Open Access in India: Hopes and Frustrations

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Abstract

Current status of scientific research and progress made in open access – OA journals, OA repositories and open course ware - in India are reviewed. India is essentially feudal and hierarchical; there is a wide variation in the level of engagement with science and research and there is a wide gap between talk and action. Things never happen till they really happen. The key therefore is constant advocacy and never slackening the effort, and to deploying both bottom-up and top-down approaches. The author' own engagement with the Science Academies and key policymakers is described. Indian Institute of Science is likely to deposit a very large proportion of the papers published by its faculty and students in the past hundred years in its EPrints archive. There is hope that CSIR will soon adopt open access.

Keywords: India; open access; CSIR

1. Introduction

Intellectual (or knowledge) commons share with natural resources commons such as forests, grazing land, fisheries and the atmosphere some features such as congestion, free riding, conflict, overuse, and pollution. But there is a big difference. Natural resources belong to the zero sum domain: if you share something, your stock dwindles. But knowledge wants to be shared and when shared it grows! The two kinds of commons, however, require strong collective action, self-governing mechanisms and a high degree of social capital on the part of the stakeholders.

Unfortunately knowledge can be enclosed, commodified, patented, polluted and degraded and the knowledge commons could be unsustainable. That is exactly what we have allowed to happen to much of the knowledge produced by scientists around the world in the past few centuries and recorded in journals. We have allowed the copyright laws to protect the interests of publishers, who are intermediaries in reaching the knowledge to others, rather than protect the interests of the knowledge creators, viz. the authors of research papers, who want to give away their knowledge for free.

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 and now they are moving into the next level with INSPIRE whereas chemists are even now unable to get out of the shackles imposed by one of their own societies. Some countries like the UK 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.

This paper presents a status report on open access in India.

2. General trend in scientific output and publishing from India

Independent India, led by Jawaharlal Nehru, decided to invest in science and technology and to use S&T to leverage development efforts and to improve the standards of living of the people. Ever since, virtually all political parties and the people have generally supported investing in science, even though one in four Indians is living below the poverty line. This is not at all surprising considering that knowledge has always been valued very much in India.

Today 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. The Indian Academy of Sciences and the Council of scientific and Industrial Research have been the leading publishers of S&T journals in India for a long time. The other Academies, professional societies, educational institutions and a few commercial firms also publish journals. But not many of them are indexed in SCI or Web of Science, which are selective in their coverage. MedKnow Publications, a Bombay-based private company, is emerging as a quality publisher of medical journals. As social science has been neglected for long, there are not many social science journals of repute from India. The *Economic and Political Weekly* has a sizable following.

India trains a very large number of scientists and engineers and a large percent of the best graduates, especially those trained at the famous IITs, migrate to the West, and they seem to perform well. Said an article in Forbes, "India is the leader in sending its students overseas for international education exchange, with over 123,000 students studying outside the country in 2006." Indians constitute the largest contingent of foreign students in the USA; a recent estimate puts the number at over 83,000. The number of Indian students enrolled in British universities in 2006 was about 25,000. Of late there is a sizable outflow of students to Australian universities, and the Australians believe that most of them want to stay on in their country.

Research is performed essentially in three sectors: (1) higher educational institutions such as the universities and deemed universities numbering over 400, Indian Institutes of Technology and Indian Institute of Science, (2) laboratories under different government agencies such as the Council of Scientific and Industrial Research (CSIR), Department of Atomic Energy (DAE), Indian Space Research Organization (ISRO), Defence Research and Development Organization (DRDO), Indian Council of Agricultural Research (ICAR), and Indian Council of Medical Research (ICMR), and (3) laboratories in the industrial sector, both public and private. Besides, a number of non-governmental organizations and think tanks are also contributing to India's research output. Although its overall share of funds invested on R&D is decreasing, the Government continues to be the major source of funding for research, and currently it accounts for bout 70%. Industry's share is increasing, as more and more Indian companies have started acquiring overseas companies in sectors ranging from automobiles and steel to pharmaceuticals, tea and information technology, and as many multinational corporations are setting up research centres in India to take advantage of high quality researchers they could hire at costs much lower than in the West.

