Open Access to Scholarly Literature in India — A Status Report (with Emphasis on Scientific Literature)

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> "Knowledge is the common property of mankind."
> **Thomas Jefferson**, third President of the United States

> "One day open access will be just as natural as breathing… we won't need to ask anybody's permission."
> **Prof. Wiljan van den Akker**, Dean, Utrecht University

> "Open access isn't a threat either… quite the contrary, it offers tremendous opportunities. It has advantages for all concerned."
> **Prof Henk Zijm**, Dean, University of Twente

Chapter 1: Scholarly Communication

Introduction

Nothing that has happened in the recent past can have as great an influence as open access on science and scholarship in the developing world, and yet many developing countries including India are not adopting open access with enthusiasm. Developing countries remain developing largely because they often let go such opportunities.

This report is about open access. However, we will begin with a brief introduction to scholarly communication as open access is all about scholarly communication. We will then set the context by having a quick look at the status of science in India before we proceed to discuss open access in India.

Scholarly Communication

The ecology of scientific knowledge production

Science is a truly global and collective endeavour. It is at once a competitive and cooperative enterprise where free and unhindered flow of knowledge is essential for making any advance. A classic example of fierce competition in science was the controversy over the discovery of calculus involving Newton and Leibnitz in the seventeenth century.[1] More recent examples include the race between Linus Pauling and Francis Crick and James Watson for the discovery of the structure of DNA in the 1950s[2] and the controversy over the discovery of HIV retrovirus involving Luc Montagnier and Robert

[1] Loy J (2002), Newton vs. Leibniz, http://www.jimloy.com/calc/newtleib.htm.
[2] Watson J D (1968), *The Double Helix*, Atheneum, New York.

Gallo in the 1980s,[3] both of which had all the elements of a Hollywood drama. Examples of collaboration in science include the decade-long effort that led to the mapping of the human genome, arguably one of the largest international scientific collaborations ever undertaken,[4] and the number of South–South and North–South collaborations undertaken ever so often in high energy physics at international research facilities such as CERN, the European Organization for Nuclear Research.[5] If deciphering the human genome took thousands of scientists and more than $3 billion, there are also examples at the other extreme of single individuals like the reclusive Russian mathematician Grigory Perelman, who had turned down both the Fields Medal and the Clay Millennium Prize,[6] and India's own Srinivasa Ramanujan,[7] both of whom worked virtually in isolation and at no cost to the exchequer and yet produced world class research. Although such lone rangers are rare, their work will also form part of the universal knowledge pool of science.

Scientists build on what is already known. Cooperative or competitive, lone rangers or working as a team, scientists depend to a great extent on the contributions to knowledge made by others across space and time — scientists working in any part of the world and those who have contributed to science in the past. As Sir Isaac Newton said, "if I have seen further it is only by standing on the shoulders of giants."

Information is the key to science development. It helps scientists and scholars not only advance knowledge but also their own professional status. In science, information is a two-way street: scientists make the new information they generate available to as many of their peers as possible, and seek and obtain as quickly as possible the information generated by other researchers that is relevant to their own research.

Down the centuries, since scholarly communication is said to have begun in ancient Greece more than 2,000 years ago, research has typically been communicated in parallel by speech and writing.[8] However, since the beginning of modern research in Western Europe during the sixteenth and seventeenth centuries flow of information is facilitated largely by professional journals. In those early days science was known as natural philosophy! Ever since the first professional journals — *Journal des Sçavans* in France and the *Philosophical Transactions of the Royal Society* in England — commenced publica-

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3 Bazell R (2008), Dispute behind Nobel Prize for HIV research: French researchers win for virus discovery; controversial scientist shunned. http://www.msnbc.msn.com/id/27049812/ns/health-second_opinion.

4 Human Genome Project Information, http://www.ornl.gov/sci/techresources/Human_Genome/home.shtml.

5 Kroes N (2010), CERN...fascinating insight into scientific collaboration. http://blogs.ec.europa.eu/neelie-kroes/tag/cern-eu/.

6 Gessen M (2010), *Perfect Rigor: A Genius and the Mathematical Breakthrough of the Century* , Houghton Mifflin Harcourt, Boston.

7 Kanigel R (1991), *The Man who Knew Infinity: A Life of the Genius Ramanujan*, Scribner, New York.

8 Meadows A J (1997), *Communicating Research*, Academic Press, San Diego.

tion in 1665, the printed journal has become the primary vehicle of knowledge dissemination among scientists and scholars. (The field of computer science, where conferences are preferred, is an exception.) Scientists also meet other scientists, present papers at conferences, and write reports, monographs, textbooks, etc. But journals occupy a special place in scholarly communication, not only because they help scientists get the status of a permanent record for their new findings but also to establish 'priority', something scientists guard jealously. Papers are given away for free and scientists do not normally get paid for reporting their research in journals or for reviewing papers received from journal editors before they are published, whereas publishers pay them for writing textbooks and monographs.

What are journals? They are nothing but a collection of articles written by different authors appearing periodically. They provide a platform for researchers in a field, sometimes very narrow (e.g. *Journal of Raman Spectroscopy*, *Annals of Maxillofacial Surgery*) and at others all embracing (*Lancet* covering all of medicine, and *Current Science*, *Nature* and *Science* covering all of science), to announce their latest findings to other scientists around the world. In the early days there were a few scientists and a few journals, but in the past three centuries the number of scientists has increased exponentially. Since the early 1700s, the number of scholars in scientific disciplines has doubled every 15 years, according to de Solla Price.[9] And the questions they ask and the experiments they perform have become more complex and have led to the evolution of new fields, subfields and research fronts which in turn have led to the emergence of a large number of professional societies and specialty journals. Obviously, there will be hundreds of thousands of articles published every year and even larger number of references to earlier articles as it is an accepted convention to acknowledge 'the shoulders of giants'.

Journal editors do not accept for publication all manuscripts they receive. They get them reviewed by other scientists with expertise in the field and this process is called peer review. Some manuscripts are recommended straightaway, some are found not good enough for publication and many are returned to authors with comments and suggestions for revision. "Peer review results in 1.3 million learned articles being published each year and it is fundamental to the integration of new research findings in hundreds of fields of inquiry and represents a unique, global collaboration in evaluation and quality assurance," says the International Association of Scientific, Technical & Medical Publishers (STM).[10]

In the past more than 340 years, the scholarly journal has not changed much. No doubt there have been changes both in the way the content is presented and in the way

[9] de Solla Price D J (1963), *Little Science, Big Science*, Columbia University Press, New York.

[10] Peer Review Survey 2009: Preliminary Findings (2009), S*ense about Science,* http://www.senseaboutscience.org.uk/index.php/site/project/395.

journals are produced. The leisurely prose of people like Oldenburg and Faraday has given way to the terse, almost cryptic, language of today's science journals where most experimental details are replaced by a superscript or a footnote (reference to an earlier paper). Certainly the papers do not begin with 'Dear Sir' as it did in the early years! Today's journals are no longer printed using the movable type invented by Guttenberg but use computer-composed text. And many of them have gone online. Today's journals carry a variety of papers such as full-length original research papers, short communications, review articles and letters.

As knowledge in a given area started growing fast, it became difficult for most practitioners to keep pace with developments. That led to two different developments, one at the cognitive level and the other at the level of packaging information.

At the cognitive level, to be able to manage knowledge growing at a fast pace scientists divided fields into subfields and further into narrower specialties. For example, chemistry was organized into physical chemistry, organic chemistry, inorganic chemistry, nuclear chemistry, etc., and in turn organic chemists started specializing in heterocyclic compounds, steroids, physical organic chemistry, synthetic organic chemistry, natural products chemistry, etc. However, all of scientific knowledge is a single whole with different fields and subfields related to each other, some are close and others are distant. The unity of sciences is revealed beautifully in the diagram 'Scientific paradigms'. [See Appendix 1] This notion of the unity of sciences is central to science. We now see scientists originally trained in physics or engineering working on biological problems of great importance or working as economists in the World Bank and hedge fund managers in Wall Street. Also, areas such as complexity science and nanotechnology attract bright minds from all fields.

At the level of packaging knowledge, the emergence of review journals such as *Chemical Reviews* and *Annual Review of Microbiology*, abstracting services such as *Chemical Abstracts* (now *SciFinder Scholar*), current awareness services such as *Current Contents*, and multidisciplinary citation indices such as *Science Citation Index* (now part of *Web of Science*) helped overcome the problem of dealing with the unmanageable growth of knowledge to some extent.

With the rising number of journals, academies and societies which were traditionally publishing them could no longer cope with the numbers. And enterprising commercial publishers started taking over the burden of publishing many of the journals. That paved the way for privatization of knowledge. Today there are reportedly 25,000 refereed journals in the areas of science, technology and medicine (STM), many of them published by commercial publishers. As of late 2010, Elsevier published 1610 journals, Springer 588

journals and Lippincott Williams & Wilkins 299 journals.[11] According to a 2009 report, "The scholarly journal marketplace has consolidated in recent years. Three companies dominate: Elsevier, Springer, and Wiley. Elsevier is the dominant force in science, technology, and medical (STM) publishing, with three times the market share of its closest competitor. Commercial publishers have established considerable monopoly power, playing a role in 60 per cent of all peer-reviewed journals, owning 45 per cent and publishing 17 per cent on behalf of non-profit organizations. In STM, seven major commercial publishers account for 30 per cent of peer-reviewed titles but 60 per cent of the market's revenue." [12]

With the advent of new technologies such as the Internet and the World Wide Web, it became possible for scientists around the world to look for alternatives to journals. For example, in 1991 Paul Ginsparg of Los Alamos National Laboratory (LANL) came up with arXiv, an electronic preprint service for the physics community.[13] Although there had been preprint services for physicists earlier, such as the ones at the Centre for Research in Nuclear Energy, Geneva (CERN) and Stanford Linear Accelerator laboratory (SLAC), it was arXiv which really revolutionized sharing of information among physicists in a fully online manner.

With dwindling budgets and rising costs of journals, scholarly communication today is at a crossroads. We need to think seriously about how scholarly information can be shared efficiently and at an affordable cost. Even librarians in affluent institutions in the United States feel that current methods of scholarly communication are unsustainable and proving to be excessively restrictive.

Scholarly Communication and Evaluation of Science

While the main purpose of scholarly communication is, as the very name indicates, communicating results of scientific research among scientists and scholars, it has acquired an additional function, viz. evaluation of scientific research. Research is done by researchers not only for uptake by other researchers but also for the benefit of the public that funds the research. What is more, the research uptake not only contributes to research progress but also to one's own career advancement, recognition by way o of rewards and funding. This aspect of scholarly communication takes advantage of the networked nature of scientific papers — later papers citing earlier papers and several papers quoting the same paper.

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[11] Koehlmoos TP and Smith R (2011), Big Publishers Cut Access to Journals in Poor Countries, *The Lancet*, 377: 273 -276. DOI: 10.1016/S0140-6736(11)60067-6.

[12] Young P (2009), *Serials Crisis and Open Access: A White Paper for the Virginia Tech Commission on Research*; http://scholar.lib.vt.edu/faculty_archives/YoungP/OAwhitepaper.pdf.

[13] Ginsparg P (2001), Creating a Global Knowledge Network, Second Joint ICSU Press — UNESCO Expert Conference on Electronic Publishing in Science; http://people.ccmr.cornell.edu/~ginsparg/blurb/pg01unesco.html.

In the 1950s, Eugene Garfield, an intrepid scholar-entrepreneur, saw the possibility of using the links between the articles and the cited references to construct a citation index and define impact factors for journals (based on how often an article published in a journal was cited on average in a given period) to measure the importance of different journals in their fields.[14] The Institute for Scientific Information which he founded (and which currently forms part of Thomson Reuters) started bringing out *Science Citation Index* (*SCI*) and providing journal impact factors in the early 1960s.[15] Garfield followed it up with a novel application, viz. The indices he developed to studying science.[16] Since then policy makers and administrators in governments and funding agencies use citations and impact factors as performance evaluation indicators. For example, the National Science Foundation, USA, uses publication and citation data taken from *SCI* in its biennial report *Science and Engineering Indicators* to assess the status of science in the US and compare it with the status of science in other countries.[17] To give another example, in an article published in *Nature*, Sir David King, the former Chief Scientific Advisor to the Government of UK, used publication and citation data to show that eight countries, led by the USA produced almost 85 per cent of the world's most highly cited (top 1 per cent) publications between 1993 and 2001 and the top 31 countries accounted for 97.5 per cent of most highly cited papers while 162 other countries produced less than 2.5 per cent.[18] A recent Royal Society report[19] provides a number of science indicators. Here is a summary by Siemens[20]:

- In 2008, the world invested almost $1.2 trillion on research, and there were 7.1 million researchers who together authored 1.58 million research publications (of which less than 9 per cent came from social sciences and humanities).
- The G-8 countries are still leaders in research, but will be overtaken by China in the near future. In all probability China may overtake the United States as the world's leading publisher of research papers as early as 2013.

