doing, leading to low visibility and low use of their work. As Indian scientists publish their own research in thousands of journals, small and big, from around the world, their work is often not noticed by others elsewhere, even within India, working in the same and related areas. Thus Indian work is hardly cited.

Both these handicaps can be overcome to a considerable extent if open access is adopted widely both within and outside the country. That is easier said than done. As an individual I have been actively advocating open access for the past seven years. A few more have joined in recent years. But what we have to show is rather limited.

The situation with accessing overseas journals has improved considerably thanks to five major consortia which provide access to large groups of scientists in India (especially those in CSIR labs, IITs and IISc).

On the open course ware front the consortium of IITs and IISc have launched the NPTEL programme under which top notch IIT and IISc professors have come together to produce both web-based and video lessons in many subjects. Now these are available on YouTube as well. Recently the Indira Gandhi National Open University, one of the largest open universities in the world, decided to make all its course material open access. The school textbooks produced by the National Council of Educational Research and Training are also freely accessible on the Internet.

Many physicists in the better-known institutions use arXiv, which has a mirror site in India, both for placing their preprints and postprints and for reading preprints of others. But many others are not aware of it. What we need is advocacy and more advocacy.

The policy front

Very little has happened on the policy front! Whatever has happened happened because of some champion promoting it.

Two science academies decided to make their journals open access a few years ago, but their web presence can improve a great deal. Right now about a 100 Indian journals are open access journals. An individual and his publishing company took the initiative to persuade a number of societies to make their journals open access and you will hear from him shortly. Another individual and his company bring out Open J-Gate, a search service for all open access resources. The major journal publishers in the government sector – CSIR and ICAR – have not yet adopted open access. The National Informatics Centre has a programme of helping journals go open access.

The National Knowledge Commission has recommended open access to science and scholarship and the Prime Minister has accepted it in principle. But the heads of government's departments of science and research councils do not seem to have applied their minds to opening up access to research papers. The examples of the research councils in the UK, the Wellcome Trust, the Howard Hughes Medical Institute and more recently NIH have had virtually no impact. Recently, Prof. Samir Brahmachari, the Director General of CSIR and a champion of open source drug discovery, has initiated a move to bring all of the more than 4,000 papers published annually by CSIR scientists into open access.

The Indian Institute of Science, Bangalore, was the first to set up an institutional repository in India. They use the GNU EPrints software. Today the repository has close to 12,000 papers, not all of them full text and not all of them truly open (as many papers are available only to searchers within the campus). The number is likely to cross 20,000 this year, the centenary year of the Institute. IISc also leads the Million Books Digital Library project's India efforts.

Today there are about 40 repositories in India including three subject-based central repositories (as seen from ROAR and OpenDOAR). The National Institute of Technology, Rourkela, is the only Indian institution to have mandated OA for all faculty publications. Apart from NIT-R, the deposition rate of current papers is pretty low in all other institutions.

Despite concerted advocacy and many individual letters addressed to policy makers, Many senior scientists and directors of research laboratories and vice chancellors of universities do not have a clear appreciation of open access and its implications.
There are exceptions, of course. Prof. Padmanabhan Balaram, Director of the Indian Institute of Science and Editor of Current Science, wrote an editorial on the need for open access in Current Science a few months ago, and Prof. Stevan Harnad commented on it. Prof. Balaram was also interviewed by SciDev.Net on his views on open access.

With funding from the Department of Scientific and Industrial Research a small group at Indian Institute of Science – National Centre for Science Information – is ready to help any Institution set up OA archives (using EPrints or DSpace) and to convert journals to open access using the Open Journal System. Not many institutions have taken advantage.

The more than 60 well-funded Bioinformatics Centres have been talking about setting up their own OA archives for more than six years, but nothing has happened. In a national laboratory, scientists do not want to upload their papers in the OA repository set up by the library. There is great reluctance and apathy among scientists.

Among those who understand the issues, many would rather like to publish in high impact journals, as far as possible, and would not take the trouble to set up institutional archives. Most Indian researchers have not bothered to look up the several addenda (to the copyright agreement forms) that are now available. Many scientists I spoke to are worried that publishers may not publish their papers if they attach an addendum! Publishing firms work in subtle ways to persuade senior librarians and prominent scientists to keep away from OA initiatives. There are no equivalents of FreeCulture.org among Indian student bodies and no equivalent of Alliance of Taxpayers for Open Access to influence policy at the political level.

Mere knowledge that something is good is not enough for its widespread adoption. We need to find ways to persuade scientists and policy makers to adopt open access. We should examine what holds them back and find ways to deal with those factors. Wherever there has been a champion to lead OA initiatives have succeeded.

We should adopt both bottom up and top down approaches. We should launch massive advocacy and training programmes.

Two things can hasten the adoption of OA in India.

(1) If the political left is convinced that research paid for by the government is not readily available to the people freely and what is worse the copyright to the research papers are gifted away to commercial publishers from the advanced countries, then they may act.

(2) If the students are attracted to the idea that fighting for open access is the in thing to do, then they will form FreeCulture like pressure groups and fight for the adoption of open access.

Medical information and developing countries

Now let us turn our attention to medical information and developing countries.

All nations, whether industrialized or developing, face a broad array of challenges that will require the application of up-to-date scientific knowledge and technology. Such challenges include stimulating economic growth, mitigating environmental problems, safely adopting beneficial new technologies, and quickly responding to sudden outbreaks of new diseases. No nation can now afford to be without access to a credible, independent

science and technology (S&T) research capacity that would help it to develop informed policies and take effective action in these and other areas, says a report by the InterAcademy Council (IAC).

Scientists in developing countries need particular attention, says Bruce Alberts, former President of the US National Academy of Sciences. According to him, connecting all scientists to the world wide web and making available free on the web a rich array of scientifically validated knowledge resources are the key steps to creating research capacity in the developing world.

It is heartening to note that the geography of science is changing. Today China is second only to the United States in the number of papers published annually. About fifteen years ago China was way below in the rankings. South Korea today is in the top 12 countries. On the other hand Africa is yet to catch up.

The need for medical information and research in developing countries is particularly important. Pharmceutical companies have no incentives to invest on research on "neglected diseases".

A few years ago a few well-meaning librarians persuaded leading journal publishers to make available free access to their medical journals to researchers in poor countries. Thus was born HINARI, and it was followed by similar programmes for agriculture (AGORA) and environment (OAER). No doubt these initiatives have helped many researchers in developing countries gain access to valuable information.

But HINARI left out countries like India even though the per capita income in India is far below the threshold prescribed, because the publishers did not want to lose already existing subscription income. There are also other operational problems; for example, one can access the journals only in designated libraries.

If only the librarians who initiated the move and WHO had invested their time and energy on promoting open access the results would have been far more beneficial. The number of hits received by MedKnow and Bioline International open access journals is a testimony to the efficacy of open access.

Let me close by making a suggestion: Movements like A2K which are emerging as a force to reckon with should talk to key policy making bodies such as the Inter Academy Panel, the Inter Academy Council and the Academy of Sciences for the Developing World (TWAS) and persuade them to adopt open access world wide.

A number of organizations talk about open access. But there is a wide gap between intentions and implementation. Movements like A2K can help bridge the gap.

Thank you.