One would think that everything is fine with science and technology in India. Far from it.

In terms of the number of papers published in refereed journals, in terms of the number of citations to these papers, in terms of citations per paper, and in terms of international awards and recognitions won, India's record is not all that encouraging. In the past few years things have started looking up. In Table 1 I present some data on India's contribution to the research literature of the world as seen from well-known databases. I also provide the number of papers from the People's Republic of China to see India's

contribution in perspective. 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%.

Year	Scopus		MathSciNet		Engineering Village+		SciFinder	
	India	China	India	China	India	China	India	China
2007	43005	190847	1765	11252	25126	205734	41697	235309
2006	40749	179388	1949	11762	25954	199881	38253	222371
2005	36385	157809	1936	10073	21870	173291	33675	183931
2004	32319	111219	1777	9544	18982	121725	29341	126647
2003	29972	74895	1904	8663	16804	81604	25985	106518

*Data accessed on 29 May 2008. Data for 2007 in MathSci Net and Engineering Village for 2007 are incomplete. + including both Compendex and INSPEC

Table 1. The numbers of papers indexed from India and China in major bibliographic databases*

In Table 2 I present some data on the number of papers from India and three other countries and the average number of citations won by research papers from these countries as seen from Scopus. No doubt, the number of papers from India is increasing steadily, but the growth rate is nowhere near that of China. India moved from the 13th rank in 1996 in terms of number of papers published in journals indexed by *Web of Science* to 10th in 2006, whereas China moved during the same period from 9th to the second position.

Year	China			India			Sout Korea			Brazil		
	Doc	Rank	C/d	Doc	Rank	C/d	Doc	Rank	C/d	Doc	Rank	C/d
1996	26853	9	4.37	20106	13	6.13	9669	20	8.55	8497	21	9.42
1997	29871	9	4.55	20694	13	5.67	11876	16	8.17	10167	20	8.45
1998	31887	8	4.24	19755	13	5.78	11579	16	8.88	10357	20	8.49
1999	36180	8	4.58	22578	12	5.30	14645	16	8.54	12196	18	7.95
2000	42250	6	4.29	22788	12	5.17	16321	15	8.07	12857	17	7.36
2001	55850	5	3.22	23362	12	4.34	17930	14	6.63	12708	19	5.84
2002	55400	5	3.32	24838	12	3.82	18740	14	5.74	14590	16	4.93
2003	66748	5	3.26	28741	12	3.31	23406	14	5.00	16978	17	4.31
2004	98577	2	1.92	30258	12	2.26	27200	14	3.14	18695	18	2.93
2005	148221	2	1.92	34849	11	1.00	32488	13	2.88	21239	17	1.29
2006	166205	2	0.12	38140	10	0.19	34025	12	0.22	25266	15	0.22
1996-2006	758042	5	3.14	28109	12	3.91	217879	14	5.84	163550	18	5.56

Source: SCImago Journal & Country Rank (based on data from SCOPUS), courtesy Prof. Félix de Moya of Grupo SCIMAGO, Spain.
Doc = Number of documents. C/d = Citations per document, computed for the 11-yeaar period. Note the decrease in value for later years.

Table 2. Output of research papers from selected countries

Data provided in Table 3 (courtesy In-cites) clearly show that in no field does India receive enough citations to be on par with the world average. In certain fields like physics, materials science, the gap is narrow, but in most areas of life sciences the gap is indeed large. In areas like plant and animal science and immunology Indian research appears to be way behind.

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. New specialized higher educational institutions are being set up with the hope some of them will eventually emerge as world class institutions. Science Academies are discussing ways to improve the quality of science education with a view to getting better-educated graduates to research.