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[14] Garfield E (1955), Citation Indexes for Science: A New Dimension in Documentation through Association of Ideas, Science, 122: 102-111; http://www.garfield.library.upenn.edu/essays/v6p468y1983.pdf.

[15] Garfield E (1964), *Science Citation Index* — A New Dimension in Indexing, *Science*, 144: 649 – 54; http://www.garfield.library.upenn.edu/essays/v7p525y1984.pdf.

[16] Garfield E (1970), Citation Indexing for studying science, *Nature*, 227: 669 – 671; http://www.garfield.library.upenn.edu/essays/V1p132y1962-73.pdf.

[17] National Science Board, (2010). *Science and Engineering Indicators 2010*. National Science Foundation, Arlington, VA; http://www.nsf.gov/statistics/seind10/front/fronts6.htm.

[18] King, D A (2004), The Scientific Impact of Nations, *Nature*, 430: 311-316 DOI: 10.1038/430311a.

[19] The Royal Society (2011), *Knowledge, Networks and Nations: Global Scientific Collaboration in the 21st century,* RS Policy document 03/11; http://www.ukcds.org.uk/_assets/file/publications/2011-03-28-Knowledge-networks-nations.pdf.

[20] Simmons G (2011), Knowledge, Networks and Nations, Elearnspace, http://www.elearnspace.org/blog/2011/04/04/knowledge-networks-and-nations/comment-page-1/#comment-78747.

- There is a growing need for open access — not only in developing countries, but for the benefit of science globally.
- 65 per cent of R&D is funded by private enterprise (up from 52 per cent in 1981) in OECD countries. Developing countries have a greater percentage of government funded research.
- Collaboration is on the rise — researchers, institutions, and countries are interconnected in their research.
- Science is happening in more places but it remains concentrated. There continues to be major hubs of scientific production — flagship universities and institutes clustered in leading cities. What is changing is that the number of these hubs is increasing and they are becoming more interconnected.
- Foundations (Bill & Melinda Gates in particular) are playing an important role on global health research, and there are concerns about transparency of foundations in general.

In a recent paper, Madhan *et al*. have shown that in the ten years 1998 – 2007 there were less than 800 papers from India that were cited at least 100 times, compared to more than 9,000 papers from France and Japan.[21] This asymmetry between the rich and the poor countries persists and is not likely to go away soon.

Figure 1, taken from Worldmapper shows the severity of the asymmetry in the production of scientific papers graphically. While the United States is bulging, the entire continent of Africa, but for publications from South Africa, is all but a thin streak and Latin America is famished too. Please note this figure is based on publication data for 2001. If we use data for 2010, both China and India will be looking much larger.

Hundreds of literature-based studies are carried out annually on international collaboration among scientists, academia-industry interaction, relevance of research to local needs, etc. Scientists are happy when their work is cited by others as often increased citations help in winning fellowships, awards, promotions and research grants. Journal publishers are happy when articles published in their journals are cited as increase in citations leads to increase in impact factors and the journals go up in the pecking order. Indeed, there is intense competition among journals and research institutions to publish more highly cited papers. However, it must be understood that as far as quality of research is concerned peer review is the most accepted yardstick.

[21] Madhan M, Chandrasekar G and Arunachalam S (2010), Highly Cited Papers from India and China, *Current Science*, 99: 738-749 http://www.ias.ac.in/currsci/25sep2010/738.pdf.

Doing science (or working in any other area of scholarly pursuit) in a developing country has its own problems. First, the facilities available — funds, laboratories, libraries, infrastructure, opportunities to attend conferences and meet peers — are meagre. Second, there is an inherent bias among many scientists in the developed countries about the capabilities of scientists from the developing countries. *New Scientist* once commented in an editorial that when it came to choosing manuscripts for publication, editors of reputed international journals would more likely select the one from Harvard in preference to the one from Hyderabad even though both manuscripts may be of comparable quality.[22] And third, and most important of the three, when developing country researchers want to communicate their findings, they are virtually forced to send them to an American or west European journal in order to gain recognition among peers and visibility, although often they fail to get their manuscripts accepted by these journals. Even within their own countries, publishing in these journals is considered important. As a result, developing countries find it extremely difficult to establish high quality journals and quality peer reviewing.

[22] Unsigned editorial (1976), It is Not What You Know — If There are Biases in Scientific Publication Editors Must Take the Blame*, New Scientist*, 2106: 3.

Chapter 2: Science in India

Structure and Organization of Science in India

Scientific and scholarly research in modern India goes back to the establishment of research universities during the British rule in the latter half of the nineteenth century, picked up momentum during the early twentieth century when men like Srinivasa Ramanujan, C V Raman, J C Bose, S N Bose, K S Krishnan and M N Saha made world class discoveries. Then there was a long period of stagnation before it saw signs of revival a few years before independence. Post-independent India saw the setting up of a very large number of research institutions, universities and think tanks and emergence of new professional societies, which in turn led to the publication of new journals and growing number of research papers. The past decade has seen a rapid rise in both R&D investment and research output. As is to be expected, such rapid growth in quantity did not lead to quality output. Reviewing Angela Saini's recent book *The Geek Nation: How Indian Science is Taking Over the World* in *The Independent*, historian Chandak Sengoopta asks "Make up your own list of Indians who have had a global impact and there will be few scientists on it. Indian artists, writers and social scientists have achieved vastly more, and for a fraction of the state investment that has gone into science and technology. Has Indian science ever produced a Ravi Shankar or, for that matter, a Raj Kapoor?"He sums up: "Pockets of excellence notwithstanding, the overall state of Indian science and technology continues to be dispiriting."[23]

Scientific research in India is largely performed by three types of institutions: research laboratories under different Ministries of the Central Government, higher educational institutions, and industrial research laboratories. Non-governmental organizations, think tanks and some state government institutions perform some research. In recent years, a number of transnational companies have set up R&D centres in India. Figure 2 is an organogram of R&D in India and Figure 3 is a simple representation of R&D under the central government.

There were 3,960 research performing institutions in India in 2006, according to *Research &Development Statistics at a Glance*, 2008.[24] Besides, there were 358 universities, 13 institutions of national importance and 20,677 colleges. The numbers might have increased in the past five years. But not all of these institutions perform research.

Of these, the institutions under the central S&T ministries and departments account for the bulk of India's research output. These include Council of Scientific and Industrial

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[23] Sengoopta C (2011), Book Review: *Geek Nation: How Indian Science is Taking over the World*, by Angela Saini, *The Independent*, 1 April 2011.

[24] Department of Science and Technology (2008), *Research and Development Statistics at a Glance (2007-2008)*, Ministry of Science and Technology, Government of India; http://www.dst.gov.in/scientific-programme/r&d-eng.pdf.

Research (CSIR), Defence Research & Development Organization (DRDO), Department of Atomic Energy (DAE), Department of Biotechnology (DBT), Department of Science and Technology (DST), Department of Space (DoS), Ministry of Earth Science (MoES), Indian Council of Agricultural Research (ICAR), Indian Council of Medical Research (ICMR), Ministry of Communication and Information Technology(MCIT), Ministry of Environment and Forests (MoEF) and Ministry of Non-conventional Energy Sources (MNES). Major higher educational institutions such as Indian Institute of Science (IISc) and, Indian Institutes of Technology (IITs) also make substantial contributions.

Research is carried out in a wide variety of fields in India and every field and subfield has one or more professional societies, some of them going back to the eighteenth century. The oldest of them is the Asiatic Society, Calcutta, founded by Sir William Jones on 15 January 1784. Apart from the many professional societies there are several Academies in India. Notable among them are the Indian Academy of Sciences, Bangalore (founded in 1934); Indian National Science Academy, New Delhi (1935); National Academy of Sciences, India, Allahabad (1930), Indian National Academy of Engineering, New Delhi (1987), National Academy of Agricultural Sciences, New Delhi (1990), and National Academy of Medical Sciences, New Delhi (1961).

Research is carried out at different levels as well. At the one end, scientists at institutions like the Tata Institute of Fundamental Research and Harish Chandra Research Institute carry out research in advanced topics in frontier areas of theoretical physics, radio-astronomy, molecular biology, etc., and try to publish their findings in high impact journals, and at the other end researchers engaged in identifying active principles in indigenous medicinal plants, solving local problems such as producing cooking gas from plant and animal waste, eradicating mosquitoes from residential areas, etc. and publishing their work mostly in Indian journals. One is not inferior to the other and developing countries need both and that is why funding agencies support both kinds of research. But from the standpoint of the global perspective there is a big difference: the former will be evaluated using the same yardsticks as science carried out in the best laboratories of the world, viz. using citation counts, impact factor of the journal, etc., and the latter will be evaluated by its immediate impact on people's lives. One would not expect papers on the application of science to rural development to get published in a high impact journal or be cited a large number of times.

Changing face of Indian Science

The last few years have seen a perceptible change in the geography of science, with Asian countries led by China and India increasing their share of the world's research papers. For example, Asia has overtaken Europe and USA to become the largest producer of research papers in chemistry, according to a study released by Thomson Reuters on 28 March 2011. Researchers in Asia now contribute 43 per cent of chemistry papers pub-

lished, with China alone accounting for 20 per cent, compared to the European Union's 32 per cent and the US share of 18 per cent.

China and India are also increasing their investments on R&D at a rate higher than that of the advanced countries. Taiwan, South Korea and Brazil have also raised their science and technology profile. According to the latest *Global R&D Funding Forecast* by Battelle and *R&D Magazine* , India's gross expenditure on R&D is expected to rise from USD 28.1 billion (PPP) in 2009 to USD 33.3 billion in 2010 and USD 36.1 billion in 2011. India's investment amounts to 2.5 per cent of the global R&D spending in 2009, 2.9 per cent in 2010 (when recession caused decreased investments in most of the western world), and 3.0 per cent in 2011. Incidentally, China's investment amounts to a much larger share of global R&D spending, viz. 11.2 per cent in 2009, 12.3 per cent in 2010 and 12.9 per cent in 2011. *Nature* reported in early 2009 that government spending on science research in India was likely to raise from roughly 0.9 per cent of gross domestic product in 2009 to 1.2 per cent by 2012.[25]

Table 1 gives a quick overview of the number of research papers published by Indian researchers and indexed in *Web of Science* (*WoS*), a database produced by Thomson Reuters and used worldwide in formulating science policy. From 2000 to 2004 the number of papers indexed in the *Science Citation Index part of WoS* grew by 27 per cent, but from 2004 to 2008 it grew by 41 per cent. The number of Indian papers indexed in *Social Science Citation Index* part of *WoS* remained virtually constant during 2000 – 2004 (with a slight decrease in 2001 and 2002), but increased by 48 per cent between 2004 and 2009. Table 2 gives data on the number of papers from India and percent share in world's publications over two five-year periods. We see that in virtually every field India's share of the world's publications is increasing. Please note this table includes only the top ten fields by India's share of world publications. Overall, India accounted for 2.94 per cent of world publications in the five years 2004 – 2008. Figure 4, taken from Adams *et al*., shows the relative growth rates of science in India and selected G8 countries. "India's recent increase is striking, rising sharply in contrast to the other nations' largely static changes in growth since 2000. If this trajectory continues then India's productivity will be on a par with most G8 nations within 7 to 8 years and over take them between 2015 and 2020," says Adams *et al*.[26]

While it is gratifying to note that both the number and percent share of papers from India are on the rise, the impact of Indian research as measured by citation indicators con-

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[25] Jayaraman, K S (2009), India's Electioneers Make Bold Pledges on Science, *Nature*, 458: 956-957 DOI: 10.1038/458956a.

[26] Adams J, King C and Singh V (2009) *Global Research Report — Research and Collaboration in the New Geography of Science: India*, Evidence Ltd, London. http://science.thomsonreuters.com/m/pdfs/grr-india-oct09_ag0908174.pdf.

tinues to be poor. Year after year, studies carried out by the Research Group of Thomson Reuters show that in no field Indian research publications have been cited more than the world average, as shown in Table 3.