Field	Percentage of papers from India	Relative impact compared to world
Materials Science	5.12	-25
Agricultural Sciences	5.06	-57
Chemistry	4.81	-34
Physics	3.71	-20
Plant & Animal Sciences	3.44	-65
Pharmacology	3.21	-45
Engineering	2.93	-28
Geosciences	2.72	-51
India's overall percent share, all fields: 2.63		
Ecology/Environmental	2.55	-51
Space Science	2.52	-47
Microbiology	2.18	-50
Biology & Biochemistry	2.06	-56
Mathematics	1.72	-43
Computer Science	1.57	-29
Immunology	1.19	-65
Clinical Medicine	1.18	-56
Molec. Biol. & Genetics	1.17	-62
Economics & Business	0.75	-52
Social Sciences	0.73	-44
Neurosciences & Behavior	0.55	-51
Psychology/Psychiatry	0.30	-38

Courtesy: *SciBytes - ScienceWatch*, Thomson Reuters

Table 3. Number of Indian papers published in different fields during the five years 2002-2006 and citations to them [Data from *National Science Indicators*, Thomson Reuters]

3. Awareness of OA in India

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 said.

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

1. They find it difficult to access what other scientists have done, because of the high costs of access. With India's 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. Even the programmes supported by UN agencies are not available for free in India, even though India's per capita GDP is far below the agreed upon threshold of US $1,000.

2. Other researchers 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. No wonder Indian work is poorly 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. There are a few more advocates and proponents of OA in India. But what we have to show is rather limited.

With the advent of the Internet and the Web, we need not suffer these problems any longer. If science is about sharing, then the Net has liberated the world of science and scholarship and made it a level playing field. The Net and the Web have not merely replaced print and speeded 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 datasets 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. Our thinking and actions are conditioned by the print-on-paper era, especially in India! From colonial days, most people do things only when they are told to do.

The situation with accessing overseas toll-access journals has improved considerably thanks to five major (and a few smaller) consortia that provide access to a large number of journals for large groups of scientists in India (especially those in CSIR labs, IITs and IISc). Many universities have benefited through INFLIBNET. ICMR labs and selected medical institutions have formed ERMED, their own consortium. Rajiv Gandhi Health Sciences University, Bangalaore, provides access to literature through HELINET Consortia to a number of medical colleges in the South.

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.

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. A very large number of Indian researchers working in universities and national laboratories are not aware of open access – green or gold - and its advantages. Very few Indian authors know about author's addenda and whenever they receive a publisher's agreement form they simply sign on the dotted line giving away all the rights to the publisher. Call it ignorance or indifference, but it is rampant. Many authors think that attaching an author addendum to the copyright agreement may lead to rejection of their paper! Or at least they do not want to take a risk. What we need is advocacy and more advocacy.

4. OA journals and OA repositories in place

Thanks to the initiatives taken by Prof. M S Valiathan, former President of the Indian National Science Academy, the four journals published by INSA were made OA a few years ago. The Academy also signed the Berlin declaration. Four years ago, he convened a one-day seminar on open access as part of the Academy's annual meeting. The Indian Academy of Sciences converted all its ten journals into OA.

The Indian Medlars Centre at the National Informatics Centre brings out the OA version of 40 biomedical journals (published mostly by professional societies) under its medIND programme.

MedKnow brings out more than 60 OA journals, on behalf of their publishers, mostly professional societies. [Not all of them are Indian journals. Also, some MedKnow journals are included in the medIND programme of NIC.] Three OA medical journals are brought out from the Calicut Medical College. A few more OA journals are brought out from India. In all, the number of Indian OA journals will be around 100 (DOAJ lists 97, but it does not list journals published by the Indian National Science Academy). Dr D K Sahu, the CEO of MedKnow has shown with ample data that OA journals can be win-win all the way. For example, the *Journal of Pstgraduate Medicine* (JPGM) was transformed into a much better journal after it became OA. It attracts more submissions of better quality papers and from researchers from many countries; the circulation of the print version has increased; advertisement revenue has increased (both for the print version and for the online version). Its citation per document ratio has been increasing steadily. Dr Sahu has made several presentations on MedKnow journals and how open access is helping in improving the quality of the journals as well as their revenue, but not many other Indian journal publishers are coming forward to make their own journals OA. Incidentally not a single Indian OA journal charges a publication fee. Several leading publishing firms (both European and multidisciplinary) have started poaching on these newly successful OA journals! In fact a few journals have moved out of MedKnow to foreign publishers who have lured them with money.

The online versions of a few Indian journals are brought out by Bioline International. Two young OA advocates, Thomas Abraham and Sukhdev Singh, have formed a society to promote Open Journal System in India. The National Centre for Science Information at the Indian Institute of Science has also helped a few journals become OA by adopting OJS.

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 10,200 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). IISc also leads the Million Books Digital Library project's India efforts under the leadership of Prof. N Balakrishnan.

Today there are 31 repositories in India (as seen from ROAR; OpenDOAR lists only 28), including three in CSIR laboratories, viz. National Chemical Laboratory, National Institute of Oceanography, and the National Aerospace Laboratories. Three of them are subject-based central repositories. OpenMed of NIC, New Delhi, accepts papers in biomedical research from around the world. The Documentation Research and Training Centre at Bangalore maintains a repository for library and information science papers. Prof. B Viswanathan of the National Centre for Catalysis Research maintains, virtually single handed, a repository for Indian catalysis research papers with over 1,150 full text papers. Five of the thirty Indian repositories have found a place in the list of top 300 repositories prepared by the Cybermetrics Lab of the Centro de Información y Documentación Científica (CINDOC) of Consejo Superior de Investigaciones Científicas (CSIC), Spain: Indian Institute of Science is placed at 36th rank, followed by Indian Statistical Institute – Documentation Research and Training Centre at 96. Openmed of National Informatics Centre at 111, Indian Institute of Astrophysics at 228 and the National Institute of Oceanography at 231. The repository at the Raman Research Institute has all the papers written by C V Raman, the winner of the 1930 Nobel Prize for Physics. 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. Soon ICRISAT, a CGIAR laboratory located in India, will throw open its OA repository.

A small proportion of Indian physicists, mostly high energy and condensed matter physicists, use arXiv to deposit preprints and postprints. And arXiv has a mirror site at the Institute of Mathematical Science

(IMSc), Chennai, which is visited by an increasing number of researchers from India and the neighbouring countries. A few weeks ago IMSc set up its own institutional repository.

A small team at the University of Mysore is digitizing doctoral dissertations from select Indian universities under a programme called Vidyanidhi.

With funding from the Department of Scientific and Industrial Research a small group at Indian Institute of Science – National Centre for Science Information – was helping Indian institutions 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.

Informatics India Pvt Ltd, a for-profit company with its headquarters in Bangalore, is bringing out a service called Open J-Gate, which indexes all open access journals in the world. And it is absolutely free. Jairam Haravu of Kesavan Institute of Information and Knowledge Management has made the NewGenLib library management software open source. NewGenLib can be used to set up and maintain institutional repositories.

5. Policy developments

The two Science Academies, INSA at New Delhi and IASc at Bangalore, and many of their Fellows have been engaged in a discussion on open access and its advantages, but there has been very little follow-up. As India continues, in a sense, to be feudal, one wonders if top-down approaches would work better than bottom-up approaches. But OA advocates are working on both fronts!

On the bottom-up front, a number of workshops have been held with a view to training mostly library staff in the use of OA software such as EPrints, DSpace, and NewGenLib. Dr A R D Prasas of the Indian Statistical Institute – DRTC, Bangalore, is on the advisory board of DSpace, and has conducted many workshops on setting up repositories using DSpace. Two online discussion lists OA-India and OADL are used by mostly LIS professionals to discuss OA related issues. But very few working scientists have taken part in these discussions. Several librarians have written about OA in professional journals.