(That is not to say that all papers from India are poorly cited. Surely there are outstanding scientists whose papers have won a very large number of citations as shown by Madhan *et al*.[27]. What we are talking about is the national average.) Also, as most Indian journals are not indexed in *SCI*, are not assigned impact factor, and do not have a large subscriber base, papers published in them are not read by many. Table 4 lists the impact factors of 35 Indian journals as seen from the 2009 edition of *Journal Citation Reports*. Only three titles have an impact factor greater than 1.00. Clearly, Indian science has a visibility problem.

To overcome this problem, many Indian publishers are tying up with western publishing companies. Almost in all such cases the initiative has come from the western publishers who want to enlarge the collection of journals under their banner. For example, a few years ago Springer approached the Indian Academy of Sciences, which publishes nine research journals and a popular science journal aimed at students, and successfully negotiated an agreement to market the Academy's journals outside India. A similar effort by the Nature Publishing Group for a tie-up with *Current Science* did not go through. There have also been efforts to buy out journals published by Indian commercial publishers and even to take over Indian publishing companies.

Now that we know where Indian science stands - low but increasing research productivity helped by increasing investments on R&D, and low but moderately improving visibility — what should we do? The answer is simple: adopt open access as a national policy. Adoption of open access alone can improve visibility and impact of Indian science, and we should encourage the rest of the world to adopt open access so we can access relevant research information.

[27] Supra note 21.

Chapter 3: Open Access

What is Open Access?

Open Access is free, immediate, permanent online access to the full text of research articles for anyone, webwide, without the severe restrictions on use commonly imposed by publisher copyright agreements.

There are two roads to open access:

(1) the "green road" of open access self-archiving, where authors provide open access to their own published articles, by making their own e-prints (the final accepted version) freely available to all by placing them in institutional or central repositories;

(2) the "golden road" of open access journal-publishing, where journals provide open access to their articles (either by charging the author/institution, a publication or processing fee instead of charging a subscription fee from the user/institution, or by simply making their online edition free for all and recouping the publication and production costs from other source).

Open access was first defined in this manner in the Budapest Initiative of 2002 that arose from a meeting convened by the Open Society Institute (OSI) on December 1-2, 2001 with a view to accelerating progress in the international effort to making research articles in all academic fields freely available on the Internet.[28]

A few months after the meeting at Budapest, on 13 April 2003, a group consisting of biomedical researchers, editors, publishers, funders and librarians met at the Howard Hughes Medical Institute, Chevy Chase, MD, USA, and came up with a more elaborate definition, which came to be known as the Bethesda Statement:[29]

> An Open Access Publication is one that meets the following two conditions:
>
> (1) The author(s) and copyright holder(s) grant(s) to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship, as well as the right to make small numbers of printed copies for their personal use.

[28] http://www.soros.org/openaccess.
[29] http://www.earlham.edu/~peters/fos/bethesda.htm.

(2) A complete version of the work and all supplemental materials, including a copy of the permission as stated above, in a suitable standard electronic format is deposited immediately upon initial publication in at least one online repository that is supported by an academic institution, scholarly society, government agency, or other well-established organization that seeks to enable open access, unrestricted distribution, interoperability, and long-term archiving (for the biomedical sciences, PubMed Central is such a repository).

On 22 October 2003, heads of many German research organizations and several others signed the Berlin Declaration, which used almost (but not exactly) the same language as the Bethesda Declaration except for the inclusion of cultural heritage in its ambit.[30]

That open access should have engaged the serious attention of so many scientists and policy makers on both sides of the Atlantic is a testimony to the strong belief in the notion of public access to publicly funded research.

The two roads to open access, viz. open access self-archiving and open access publishing, are complementary. Normally, by open access we mean open access to refereed research papers. But open access does not exclude other forms of scholarly material such as preprints, theses, conference papers and reports.[31]

As pointed out by Peter Suber,[32] open access is compatible with copyright, peer review, revenue (even profit), print, preservation, prestige, career advancement, indexing, and other features and supportive services associated with the traditional form of scholarly literature.

Why open access?

A research academic essentially performs two functions: doing research and sharing it with others. The way research findings are disseminated today — by publishing it in over-priced journals — is utterly inadequate to meet the main purpose of research, viz. maximizing knowledge. If 100 per cent of research articles published in about 25,000 peer-reviewed journals were freely accessible through open access, then the usage, impact, productivity and progress of research would be maximised and the scientific enterprise would become more efficient. The likelihood of wasting resources and time on duplicative investigation will decrease when researchers have comprehensive access to

[30] http://oa.mpg.de/lang/en-uk/berlin-prozess/berliner-erklarung/.
[31] Sci-Bytes (2010), Science in India, 2004-08, *ScienceWatch.com;* http://sciencewatch.com/dr/sci/10/jan10-10_2/
[32] Suber P, (First put online June 21, 2004. Last revised November 6, 2010), *Open Access Overview*, http://www.earlham.edu/~peters/fos/overview.html.

the results of earlier work, and cross-fertilization between disciplines and specialties will also be enhanced, says Jan Valterop.[33] The problem with the traditional model of subscription-based journals is that it tends to treat what is essentially a public good as a commodity.[34]

By treating knowledge, information and research as a commodity and charging huge subscription costs to access that commodity, we are limiting the number of people who can afford to access it and the public benefit of research.[35] Vexed with the commodifiers of knowledge, viz. large publishing houses, many academics were looking for new, non-commercial methods to share knowledge. In the print-on-paper era it was not possible to make 100 per cent access to research articles, but with the advent of the Web, open access can provide free access to all articles immediately and permanently. Open access has the potential to truly democratize knowledge.

Open access would be particularly beneficial to researchers in the developing countries who are working under very difficult conditions, especially in regard to information access. To do research, they need access to essential global research findings, but they do not have such access. For example, a survey carried out a few years ago by the World Health Organization revealed that in the 75 countries with a GNP per capita per year of less than $1,000, 56 per cent of medical institutions had not subscribed to a single journal; in countries with a GNP between $1-3 thousand, 34 per cent had not subscribed to any journal and a further 34 per cent had an average of two subscriptions per year.[36] What kind of research is possible in these institutions?

It is not merely journals from the North that developing country scientists need. They need to read what their colleagues from the South publish as well. Indeed, often what is published by colleagues from the South may be directly relevant to their work as they may be dealing with the same problems. Unfortunately many journals published in the South do not have a large subscription base or a sound marketing back-up. Scientists in the North need to read journals published in the South as well, especially in areas such as public health. The international outbreak of SARS, sea level rise and global warming are all global problems and know no national boundaries. They need global efforts to solve.

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[33] Valterop (2008), Open Access Publishing, in E-resources Management Handbook, United Kingdom Serials Group (UKSG), 117-121; DOI: 10.1629/9552448_0_3.12.1; http://uksg.metapress.com/link.asp?id+dplay0kyn6nkvk7u.

[34] Supra note 32.

[35] Supra note 32.

[36] Aronson B, (2003), Improving Online Access to Medical Information for Low-Income Countries, *New England Journal of Medicine*, 350: 966-968.

Open access's value to the developing countries is likely to increase manifold as the penetration of the relatively cheaper mobile telephones in the poorer countries of the world increases at a much faster pace than the more expensive personal computers and laptops. And the mobile phones are becoming smarter. More researchers will have access to Internet and hence open access material.

Open access can benefit the lay public as well. Why the public should care for what is published in the rarefied areas of scientific knowledge, one may ask. To anyone who is following the debates on climate change, genetically modified crops and generic drugs it would be clear that these debates are as much cultural, social and political as they are scientific. In particular, as Prof. Andrew Hoffmann of MIT points out in a recent interview to the *New York Times*, the position people take on these issues is largely political and based on the values and beliefs they hold. That is why it is all the more important in a world which is getting more and more complex to promote the public understanding of science, and what better way than making all science open and freely accessible to all. Added to that, there are initiatives now which take the common citizens as partners in performing science. For example, the Einstein@Home project[37] discovered a radio-pulsar and the LHC@Home project[38] enables volunteers to contribute idle time on their computer to help physicists develop and exploit particle accelerators, such as CERN's Large Hadron Collider. A number of amateur astronomers now use sophisticated telescopes attached with smart phones to look at the night sky and identify new planets.

"I think that the whole arena of medical research publication and reporting needs a shake up and needs to be handled in a different way. I think that we could be eons ahead of where we are today if we had a very different system for sharing results," says Sharon Terry of Genetic Alliance, a patient advocacy group.[39]

Serials crisis

It is not only institutions in developing countries which find it hard to access research information. Librarians in affluent universities in North America are facing a crisis too. As publishers are accountable to their shareholders more than to scientists who publish in and read their journals and librarians who subscribe to them, their main motive is profit rather than providing scientists affordable access to information. Publishers' greed led to a spiralling rise in the subscription price of journals, especially in the past three decades, with journal subscription costs rising at many times the general inflation. According to the Association of Research Libraries (ARL), the median subscription cost of a journal rose from $87 in 1986 to $267 in 1999 at an alarming 9 per cent annual growth rate. In 1986, research libraries in North America purchased on average 16,312 serial titles and

[37] Einstein@Home.org
[38] http://lhcathome.cern.ch/.
[39] http://www.biomedcentral.com/openaccess/archive/?page=features&issue=21.

32,679 monographic titles. By 1999, research libraries purchased 15,259 serial titles, or 1,053 fewer, and 24,294 monographic titles, or 8,385 fewer.[40] Many libraries were compelled to divert money meant for monographs to journals and yet they could only subscribe to a much lower number of journals than before.

In the 18 years 1990-2008, the consumer price index rose by about 50-60 per cent but the average cost of journals in certain categories has risen by over 400 per cent, and the median value of serials expenditure of the 113 academic member libraries of ARL rose by 374 per cent, from less than $150 million to more than $709 million in unadjusted dollar figures.[41] Librarians found that even with an increased budget they could get only a smaller number of journals. Between 1986 and 2000, for example, serial unit costs increased by 226 per cent for American research libraries, by 364 per cent for libraries in the UK and by 474 per cent for libraries in Australia. During the same period the spending on these information resources increased by 192 per cent in the US, and 263 per cent in Australia. Yet, the serial titles purchased declined by 7 per cent in the US and 37 per cent in Australia.[42] Figure 5 provided by Hooker[43] and based on the data from Library Journal,[44] Annual Periodicals Price Surveys carried out by Lee Van Orsdel and Kathleen Born,[45] shows how journal prices are going through the roof. The declared profit of three large commercial publishers of science, technology and medicine (STM) journals in 2009 was in the range $234 million - $693 million and the margin of profit as high as 35 per cent.[46] The most recent figures for journal costs in different fields are given in Table 5.

The serials crisis was the last straw on the camel's back that led librarians and researchers in the West to seriously think of alternatives to the prevailing system of knowledge dissemination. Organizations such as ARL, Open Society Institute (OSI) and eEIFL took interest in open access largely because of the serials crisis.

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[40] Trends in ARL Libraries: Introduction to ARL Statistics 1998-99; http://www.arl.org/stats/arlstat/99intro.html.

[41] Kyrillidou M (2000), Research Library Trends: ARL Statistics, *Journal of Academic Librarianship*, 26: 427-436; http://www.arl.org/bm~doc/jal99.pdf.

[42] Webster D (2002), Strategic Challenges Facing Research Libraries, *Report and Proceedings of a Seminar on Managing University Libraries*, held on 26-27 August 2002 at the OECD headquarters in Paris. http://www.oecd.org/dataoecd/54/29/23281169.PDF.

[43] Hooker C W, (2009), Scholarly (Scientific) Journals vs. Total Serials: % price increase 1990-2009, *Open Reading Frame blog*; http://www.sennoma.net/main/archives/2009/04/scholarly_journals_vs_total_se.php.

[44] http://www.libraryjournal.com/.

[45] Van Orsdel L C and Born K, (2009), In the Face of the Downturn, Libraries and Publishers Brace for Big Cuts**,** *Library Journal*, Issue 7; http://www.libraryjournal.com/article/CA6651248.html.

[46] Supra note11.

There are other far more fundamental considerations too. It is not just researchers who need access to research information. Teachers and students wishing to make the class lively, doctors, patients and their families seeking medical information, small businesses looking for product and process-related information, and the lay public generally interested in late international developments in science are also unable to afford access to such information much of which is produced with taxpayers' money. If, as Nobel Laureate Joseph Stiglitz argues, knowledge is a global public good that is central to successful development, then the international community has a collective responsibility for the creation and dissemination of knowledge for development.[47] But there is an increasing tendency to privatize knowledge and strengthen intellectual property regimes. Here is what Arun Narasimhan of IIT Madras says: "As a researcher, I do all the hard work, think of an idea, find the research methods and tools, find the funding if necessary to accomplish certain tasks to realize the idea and see its merit, write the results using the idea and analyze the pros and cons of the idea and send that research article usually to a research journal office comprising of other researchers. The subsequent peer review process that qualifies my idea for its worthiness as original useful scientific knowledge is done by these academics and researchers mostly for no fee. It is a service they all must perform because it will be reciprocated in kind and quality by other researchers in the community to uplift their research work. Strict but free of money. … But the actual publishing of the entire body of research knowledge is done by publishers, the middlemen, (and it is they) who control entirely the key aspects like who could have access to such knowledge, how much profit the publishers could make, what sort of copyright the researcher who generates original knowledge could have and so on."[48]

Every innovation makes use of previously accumulated knowledge — it draws on the global commons of pre-existing knowledge. This issue of the use of the global knowledge commons has been brought home forcefully in the context of bio-diversity, where private firms have prospected for valuable drugs in natural settings in developing countries.[49] Countless numbers of plants used in traditional medical systems of India, China, Africa and Latin America have been drafted into the western medical system through knowledge acquired from local people. Western pharmaceutical companies take away tonnes of plant material from these regions but the local people get hardly any

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47 Stiglitz J E (1999), 'Knowledge as a Global Public Good' in *Global Public Goods: International Cooperation in the 21st Century*, edited by Inge Kaul, Isabelle Grunbuerg and Marc A Stern, published for UNDP by Oxford University Press, New York, 308-325. http://www.undp.org/globalpublicgoods/TheBook/globalpublicgoods.pdf#page=346.

48 Narasimhan A (2008), Open Access Publishing, *nOnoScience*, http://www.nonoscience.info/2008/02/20/open-access-publishing/.

49 Supra note 38.

compensation for their unpatented knowledge, a case of inequitable flow of knowledge from the South to the North.[50]

Basic research and many other fundamental forms of knowledge are not, and almost certainly should not be, protected by an intellectual property regime, points out Stiglitz.[51]

There is a compelling ethical case as well for open access to research findings especially when it is public health that is being compromised by needless access restrictions, says Harnad.[52] But the ethical imperative for open access is far more general: It applies to all scientific and scholarly research findings published in peer-reviewed journals.[53]

Open access also benefits journal publishers as open access increases visibility and use and thereby impact and status, and funding agencies by maximizing the value of research they fund. Thus, open access is a win-win for all stakeholders.

The serials situation in India

Returning to the serials crisis, the situation in India with regard to access was poor about a decade ago although much better than that in most developing countries. But with the formation of library consortia eight years ago and allocation of special funding for these consortia by the government, access to journal literature has improved in India considerably. For example, the largest academic library in India, the one at the Indian Institute of Science (IISc), received only 1,381 print journals in 2002, of which 200 where accessible online. After joining the INDEST consortium[54] of the Ministry of Human Resource Development in 2003, IISc researchers have access to a large number of journals, currently 9,100 [S Venkadesan, private communication]. In contrast, Columbia University received 133,831 serials (journal titles + book series) in 2007 of which 102,053 were purchased; Johns Hopkins University received 105,453 serials (76,065 purchased) and Pennsylvania State University received 88,668 serials (80,912 purchased). Even a smaller university like Delaware received 29,246 serials (20,665 purchased).[55]

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[50] Arunachalam S (1995), 'Science on the Periphery: Can it Contribute to Mainstream Science?, *Knowledge and Policy: The International Journal of Knowledge Transfer and Utilization*, Vol. 8, Number 2, Summer 1995, 68-84. [Revised version of a paper presented at the ORSTOM– UNESCO conference on 20th Century Science — Beyond the Metropolis; September, 1994, Paris]. http://horizon.documentation.ird.fr/exl-doc/pleins_textes/pleins_textes_7/carton07/010008908.pdf.

[51] Supra note 38.

[52] Supra note 41.

[53] Harnad S (2007), Ethics of Open Access to Biomedical Research: Just a Special Case of Ethics of Open Access to Research. *Philosophy, Ethics, and Humanities in Medicine*, 20:31. doi:10.1186/1747-5341-2-31.

[54] http://paniit.iitd.ac.in/indest/.

[55] Kyrillidou M and Bland L (2009), *ARL Research Statistics 2007-2008,* Association of Research Libraries; http://www.arl.org/bm~doc/arlstat08.pdf.

The INDEST consortium helps IISc and Indian Institutes of Technology (level 1 Institutions), National Institutes of Technology, Indian Institutes of Management and Indian Institutes of Science, Education and Research (level 2) and private engineering colleges (level 3) in negotiating with overseas publishers for group subscriptions to journals. There are other consortia which cover laboratories and universities institutions under ICAR, laboratories under CSIR, laboratories under DAE, etc. The INFLIBNET consortium of UGC works with universities.

While the number of journals Indian institutions can access has increased considerably, one wonders whether our scientists, professors and students have taken full advantage of this development. There are people who believe that the transaction has benefited the publishers, whose representatives in India are marketing their journals and databases aggressively, more than the Indian researchers. A study carried out at a premier institution revealed that many journals have not been used at all by faculty and students in several years. In another instance, the senior librarian of a national laboratory under a research council told us that they were paying more than Rs 20 million for a consortium subscription of a multidisciplinary database, but not many people are using the database. We are not arguing that information published in those journals or the database is useless. There is a case for increasing awareness among Indian researchers of the importance of information and there is a need for focused short-term training programmes in scholarly communication.

Some consortia administrators attribute the increase in the number of papers published by Indian researchers in recent years to the large number of journals researchers can access online. This conclusion is farfetched. Writing a research paper and getting it published is at the end of a long process, starting from thinking up an idea, obtaining funds, performing experiments, and so on. The increase in the published output is probably due to the increase in funds allocated for R&D by the government.

Chapter 4: Open Access in India

Let us begin with a bit of history.

Open access did not take as long as printing took to reach the shores of India. It took more than a hundred years for the printing press to reach India in 1556, through a freak of history, after it was invented by Gutenberg.[56] And the first scientific paper in print from India was produced by Garcia de Orta, a Portuguese physician in 1563. It was on Indian plants and drugs. But, as technology progresses it has a tendency to compress telescopically the time delay for newer developments to spread, and it took just about a decade for open access to have a large following in India after it took roots in the West.

Open access in the West in the true sense began with arXiv (1991)[57] and the World Wide Web, if we consider electronic interlinking of information as the enabler of open access. But the idea of open access was much older. We would think the CERN library's reprints collection, followed by the distribution of reprints (and then grey literature) by SLAC preceded arXiv. Two other early open access initiatives were the founding of the journal *Psycholoquy* by Stevan Harnad in 1989[58] and his seminal paper on scholarly skywriting in 1990.[59]

The idea of open access to scholarly literature is not new to India. High energy physicists around the world have been using the CERN preprint repository, the very first such facility set up in the early 1950s, which replaced the earlier system of distributing hundreds of copies of print-on-paper versions of their yet-to-be-published research papers around the same time they would submit the paper to a journal. In the mid-1960s, Stanford Linear Accelerator Centre (SLAC) set up a repository for these reprints. And in 1974, the first grey literature electronic catalogue, SPIRES (Stanford Physics Information Retrieval System) was set up at SLAC. Early Indian high energy physicists, many of whom had worked in the West were using these services. Ever since Paul Ginsparg set up arXiv at the Los Alamos National Laboratory (LANL), many Indian researchers in the areas of high energy physics and condensed matter physics in the better-known institutions started depositing their preprints in arXiv and looking it up for preprints by others. They were later joined by mathematicians, computer scientists, quantum biologists, etc.

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[56] Kesavan B S (1984), History of Printing and Publishing in India, National Book Trust, New Delhi.

[57] Luce, R. E. (2001) E-prints Intersect the Digital Library: Inside the Los Alamos arXiv. *Issues in Science and Technology Librarianship*, Winter 2001.

[58] Harnad S (1991), Post-Gutenberg Galaxy: The Fourth Revolution in the Means of Production of Knowledge. *Public-Access Computer Systems Review* 2 (1): 39 - 53; http://cogprints.org/1580/.

[59] Harnad S (1990), *Scholarly Skywriting and the Prepublication Continuum of Scientific Inquiry. Psychological Science 1: 342 - 343 (reprinted in Current Contents 45: 9-13, November 11 1991).* http://cogprints.org/1581/1/harnad90.skywriting.html.

Besides, Institute of Mathematical Sciences (Matscience), Chennai, set up a mirror server for arXiv.

All this was happening as a matter of routine practice of communicating research and physicists found arXiv a convenient way to access nascent research long before it appeared in a refereed journal. Physicists, as always, were the first to embrace such new developments. What about the others — chemists, earth scientists, life scientists, the biomedical researchers, agricultural researchers and engineers? And even among physicists, what percentage of Indian physicists deposits their preprints and searches arXiv to learn about current developments? One really does not know.

The history of open access in India can be traced through major events, some of which helped raise awareness and implementation and the others had policy implications. The open access movement in India started with a few individuals who were influenced by the work of a few eminent open access champions. Initial efforts took place at M S Swaminathan Research Foundation (MSSRF), NCSI-IISc, Bangalore, Mysore University, and Documentation Research Centre of the Indian Statistical Institute, Bangalore (DRTC-ISI). While efforts at Mysore University, influenced by Ed Fox of Virginia Tech, focused on building repository for electronic theses and dissertations [See Box 1, Vidyanidhi (Electronic Theses and Dissertations].

Box 1, Vidhanidhi (Electronic Theses and Dissertations)

Vidyanidhi Digital Library[60], one of the earliest Electronic Theses and Dissertations (ETD) initiatives in India, has been online since 2002. It began as a pilot study in 2000 with sponsorship from the then National Information System for Science and Technology (NISSAT), Department of Scientific and Industrial Research (DSIR), Government of India. Vidyanidhi expanded into a national initiative with support from the Ford Foundation in 2003. Today, it is one of the largest repositories with nearly 12,000 full text and more than 1, 30,000 metadata records of Indian theses.

After a discussion with Prof. Ed Fox, Prof. Shalini Urs of the University of Mysore submitted a project proposal to NISSAT in 1999. In 1999 she presented a concept note on the role of ETDs in India at the UNESCO Workshop on an international project of tronic dissemination of theses and dissertations.[61] UNESCO in its support for ETDs sanctioned a project to collaboratively write an International Guide for ETDs.[62]

[60] www.vidhyanidhi.org.in.

[61] Urs Shalini R, (1999), TD Initiatives in India- proposed Mysore University ETD Project. Paper presented in Workshop on an international project of electronic dissemination of thesis and dissertations held by UNESCO at Paris on 27- 28 September 1999. Available at http://www.unesco.org/webworld/etd/contributions.html.

[62] The UNESCO Guide for Creating Electronic Theses and Dissertations (ETDs) written collaboratively by an international community and coordinated by Shalini Urs, 2002.

The Vidyanidhi pilot studied the feasibility of ETDs in India and a report was submitted to NISSAT in 2002.The pilot study examined the PhD workflows of more than 70 universities; practices of writing and archiving electronic doctoral theses; and the technological requirements of an eTheses repository. The continuation and expansion of Vidyanidhi was possible due to the munificent grants by the Ford Foundation in 2003 and 2005. The main mission (in addition to building an open access repository) of Vidyanidhi under the Ford Foundation support was to lead the advocacy of and spur the ETD movement in India.

Vidyanidhi began its advocacy for ETD movement in India by organizing a high level meeting of Vice Chancellors and chaired by Prof. Arun Nigavekar, the then Chairman of University Grants Commission (UGC), in May 2004 to campaign for and enlist the support of universities to join the movement and also to initiate the national policy for ETDs in India. These efforts resulted in the constitution of an UGC pert committee and subsequently UGC (Submission of data and Full-text of Doctoral Theses in Electronic Format) Regulations, 2005. nidhi also initiated university level ETD policies in several universities such as Delhi University, Jawaharlal Nehru University, Jadavpur University, University of Calcutta, and others. To create the needed momentum for ETD movement in India, a small team of six professionals from potential partnering institutions attended the international ETD 2004 Conference held in Lexington, USA. The Ford Foundation supported this initiative.