One major concern expressed by librarians and repository managers is about copyright violation; they are really worried about journal publishers taking action against their institutions.

I have been writing to scientists and librarians regularly alerting them to OA developments around the world and the need for India to adopt OA quickly. By now a very large number of Indian researchers, among them elected Fellows of Academies, must have heard about the advantages of OA several times. The Indian Academy of Sciences had started on a pilot basis placing the full text of papers by Fellows of the Academy, but the project has not gone beyond the initial effort. A similar proposal is pending with INSA. If implemented these projects will be the equivalent of the Cream of Science project in the Netherlands.

Despite concerted advocacy and many individual letters addressed to policy makers, 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 And Harvard University have had virtually no impact on the Indian S&T establishment. 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.

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.

The National Knowledge Commission headed by Mr Sam Pitroda, a technocrat and a telecom expert, has recommended open access and it is understood that both the Prime Minister and the Deputy Chairman of the Planning Commission have been apprised of the need for adopting OA as a national policy. Two OA advocates, yours truly and Dr A R D Prasad were members of the Working Group on Libraries that advised the National Knowledge Commission. In addition, Dr Mangala Sundar Krishnan of NPTEL and IIT Madras and I were members of the working group on open and distance education. These two groups had submitted strong recommendations in favour of India adopting open access mandate for publicly-funded research.

6. Opportunities and Challenges

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. A recent letter to the editor of *Nature* from a leading Indian scientist, a foreign associate of the National Academy of Sciences, USA, illustrates this point. Publishing firms work in subtle ways to persuade senior librarians to keep away from OA initiatives. There have been no equivalents of FreeCulture.org among Indian student bodies and no equivalent of Taxpayers' Alliance to influence policy at the political level.

Hopes - As pointed out earlier, the National Knowledge Commission supports open access and has included it in its recommendations to the Government. Google is in touch with NKC with a proposal to digitize all doctoral theses and bringing out OA versions of selected print journals and digitizing back runs of OA journals.

The Director of Indian Institute of Science, which is in its centenary year, has decided to digitize all papers published from the Institute in the past more than 99 years and make them available to the world through the Institute's EPrints archive, and the work has just begun.

The Director General of the Council of Scientific and Industrial Research has said that it should be possible for CSIR to adopt a mandate similar to the one adopted by the Irish Research Council. Hope it becomes a reality soon.

The Indian National Science Academy invited me to address its Council a few months ago and the President, Vice Presidents and Members of the Council listened to me carefully; again in early April 2008 the Academy held a half-day meeting on open access, free and open source software and copyright issues. I was asked to coordinate the presentations on the first two topics. But the lawyer who was invited to speak on copyright probably had very little understanding of the 'give away' nature of journal papers. INSA will send before long its recommendations to the Government. Developments around the world, including in Latin America, South Africa and China, I hope, will goad Indian establishment to action.

7. International collaboration and ways forward

The Principal Scientific Advisor to the Government was a former chairman of the Atomic Energy Commission and is fully aware of developments around the world. His own colleagues have been part of the work at CERN and are involved in many international collaborative projects. He often meets with his counterparts in other countries, especially the UK and European Union. Decisions on OA made in the UK and Europe may have an influence on him.

India is an important member of both the InterAcademy Panel and the InterAcademy Council. If these

bodies could be persuaded to endorse and adopt OA, then India will fall in line.

I am trying to get a few OA champions to major events in India. Stevan Harnad came to India about eight years ago, but we did not provide him opportunities to meet many policy makers. Alma Swan came twice and did meet some key people. May be we need to facilitate more such visits and meetings.

EIFL does not work in India. We should persuade them to include India in their programmes.

8. Conclusion

One never knows when things start happening in India. They go on talking and holding meetings but they rarely act here. That is why it is important we keep pushing.