Partnering with the National Social Science Documentation Centre (NASSDOC), dian Council of Social Science Research, Jamia Millia Islamia University; University of Hyderabad, Vidyanidhi has been able to build of a collection of nearly 12,000 full text theses. Vidyanidhi deploys a hybrid platform with the full text repository built on DSpace, and the metadata repository in Microsoft platform. Vidyanidhi is also one of the early Unicode compliant multilingual databases with Kannada and Hindi search ties and automatic transliteration features.[63] The repository has also served as a test bed for many research studies including development of ontology based semantic web systems.[64]

[63] Urs Shalini R, and Raghavan K S, (2001), Vidyanidhi Digital Library, Communications of the ACM, 44: 88-89.

[64] Angrosh M A and Urs Shalini R(2007), Development of Indian agricultural re-search ontology: semantic rich relations based information retrieval system for Vidyanidhi digital library, Proceedings, ICADL 2007, Proceedings of the 10th in-ternational conference on Asian digital libraries: looking back 10 years and forging new frontiers

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efforts at NCSI and DRTC, where they had regular advanced training programs with special emphasis on computer applications in libraries, addressed understanding construction of repositories and training people in building and maintaining institutional repositories. Efforts at MSSRF led by an editor-turned information scientist focused on policy related issues, advocacy and training.

The Evolution of Open Access in India

Indian Academy of Sciences, founded by Sir C V Raman in 1934, is a remarkable organization in many ways. It takes up issues relevant to India at the right time and selects a balanced mix of people to discuss them. In 1999, the Academy hosted a meeting on geographical information and virtually every one of the speakers focused on public access to geographical information. The proceedings of the meeting were published in *Current Science* in its issue dated 25 August 2000. A seasoned science writer wrote a detailed report.[65] This meeting is probably the earliest in India in the area of openly accessible data.[66]

The evolution of an open access policy in India began at a two-day conference on Advances in Information Access and Science Communication held at M S Swaminathan Research Foundation, Chennai, (MSSRF) on 16 – 17 September 2000, as a tribute to Dr. Eugene Garfield on his 75th birthday. At this conference Prof. Stevan Harnad, open access archivangelist, spoke about 'scholarly skywriting' and the need for every research-performing institution to adopt open access self-archiving of preprints.[67] To many in the audience Harnard's ideas were an eye opener.

The Indian Academy of Sciences convened a meeting in April 2001, a few weeks after the Second ICSU-UNESCO International Conference on Electronic Publishing in Sci-

[65] Ramachandran R (2000), Public Access to Indian Geographical Data, *Current Science*, 79: 450-467; http://www.ias.ac.in/currsci/aug252000/ramachandra.pdf.

[66] Valdia KS (2000), Free access to topographical maps: Coping with natural hazards, assessing development potential and monitoring environmental changes, *Current Science*, 79: 479-480; http://www.ias.ac.in/currsci/aug252000/dprao.pdf; Matthan R (2000), Geographical data – do we have a fundamental right to access it?, *Current Science*, 79, 499-503; http://www.ias.ac.in/currsci/aug252000/rahul.pdf. Also see Supra note 65.

[67] Arunachalam S (2001), Advances in Information Access and Science Communication, *Current Science*, 80: 493 – 494; http://www.ias.ac.in/currsci/feb252001/493.pdf.

ence,[68] where it was decided to encourage Indian S&T journal publishers to adopt electronic publishing.[69] Subsequently, two three-day workshops for editors of S&T journals were held at the Indian Institute of Science during 8 to 10 and 13 to 15 March 2002. These workshops, conducted by Dr. Leslie Chan of the University of Toronto and Ms. Barbara Kirsop of the Electronic Publishing Trust for Development emphasized the need to increase visibility of Indian journals by adopting open access.

A fledgling publisher of medical journals who attended this workshop, Dr. D K Sahu of MedKnow[70] , currently publishes 150 journals of which 148 are open access [See Box 2, Medknow Publications – An Innovative Open Access Journal Publisher].

Box 2, Medknow Publications – An Innovative Open Access Journal Publisher

Medknow Publications, founded 12 years ago by Dr. D K Sahu, a paediatrician, is a publisher for peer-reviewed, online/print+online journals in the area of STM. MedKnow is the largest open access publisher in the world which does not charge author or author institution for submission, processing or publication of articles. Medknow has shown that open access does not adversely affect print subscriptions.

Publishing on behalf of learned societies and associations, currently MedKnow publishes 150 journals (all but two of which are open access). Medknow pioneered the 'fee-less-free' model of open access publishing and provides immediate free access to the electronic editions of the journals majority of which do not charge the author or author's institution for submission, processing or publication of the articles.

MedKnow has successfully put in place an original electronic manuscript submission and peer review system in India.[71] This system is in use for more than seven years and over 50,000 manuscripts have been processed through it. Each MedKnow journal has its own professional, sophisticated and easy to use website. See, for example the Journal of Postgraduate Medicine.[72]

All journals use the OpenURL standard, making it easy for libraries to link users as directly as possible from citation to the full text of the article. MedKnow achieved more

[68] Second Joint ICSU Press - UNESCO Expert Conference on Electronic Publishing in Science held at UNESCO HQ, Paris, 19 – 23 Feb 2001.

[69] Prakash N A (2001), Workshop on Electronic Publishing, Bangalore, March 2002; http://www.ias.ac.in/epubworkshop/.

[70] www.medknow.com.

[71] www.journalonweb.com.

[72] http://www.jpgmonline.com/whatsnew.asp.

than a hundred thousand page downloads in a month.

Most MedKnow journals are archived at multiple places including OAI-compliant e-print repositories and sites such as Bioline International[73]. All the journals are searchable from a single interface on the MedKnow site. The journals are also linked from DOAJ[74] and PubMed through LinkOut.

MedKnow has collaborations with the major bibliographic agencies, subscription agents, internet search engines and secondary aggregating agencies. These collaborations help in increasing the visibility and accessibility of the published papers across the world.

The MedKnow website provides statistical information everyday and it is truly impressive. Here is what one found on 6 April 2011: **150** Total journals, **130** Total associations / societies, **60,682** Total articles, **52,995** Full text articles, **0,155** Manuscripts submitted in 2011, **1,542,153** Articles downloaded in Mar '11, and **50,306** Articles downloaded on Apr 5, 2011.

Writing about a presentation by Dr Sahu, Heather Morrison said: "It is absolutely exquisite — a must-read for every open access advocate!

D.K. Sahu illustrates how open access made it possible for the *Journal of Postgraduate Medicine* to move from fairly limited, India-based accessibility (less than 400 print subscriptions) to awesome usage statistics - often over 3,500 visits per day - from around the world. Citations and article submissions have increased, and the JPGM's impact factor is projected to increase by a very great deal. International submissions have increased, too - perhaps authors from North America and Europe are going to India for their open access solution???"

Subbiah Arunachalam
[Compiled from the MedKnow website[75] and other sources]

and is today the world's largest open access publisher that does not charge a fee either from the author or from the readers. [Although 750 open access journals are published under the label SciELO, it cannot claim this distinction. Strictly speaking SciELO, as its website says, is a meta publisher or a virtual library or a network of collections of journals with the journals themselves being published by many publishers located in 16 countries spread over Latin America, Caribbeans and Western Europe.]

[73] www.bioline.org.br.
[74] www.doaj.org.
[75] www.medknow.com.

In 2001, Dr. T B Rajasekhar of the National Centre for Science Information, IISc, assigned a trainee a project on setting up a repository using EPrints. That led to the setting up of India's first repository, EPrints@IISc, in November 2002 at a time when not many repositories were there in the world [See Box 3, EPrints@IISc – The First Indian Institutional Repository].

Box 3, EPrints@IISc – The First Indian Institutional Repository

Established in 1909, the Indian Institute of Science[76] has grown into a premier tion of research and advanced instruction. Currently there are more than forty departments, centres and units staffed by 2,000 active researchers working in almost all frontier areas of science and technology. It has a high international standing. The Institute has one of the best computing, networking, and experimental facilities for research in the country.

In the last 100 years, the Institute's faculty and students have published around 35,000 papers, as seen from the *Web of Science*.[77] In recent years, IISc has been publishing more than 1,500 research articles annually in almost all frontier areas of science and ogy. Most of these research articles are being published in subscription-based tional journals. Fellow researchers in the country and across the world may or may not have access to these research publications depending on whether their libraries have subscription to the journals in which these articles are being published.

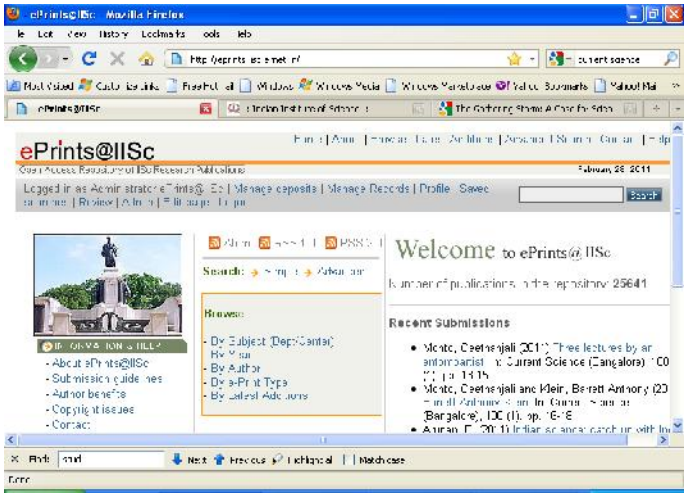
Although we have access to many online scholarly resources, including leading bibliographic and citation databases, data sets and more than 9, 000 electronic journals, our faculty and students do not get all the information they need.

We at IISc realized the problem of the inadequacies of the traditional system of arly communication and were keen to overcome them. One of the trainees of the National Centre for Science Information (NCSI), a unit of IISc, had carried out a project entitled "Archiving of Scientific Literature – Experience with EPrints.org software" in 2001, and had successfully implemented EPrints.org[78] software to create an open-access repository of research publications. When in March 2002, thanks to an initiative taken by Prof. biah Arunachalam the Indian Academy of Sciences hosted two three-day workshops on electronic publishing at IISc, Dr T B Rajasekhar of NCSI took an active part and spoke about metadata. By 2002, the NCSI had a group led by Dr. Rajasekhar which was well aware of developments in open access journals and repositories and their advantages and the EPrints@IISc repository was set up in November/December 2002. It was the try's first and one of the world's earliest institutional repositories (http://eprints.iisc.ernet.in). The team that accomplished this comprised Dr. T.B.

[76] http://www.iisc.ernet.in.
[77] http://www.isiknowledge.com
[78] http://software.eprints.org.

jashekar, Mr. Francis Jayakanth and Mr. Madhuresh Singhal. As for as the software option was concerned, in 2002 there weren't many options, GNU EPrints.org was perhaps the only FOSS software meant for managing IRs.

In 2003, UNESCO invited Dr Rajasekhar to speak on open access initiatives in India.[79]



For the ePrints@IISc tory, GNU EPrints.org software[80] is being used right from the ning and it is serving the needs of our institutional repository very well. To date, more than 26,000 publications of IISc have been loaded into the repository of which, more than 75 per cent of uploads have the corresponding full-texts. Figure 1 shows the screenshot of ePrints@IISc homepage.

Initially, several technical value additions were incorporated in the repository. These include customization of the homepage, displaying of record count in the homepage, playing of recent additions to the repository in the homepage, scripts for importing cords from *Web of Sciences*, *arXiv.org* and *Engineering Village* database, scripts for erating browse views for the 'keywords' metadata field, customizing the ate_views' script for generating alphabetical listing of author names, scripts for generating usage statistics, etc. Most of the said customizations have been incorporated in the later versions of GNU EPrints.org software.

For the last 10 years, the average upload rate is about 85 per cent. Sadly, self-archiving is almost nil. All the uploading is done at NCSI. Another problem concerns uploading legacy papers; uniquely identifying the author names is still a problem. We have not found a solution for this issue yet. There are issues with the age reporting package as well. We are not making any attempt to find solution for the above issues. Hopefully, the newer versions of GNU EPrints will take care of these issues. Future plans for the repository include adherence to the SWORD protocol and installation and configuration of MePrints to build a

[79] http://www.nap.edu/openbook.php?record_id=11030&page=154.
[80] http://eprints.org

user profile system.

NCSI is also maintaining the Institute's theses and dissertations repository,[81] metadata harvesting service for the OAI-compliant institutional repositories in India,[82] and the science information portal.[83]

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[ROAR, however, gives a birth date of 5 April 2004]. He also wrote two of the early papers on open access from India.[84] The year 2004 also saw the birth of three other Indian repositories: Librarians Digital Library, the first DSpace-based repository of India; and the repositories of National Aerospace Laboratories and Indian Institute of Astrophysics. All four repositories are in Bangalore, the city known for the abundance of scientific institutions.

In late December 2003, a special session on open access was organized as part of the Annual General Meeting of the Indian National Science Academy (INSA), held at the National Chemical Laboratory, Pune, where among others both Subbiah Arunachalam and D K Sahu of MedKnow Publications spoke.[85] Following this event, Prof. M S Valiathan, the then president of INSA, signed the Berlin declaration and persuaded the Fellows of the Academy to make its 'proceedings' open access.

The Indian Medlars Centre, a joint effort of ICMR and the National Informatics Centre (NIC) commenced hosting open access versions of many Indian medical journals in 2003. Most of them are published by professional societies. Currently, the number is 40 [See Box 4, Open Access Versions of Indian Medical Journals hosted by Indian Medlars Centre, NIC].

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[81] http://etd.ncsi.iisc.ernet.in.

[82] http://casin.ncsi.iisc.ernet.in/oai

[83] http://www.ncsi.iisc.ernet.in.

[84] Rajashekar TB (2003), Open Access Initiatives in India. *International Symposium on Open Access and the Public Domain in Digital Data and Information for Science*, 10 – 11 March 2003, Paris, France, in *Open Access and the Public Domain in Digital Data and Information for Science: Proceedings of an International Symposium*, The National Academies Press, Washington D.C., 2004, 154-157; http://www.nap.edu/openbook.php?isbn=0309091454&page=154, and Rajashekar TB (2003), Improving the Visibility of Indian research: An Institutional, Open Access Publishing Model. *Indo-US Workshop on Open Digital Libraries and Interoperability*, Washington D.C., June 23 – 25, 2003; www.pitt.edu/~super7/28011-29001/28821.ppt; http://ncsi-net.ncsi.iisc.ernet.in/gsdl/collect/drtbrara/index/assoc/HASHbfb0.dir/doc.pdf

[85] Arunachalam S (2003), India's March towards Open Access, SciDev.Net; http://www.scidev.net/en/opinions/indias-march-towards-open-access.html.

Box 4, Open Access Versions of Indian Medical Journals hosted by Indian Medlars Centre, NIC

No.	Journal
1	Annals of Cardiac Anaesthesia
2	Endodontology
3	Health Administrator
4	Health and Population: Perspectives and Issues
5	Indian Journal of Aerospace Medicine
6	Indian Journal of Allergy Asthma and Immunology
7	Indian Journal of Anaesthesia
8	Indian Journal of Chest Diseases and Allied Sciences
9	Indian Journal of Clinical Biochemistry
10	Indian Journal of Community Medicine
11	Indian Journal of Gastroenterology
12	Indian Journal of Medical & Paediatric Oncology
13	Indian Journal of Medical Microbiology
14	Indian Journal of Medical Research
15	Indian Journal of Nephrology
16	Indian Journal of Nuclear Medicine
17	Indian Journal of Occupational and Enviornmental Medicine
18	Indian Journal of Occupational Therapy
20	Indian Journal of Otolaryngology and Head and Neck Surgery
21	Indian Journal of Pediatrics
22	Indian Journal of Pharmacology
23	Indian Journal of Preventive and Social Medicine
24	Indian Journal of Radiology and Imaging
25	Indian Journal of Sexually Transmitted Diseases
26	Indian Journal of Thoracic and Cardiovascular Surgery
27	Indian Journal of Tuberculosis
28	Indian Pediatrics
29	J.K. Practitioner
30	Journal, Indian Academy of Clinical Medicine
31	Journal of Family Welfare
32	Journal of Indian Academy of Applied Psychology
33	Journal of Indian Academy of Forensic Medicine
34	Journal of Indian Rheumatology Association
35	Journal of Obstetrics and Gynecology of India
36	Journal of The Anatomical Society of India
37	Journal of Indian Association of Pediatrics Surgeons

38	Journal of Indian Society of Pedodontics and Preventive Dentistry	
39	Lung India	
40	Medical Journal Armed Forces India	
41	NTI Bulletin	
42	Trends in Biomaterials and Artificial Organs	

In May 2004, MSSRF organized two three-day workshops on setting up institutional repositories using e-prints software with the help of Dr. Leslie Carr of the University of Southampton and Dr. Leslie Chan. Dr. D K Sahu and Dr. T B Rajasekhar also served as resource persons. These workshops, a follow-up to the suggestion made by Stevan Harnad during his visit to India in 2000, gave hands-on experience to 48 participants, mostly librarians but also some editors and R&D managers. Several participants went on to set up OAI compliant institutional repositories, but not always using e-prints!

In September 2004, Journal of Post Graduate Medicine celebrated its golden jubilee with an international conference on writing, editing and publishing at Seth G S Medical College, Mumbai, and a number of editors, publishers and open access experts spoke at this meeting. A number of medical journal editors attended this conference and learnt about the advantages of open access.

At the Annual Meeting of the Indian Science Congress Association held at Hyderabad in January 2006, a full session was devoted to open access. Dr. P M Bhargava, then Deputy Chairman of the National Knowledge Commission and an eminent life scientist, told that the times were changing and even private pharmaceutical companies were ready to share data from ongoing research into neglected diseases. Alma Swan, who took part in this meeting with support from OSI, also met a small group at ICRISAT and spoke about the advantages of open access institutional repositories. This meeting eventually led to the setting up of an open access repository at ICRISAT and Dr. William Dar, Director General of ICRISAT, joining the Board of Enabling Open Scholarship (EOS) [See Box 5, Mandating open access in an International Research Organization: The ICRISAT Story].

Box 5, Mandating Open Access in an International Research Organization: The ICRISAT Story

In January 2006, at the time of the Indian Science Congress in Hyderabad, an mal meeting took place between Alma Swan and Arunachalam and a small group of search managers at International Crops Research Centre for Semi-Arid Tropics SAT). This was a time when almost no agricultural research faculty or organization had adopted an open access mandate. ICRISAT, founded in 1972 by a consortium of tional agencies comprising the World Bank, FAO, UNDP and the Ford and Rockefeller Foundations, was meant to carry out scientific research on specific crops that are tant for food security in the rain-fed, drought-prone areas of the tropics. Over the period

of its existence, ICRISAT scientists have published about 4,500 papers in peer-reviewed journals; about 300 books have been published as well. A reasonable volume of training materials have been generated. At the time when this meeting took place, ICRISAT did not have a repository where at least all the research publications could be accessed publicly. The library services had been operating a bibliographic service providing citations only. A key research director of ICRISAT agreed that open access was a potential route that ICRISAT could make use of.

William Dar, Director General of ICRISAT[86] since 2000 is a champion of making search results and documents freely and openly available. In his stint in the Philippine agricultural research bodies in the '90s, he had promoted the use of web as a medium to make available farmer extension material on mango and banana, important crops of the Philippines. He started a process of frequent discussions in the committee of ICRISAT research leaders on open access for peer-reviewed research publications. The practicing researchers and the library staff were generally concerned about potential copyright fringement issues in relation to making available peer-reviewed papers. In this background, he initiated a large scale digitization and publication of all the printed research publications where ICRISAT owned the copyright. By late 2008, about 48,000 pages equivalent of printed publications were digitized and PDF copies were made available via ICRISAT web site. This step, which involved much planning and meticulous work, was primarily carried out by the staff of the library services.

This step also enabled the advocates of open access to take the discussions towards the open access mandate for peer-reviewed publications. By now, a broad understanding that the setting up of an institutional repository would not contravene any intellectual property obligations had emerged among the group of research leaders, thanks to the championing by the Director General. In this background, William Dar, in a meeting of the top management in May 2009 asked that a formal open access mandate be endorsed which was accepted. Since then the IR at ICRISAT, hosted on a DSpace platform, has increased its holding, and stands at nearly 3,000 full text publications in peer-reviewed journals. The repository of printed publications of ICRISAT has been merged with this repository. It was also the reason for ICRISAT holding a special workshop on open access for Indian national agricultural research institutes and universities and professional societies in that sector that publish peer-reviewed journals (Sep 2009). Indian Agricultural Research Institute (founded in 1905), the premier multi-disciplinary research and education institute of India, launched its IR within a few weeks of this workshop. Two professional societies in agricultural sciences have made their journals open access.

In a related development, a group in the Computer Science Department of IIT-

[86] http://dspace.icrisat.ac.in.

Kanpur, built a new platform hosting agricultural research publications called the OpenAgri, and went on to develop a software application called the AgroTagger which helps generate domain-specific tags for a given scholarly publication as a service that can be built on DSpace or e-prints. This is the first ever automatic tagging application in agricultural sciences. The tags were jointly developed by ICRISAT and a group affiliated to IIT-Kanpur.

What emerges from this experience is that a process of top-level championing should be followed up by ground-up ness building. One compliments the other to great effect. ondly, there should be close alliance of champions with ble IT groups since setting up and initial maintenance of pository software does require professional support. An system of information managers, IT specialists and champions with subject matter expertise need to come together in particular sectors. Institutional boundaries should be transcended.

ICRISAT is a member of the international consortium called the Consultative Group on International Agricultural Research.[87] There are 15 international agricultural research centres that are members of this consortium. It would have been great if all the other members had followed the initiative of ICRISAT. A group of leading workers in open access from across the world wrote the Chair of the Consortium Board and the Directors General of the member centres. The group is yet to receive a response after about 10 months.

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Informatics India Pvt Ltd, a Bangalore-based company, which had already developed a subscription-based online current awareness database called J-Gate, released Open J-Gate, the world's largest open access e-journals portal on 27 February 2006.[88] Prof. Jean-Claude Guédon of the University of Montreal inaugurated the service [See Box 6, Open J-Gate: India's Contribution to Open Access Movement].

[87] www.cgiar.org.

[88] Ratnakar A (2006), World's Largest Open Access e-journals Portal Launched, *Current Science*, 90: 751; http://www.ias.ac.in/currsci/mar252006/751.pdf.

Box 6, Open J-Gate: India's Contribution to Open Access Movement

Informatics conceived *J-Gate* in the year 2000 to serve three purposes: (a) Develop a global e-Journal portal for indexing and linking to full-text of every article published in every available online English language journal; (b) To provide a comprehensive and fordable indexing and abstracting service to libraries for journal literature; and (c) To sist Indian libraries in their resource-sharing and consortia initiates for journal literature. *J-Gate* evolved in its market acceptance by its ability to customize the service as a search engine and gateway service for journals subscribed by a library or a group of libraries. *J-Gate* today has emerged as the world's largest bibliographic services for e-Journals in English language, indexing articles from 23,877 e-Journals, of which 16,298 are in the scholarly domain. As the product was started in 2000, articles since 2000 are indexed for all journals. However for about hundred major publishers who deliver the metadata to Informatics, like Springer, IOP, Annual Reviews, OUP, and Taylor & Francis, the coverage is extended to several back years going back to Volume 1 in many cases. JSTOR has recently joined J-Gate to make available its metadata content and facilitate access through *J-Gate*.[89]

Open J-Gate : Comprehensive Discovery System for open access Journals

Open access movement was in its formative stage when Informatics initiated the development of *J-Gate* in 2000. The ripples of the movement was beginning to impact by then with the open access publishing initiatives of PLoS, SPARC, Biomed Central, etc. Recognizing the undercurrents of change, Informatics made a provision in its e-Journal Directory, which is a back-end component of *its J-Gate*, to indicate if a journal was available for free access. By 2005, it was found that the number of open access journals in *J-Gate* had grown to a respectable level of over 10 per cent.

J-Gate being a subscription based service, Informatics realized that to access the open access content indexed in *J-Gate*, users will have to subscribe to *J-Gate*. As a mark of its commitment to open access movement, Informatics decided to spin-off a separate free-for-all service for open access only journals to facilitate seamless and unrestricted discovery of and access to open access content. Prof. Jean-Claude Guedon, a prominent global advocate open access movement, visited India to launch *Open J-Gate* in February 2006 as a service by Informatics dedicated to promote the global open access movement.

Open Access and the Journal Metadata

Open access movement, in some respect, is a consequence of the evolution of Internet

[89] http://www.openj-gate.com.

and the Web. Open access implies that an Open Access Journal is hosted on the web for unrestricted access by its users, either immediately or within a year of its publication. Web is a wild and unruly jungle - a sure place for the content to be lost. Hence, discovery systems are more important for the content on the web than the content stored in a brary. Open access movement did focus on the discovery aspect leading to development of metadata harvesting standards (OAI/PMH) and services. But, these were largely limited to and followed by the institutional repositories (IRs). Most journal publishers have not heard of OAI/PMH. Hence, metadata harvesting from journals remains a laborious process, and continues to be so even now unless either the publishers make available the metadata or follow OAI/PMH standard to support automatic metadata harvesting.

OJ's Coverage

The journal coverage policy of *J-Gate* provides for indexing articles from both scholarly (peer-reviewed) and popular (professional & industry) journals. Informatics believes that the journals in the latter category are also important for the academic and scholarly community, and particularly the students in higher education.

Currently *Open J-Gate* indexes articles from more than 8,400 journals available for free access. Of these, over 5,600 journals are in the scholarly domain. The following two tables present statistical count of journals in *J-Gate* and *Open J-Gate*, and their subject-wise distribution.

Table 1: Journal Coverage in J-Gate and Open J-Gate

Journal Type	J-Gate	Open J-Gate
Scholarly (Peer-reviewed)	16,298	5,612
Trade & Industry	7,962	2,792
Total	**24,260**	**8,404**
Indian Journals		
Scholarly	453	385
Trade & Industry	381	125
Total	**834**	**510**

Note: Data as compiled on 10 March 2010

Table 2: Journals in Open J-Gate (OJ): Subject-wise coverage				
Subject Groups	OJ Total		OJ Scholarly	
	No.	%	No.	%
Agricultural & Biological Sciences	1,006	13%	684	14%
Arts & Humanities	1,422	18%	787	16%
Basic Sciences	2,060	26%	1,365	28%
Biomedical Sciences	2,861	36%	2,032	42%
Engineering & Technology (JET)	2,067	26%	1,156	24%
Social & Management Sciences	2,146	27%	1,088	23%
TOTAL	**7,989**		**4,792**	
Note: Data as compiled on 27 Dec 2010				

In terms of subject-wise spread, biomedical sciences (all cal and related life sciences) account for the highest percentage of journals covered. Table 2 reflects subject-wise coverage of nals in *Open J-Gate*. It should be noted that *J-Gate* classification system does place a journal in more than one subject category depending on the multi-disciplinary nature of the journal.

Features & Functionalities

Open J-Gate is designed to be simple and easy to use. All features and functionalities in *J-Gate* are provided in *Open J-Gate* also. The service has two Dr A Ratnakar modules for users to navigate. Users can: (a) browse the table of contents of the latest issues (like in *Current Contents*); and (b) Search across all journals or within a selected list of journals by broad subject categories.

Future

We estimate the total coverage of free journals in *J-Gate* at around 30 per cent, with number of freely available articles at around 20 per cent. At current growth trends, we expect the open access content to cross 50 per cent in the next 10 years. With the gradually increasing quantitative pressure, open access content will N V Sathyanarayana acquire its acceptance standard in qualitative terms too. The journals in the open access domain now provide critical mass of content for exploring an independent citation index.

Open J-Gate is expected to undergo a major enhancement in its content and user interface in the coming months *as J-Gate* itself will be moving to a new platform in 2011, supporting several new innovative features and functionalities. For some strange reason usage of *Open J-Gate* is much wider outside India than within.

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An important international workshop on Electronic Publishing and Open Access was held in Bangalore in the first week of November 2006 with financial support from the Open Society Institute.[90] This invitees-only event was attended by 16 overseas participants from a mix of developed and developing countries including the People's Republic of China, Brazil, Ethiopia, South Africa, Germany, Japan, UK and USA. The main aim of the workshop was to consider a national policy document for developing countries that could be used by governments or their science-funding organizations to speed up the scientific progress. Indeed, such a document was produced at the end of the workshop (See Box 7, Workshop on Electronic Publishing and Open Access Indian Institute of Science, Bangalore, 2-3 November 2006 [Supported by the Open Society Institute]). Together with the Budapest, Berlin and Bethesda declarations, the Bangalore declaration was expected to strengthen the open access movement in developing countries, but it has not had the intended impact in India.

Box 7, Workshop on Electronic Publishing and Open Access Indian Institute of Science, Bangalore, 2-3 November 2006 [Supported by the Open Society Institute]

The Bangalore workshop[91] was convened to bring together policy makers and search scientists from major developing countries to agree a path forward towards ing full Open Access to publicly-funded research publications. The importance of access to the world's research information for the development of a strong economy and a vibrant research capability is widely acknowledged, yet financial barriers limit access by developing countries to the research information they need. Equally, the unique research carried out in countries representing 80 per cent of the world's population is largely 'invisible' to international science because of economic or other constraints. The resolution of many of the world's problems, such as emerging infectious diseases, environmental disasters, HIV/AIDS or climate change, cannot be achieved without incorporation of the research from developing countries into the global knowledge pool.

Open Access to the world's publicly funded research literature provides equal tunities for the communication of all research information, eliminating financial barriers.

[90] Kirsop B (2007), Open Access and Developing Countries, *Current Science*, 92: 276-277; http://www.ias.ac.in/currsci/feb102007/276.pdf.

[91] http://www.soros.org/openaccess.

Furthermore, articles made available electronically on an open access basis have been shown to be cited[92] on average 50 per cent more often than non-open access articles from the same journal, thus ensuring the greatest possible benefit both to the authors, to the vestment of funding agencies and to scientific progress. The benefits to authors, readers and their organisations is now increasingly recognised worldwide and at November 4th 2006, 761 repositories had already been registered in the Registry of Open Access Repositories, and the Open Archives Initiative's OAIster search engine[93] could search over 9,000,000 records in interoperable Open Access repositories.

Building on the Budapest Open Access Initiative recommendations,[94] and past rations of commitments to the strategy of Open Access,[95]particularly the Salvador tional Declaration on Open Access for Developing Countries,[96] and recognising the fits that Open Access will bring to the strengthening of science, participants to the Workshop agreed the following model National Open Access Policy for Developing Countries.

A National Open Access Policy for Developing Countries

The [*country-name*] Government/Government Department expects the authors of papers reporting publicly-funded research to maximise the accessibility, usage and applications of their findings. To this end:

As a condition for research funding, the [*country-name*] **Government:**

(1) requires electronic copies of any research papers that have been accepted for publication in a peer-reviewed journal, and are supported in whole or in part by Government funding, to be deposited in an institutional digital repository [IR] immediately upon acceptance for publication;

(2) encourages Government Grant Holders to provide Open Access to their deposited papers immediately upon deposit;

(3) encourages Government Grant Holders to publish in a suitable Open Access Journal where one exists.

What are the benefits to scientific research, research institutes, universities, authors and readers?

What are the benefits of Open Access to [country-name]? First, [country-

[92] Ten-Year Cross-Disciplinary Comparison of the growth of Open Access and How it Increases Research Citation Impact. *IEEE Engineering Bulletin, Vol.28 N.4, December 2005.*
http://sites.computer.org/debull/A05dec/hajjem.pdf
http://eprints.ecs.soton.ac.uk/11688/.

[93] Open Archives Initiative search engine (OAIster) http://oaister.umdl.umich.edu/o/oaister/.

[94] BOAI (http://www.soros.org/openaccess/).

[95] List of OA Resources from Workshop web site http://www.ncsi.iisc.ernet.in/OAworkshop2006/.

[96] Salvador Declaration http://www.icml9.org/meetings/openaccess/public/documents/declaration.htm.

name's] research will be more accessible to global researchers, hence better known and more widely used and cited. The prestige of [country-name] researchers will increase significantly. **Second,** all [country-name] research will be open to all [country-name] entrepreneurs and the general public with Internet access. This will be beneficial both commercially and culturally. **Third,** access, usage and citation data on this research will increasingly become available for analysis to help shape researchers', institutions' and nations' strategies and policies.

What are the benefits of Open Access to researchers? As ***authors*****,** researchers benefit because their research papers are given a much wider dissemination and can be read without restriction by anyone with Internet access. This increases the impact of their research. Indeed, evidence is accumulating to show that open access articles are cited 25-250 per cent more than non-open access articles from the same journal and year[1]. As ***readers*****,** researchers benefit because they will increasingly be able to access and use the full text of all the research published in their area, not just the research available to them via the subscriptions their institution can afford. This is particularly important where neighbouring countries share common problems and need to collaborate in their research effort.

What should be done to implement the policy (answers to Frequently Asked Questions)?

What should be deposited when I have a paper ready for publication? The **final manuscript of the author's research paper** should be deposited in the author's Institutional Repository**.** This is the author's own final draft, as accepted for journal publication, including all modifications resulting from the peer-review process. (In addition, depositing pre-peer-review drafts, 'preprints', is welcome, if the author desires early priority and peer feedback, but this is just an option available to authors and not a requirement. In some cases publishers may permit their own published version, either in SGML/XML or PDF, to be deposited as well.)

When should papers be deposited?

An electronic version of the author's final manuscript resulting from research supported, in whole or in part, by Government funding should be deposited **immediately upon acceptance for publication**.

What kind of papers should I deposit?

The policy applies to peer-reviewed, original (primary) research publications and reviews that have been supported, in whole or in part, by Government funding.

The policy does not apply to book chapters, editorials, or book reviews.

Will authors still be able to publish in a journal of their choice? Authors will **continue to decide in which journal to publish their research papers**. They will only have to ensure that a copy of the final, peer-reviewed paper is deposited in their institutional repository immediately upon acceptance for publication.

What is an open access journal?

An open access journal makes articles it publishes freely accessible online[6]. Some open access journals cover their costs by charging the author's institution or funder for publication. The Government may cover such open access publication costs where funds are available and needed. Many journals absorb publication costs in other ways and make no charge.

How can I find out whether my journal has a policy compliant with immediately providing access as Open Access?

You should consult the individual journal's policy which is given in Sherpa[97] at: or in the Journal Policies – List of Publishers.[98]

Do I need to deposit my paper if the journal publishing my research already provides immediate open access to my articles?

Deposit is not required but is still recommended even if a manuscript has been accepted by an open access journal. Your institution will still wish to have your work deposited in its repository to enable it to maintain and make known a compete record of institutional research output.

This workshop was made possible by financial support from the Open Society Institute and the Indian Academy of Sciences. The Open Society Institute also supported a planning meeting in Toronto.

The National Knowledge Commission, set up by the Government of India in June 2006, constituted several working groups. Two of them, viz. the one on Libraries and the other on Open Access and Open Educational Resources, came up with recommendations on open access to knowledge. In its final report to the Prime minister, the Commission stated "to enable equitable and universal access to knowledge resources, libraries should be encouraged to create more digital resources by digitising

[97] http://www.sherpa.ac.uk/romeo.php.
[98] http://romeo.eprints.org/publishers.html.

relevant reading material in different languages, which can be shared at all levels. **Peer-reviewed research papers resulting from publicly funded research should also be made available through open access channels, subject to copyright regulations.** It is recommended that open standards and free and open source software may be used for the above."[99] This recommendation was accepted by the Prime Minister in 2008. But many of government's agencies are yet to implement it.

When the world celebrated the first Open Access Week in October 2008, Prof. Samir K Brahmachari, Director General of CSIR, announced that all 17 journals published by the National Institute of Science Communication and Information Resources (NISCAIR) would henceforth be open access. Before then only two NISCAIR journals were open access. He also constituted a committee to look into implementing an Open Access archiving policy for CSIR laboratories. Based on the recommendation of the committee a memorandum was sent by CSIR headquarters to directors of all 37 CSIR laboratories on 6 February 2009 requesting them to set up institutional open access repositories in each one of the laboratories [See Box 8, CSIR's Effort to Mandate Open Access]. Unfortunately, the memorandum was signed not by Prof. Brahmachari but by a senior official in the CSIR headquarters. The move did not pay much dividend.

Box 8, CSIR's Effort to Mandate Open Access

Here is the letter sent from CSIR headquarters to Directors of all CSIR laboratories on 6 February 2009. The response was feeble. Unfortunately, there was no follow up from CSIR headquarters.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

R&D Planning Division Anusandhan Bhavan, Rafi Marg, New Delhi -110001

NO.6/1/OA/2008-RDPD **6th February, 2009**

OFFICE MEMORANDUM

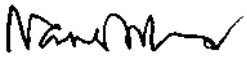
Sub: Implementation of recommendations of the "Group for Open Access to Science Publications (GOASP) of CSIR".

DG, CSIR is pleased to approve the implementation of the following recommendations of the "Group for Open Access to Science Publications (GOASP) of CSIR":

1. All research papers published from all CSIR laboratories be made open access either by depositing the full-text and the metadata of each paper in an institutional

[99] National Knowledge Commission (2007), *Report to the Nation 2007*; http://www.knowledgecommission.gov.in/downloads/report2007/eng/Report07.pdf.

repository or by publishing the papers in an open access journal in the first place.
2. All the CSIR published journals be made open access.
3. Each laboratory sets up its own interoperable institutional open access repository.
4. CSIR / lab sets up one or more centre(s) which would harvest the full-text and metadata of all these papers.
5. Each laboratory sets up Electronic Thesis and Dissertations Repository.
6. To hold a conference for creating awareness on Open Access.
7. To hold in house Training programmes on Open Access.



8. Sensitize CSIR researchers.

(Naresh Kumar)

It is requested that the above Open Access activities are implemented at the earliest.

Tel: 011-23713011, 23710453 Fax: :011-23710340, 23713011 e-mail: headrdpd(5).csir.res.in Copy to:

1. Directors of all National Labs./ Instts. of CSIR
2. All Heads of Divisions at CSIR HQs/Complex/IPMD
3. Chairman and all members of GOASP
4. PS to DG, CSIR
5. PPS & US to JS (Admn.)
6. PA to FA, CSIR
7. Office Copy

Prof. Brahmachari also conceived OSDD (Open SourceDrug Discovery), a CSIR-led initiative with a vision to providing affordable healthcare to the developing world. Launched on 15 September 2008, it provides a global platform where the best minds can collaborate and collectively endeavour to solve the complex problems associated with discovering novel therapies for diseases like malaria and tuberculosis. Participating scientists aggregate and share the biological and genetic data available freely at Open Source Drug Discovery[100]. The Government of India has committed Rs 1,500 million (US $38 million) towards this project. An equivalent amount of funding would be raised from international agencies and philanthropists.

INSA convened a half-day brainstorming meet on open access, FOSS and copyright law for scholarly communication and literary work on 26 April 2008.[101] The Fellows of Indian Academies were urged to follow the Harvard model and adopt an open access

[100] http://www.osdd.net.

[101] Brainstorming Meet on Open Access, FOSS and Copyright Law for Scholarly Communication and Literary Work: A Report; http://www.insaindia.org/pdf/OA-report.pdf.

mandate unanimously, to set up open access repositories for the publications of all Fellows past and present, and to form an expert group to monitor global developments in scholarly communication, open access and open science. Another suggestion urged INSA to recommend to the Government of India enacting legislation that would restrain scientists working in government research institutions from transferring copyright to work funded by the Indian taxpayer to publishers abroad.

The Centre for Internet and Society was represented by the authors of this report at the International Repositories Workshop jointly hosted by JISC, UKOLN and SURF Foundation and held at Amsterdam in March 2009.[102] The conference addressed the key question of how internal and external challenges to repositories would affect the future of networked repositories especially when research itself is changing in a networked environment. The open access movement goes far beyond merely depositing full texts of papers and metadata; it covers metadata standards, data exchange between repositories, data mining both by humans and machines, integrating with identifier infrastructure, and so on. In India, we have not yet reached such a stage, but what one learnt at the conference could be valuable in avoiding any mistake committed by them. Eventually, the network of Indian repositories will have to be a part of the worldwide network.

In March 2009, the Centre for Internet and Society (CIS) and CSIR jointly hosted a one-day conference on open access, which was attended by over 100 participants. Prof. John Willinsky of the Public Knowledge Project, and Dr. Leslie Chan, University of Toronto, were the key speakers. Willinsky traced the evolution of modern science and showed that open access is part of the history of science and now it is a basic human right.[103] Dr. Chan spoke about threats posed to the knowledge commons by vested interests trying to privatize knowledge. In particular, he showed how developing countries could defend themselves through adoption of open access. While in Delhi, both Willinsky and Chan met leaders of science including senior scientists and editors at CSIR and ICAR and discussed ways to gain greater visibility for Indian research. Willinsky told Indian editors that the OJS (Open Journals System) software for journal production was absolutely free and it was already being used by over 5,000 journals. Chan shared his experience running Bio line International, which helps many journals from developing countries remain in business.

Willinsky and Chan also spoke at a one-day conference held at the National Aeronautical Laboratories, Bangalore. Dr. D K Sahu of MedKnow Publications spoke both at Delhi and at Bangalore and provided ample data to show how open access for journals is a win-win all the way. He listed seven myths about open access and brought out the ad-

[102] http://www.ukoln.ac.uk/events/ir-workshop-2009/.

[103] Arunachalam S (2009), Prof. Leslie Chan and Prof. John Willinsky on a mission to India, *Bioline News Blog*; http://bioline-news.blogspot.com/2009/04/boai-prof-leslie-chan-and-prof-john.html.

vantages of going open access admirably. Mr. Sunil Abraham of the Centre for Internet and Society spoke at the Bangalore meeting on copyright, the rights of authors, and the tremendous weaknesses of a Bill before the Parliament of India.

The Wellcome Trust and DBT formed an Alliance[104] in the first week of November 2009. The aim of the £80 million initiative is to support outstanding Indian biomedical scientists with fellowships at three levels: early career, mid-career and senior. All fellows of the Wellcome Trust – DBT India Alliance are required to make their research publications open access, a practice followed by the Wellcome Trust whenever and wherever it funds research. But DBT itself is unwilling to have a similar mandate for research funded by them, despite the fact that the coordinators of more than 60 DBT-funded Bioinformatics Centres had agreed to adopt open access in principle at their Annual Meeting held at the University of Poona in February 2002.

Open Access Journals

India had to wait for the arrival of the Europeans and then the printing press before having an indigenous scientific journal. It took 123 years after the first two journals appeared in Europe in 1665 [Fig. 6 and Fig. 7] for a group of Englishmen living in and around Calcutta to bring out *Asiatick Researches* in 1788 [Fig. 8]. This was followed *by Tables Containing Results of Meterological Observations* (Madras, 1796).[105] These were the only two journals that were published in India before 1800. Today India can boast of hundreds of STM journals published by government agencies, academies, professional societies and private companies. They cater to different fields and subfields. It is difficult to have an exact number. Many of them are indexed in international indexing and abstracting services, but most have a poor subscription base. Surely making them open access will help improve the visibility and impact of the papers published in them.

As of 17 December 2010, there were 5,897 open access journals listed in the *Directory of Open Access Journals* or DOAJ [www.doaj.org] (data accessed on 17 December 2010), and of these 276 are from India. Another database, *Open J-Gate*[106], developed by the Bangalore-based Informatics India Ltd, lists 7,967 open access periodicals worldwide which include 4,773 peer-reviewed journals including 339 peer-reviewed Indian Journals (Fig. 9).

There are a few other Indian open access journals which are yet to be listed in DOAJ and indexed in *Open J-Gate*. For example, two journals published by the Indian National Science Academy (*Indian Journal of Pure and Applied Mathematics* and *Proceedings of the Indian National Science Academy*) and two journals published by Indian Council of

[104] http://www.wellcomedbt.org.

[105] Sen, B K (2002), Growth of Scientific Periodicals in India (1788 – 1900), 2002. *Indian Journal of History of Science*. s112-s207; http://eprints.rclis.org/handle/10760/7190.

[106] http://www.openj-gate.com.

Agricultural Research (*Indian journal of Agricultural Sciences* and *Indian Journal of Animal Sciences*) are neither indexed in *Open J-Gate* nor are listed in DOAJ. DOAJ does not index *Indian Journal of Natural Products and Resources* (formerly known as *Natural Product Radiance*), published by National Institute of Science Communication and Information Resources (NISCAIR). In all, there are more than 360 Indian open access journals. A list of Indian open access journals is given in Appendix 2.

Needless to say a vast majority of papers, published in the Indian open access journals, are mostly written by Indian researchers. Incidentally, two Indian journal publishers, viz. Indian Academy of Sciences and MedKnow Publications figure in the top 14 open access journal publishers in the SOAP survey.[107]

Apart from publishing in Indian open access journals, Indian researchers publish their papers in overseas open access journals as well. For example, in 2009, Indian researchers published 43,044 papers in the areas of science, technology and medicine, as seen from the Thomson Reuters database *Web of Science - Science Citation Index Expanded*. This is a highly selective database and indexes only 34 of the more than 360 Indian open access journals! Of the more than 43,000 papers, 12.75 per cent appeared in 345 open access journals. A recent study from Finland has estimated that only 8.5 per cent of open access papers were available at publisher sites.[108] The SCOAP study carried out in Europe among 50,000 authors[107] revealed that about 10 per cent of papers are currently published in open access journals.[109] Obviously, Indian scientists publish a substantially larger proportion of their papers in open access journals than the world average.

Open Access Repositories

In the west, the open access movement received considerable support from the academics, witness the signatories of the Budapest and Berlin Declarations and the Bethesda Statement, the founders of PLoS, many Nobel Laureates writing an open letter endorsing the Federal Research Public Access Act, etc. Very few academics have come forward to support the open access movement in India. One of them, Prof. B Viswanathan of the Natioanl Centre for Catalysis Research (NCCR), set up the only repository in the country to have been set up by a scientist. Every other repository was set up and maintained by librarians. Submission of documents to the eprints@catalysis repository is limited to the catalysis research community of NCCR and India. It has more than 1,700 papers, virtually all of them deposited by one person.

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[107] SOAP Survey, http://project-soap.eu/soap-survey-released-your-views-on-open-access-publishing-are-needed/.

[108] Björk B-C, Welling P, Laakso M, Majlender P, Hedlund T and Guðnason G, Open Access to the Scientific Journal Literature: Situation 2009; http://www.plosone.org/article/info:doi/10.1371/journal.pone.0011273.

[109] http://blogs.princeton.edu/newscitechseries/2011/01/open_access_study_in_europe_sh.html.

The growth of open access repositories in India (the red line) and the number of new records deposited in them (green bars) in the past ten years, as found in the Registry of Open Access Repositories (ROAR) are shown in Figure 10. One notices a large increase in the number of records in 2010 — from about 11,000 in 2009 to over 42,000 in 2010. This was made possible by a few active repositories: EPrints@CMFRI, the repository of the Central Marine Fisheries Research Institute, which was set up in 2010 alone accounts for more than 7,900 records. EPrints@NML, the repository of the National Metallurgical Laboratory, which was established in 2010, has over 2,400 records. Managers of EPrints@IISC, the repository of the Indian Institute of Science, deposited a few thousand legacy papers in 2010 following a drive started in the Institute's centenary year. Thus a large percent of papers deposited are legacy papers. What matters is the number of current papers deposited.

We would take ROAR data with a bit of caution. ROAR lists 64 Indian repositories. Some of these are no longer active and some are repetitions. Then there are a few which are yet to be listed in ROAR. On examining each one of them we found that there are 30 institutional repositories, three subject repositories and five electronic theses repositories (as on 6 March 2011). Besides, a few open access journals have used the repository software (e.g. NISCAIR journals). A list of Indian repositories is given in Appendix 3. Not all of these repositories are confined to journal articles and conference papers. Some include annual reports, newsletters, and other institutional publications.

The IISc repository, the first to be set up in India, has over 25,000 papers. Five CSIR laboratories, four ICAR laboratories, three Indian Institutes of Technology, two DST laboratories, a society, an NGO, an international institution and a private research institution are among those which have hosted institutional repositories. Four among these institutions, viz. NIT Rourkela, ICRISAT, NIO and IIHR, have an open access mandate. NIT Rourkela was the first in India to adopt an open access mandate [See Box 9, Dspace@NITR].

Box 9, Dspace@NITR

National Institute of Technology, Rourkela (NITR), was established 50 years ago. With additional funding, starting from 2003 the Institute's emphasis on research is more pronounced.

NITR had access to hardly 50 international journals in 2003. Once it became a ber of the INDEST consortium, NITR started getting access to more than 1,500 online journals in the fields of technology and engineering. The institute has also taken license to access 500 more journals on its own and a couple of databases from publishers who are not enlisted in the INDEST consortia negotiations. Even after providing access to more than 2,000 professional journals, the library of NITR gets plenty of requests from re-

searchers for papers. Seven years of building research infrastructure has borne fruit in terms of number of research papers published by NITR researchers.

NITR has some relative disadvantages. It is young and located in a small city with no other academic/ research institutions in the vicinity. There is little scope for inter-institutional academic interaction. It is very difficult to attract participants for conferences held at the campus. Senior scientists from Indian and foreign institutions would not like to spend time on travelling to a remote town. The only way NITR can showcase its research strength to the world is publishing it in international journals and our researchers found the option not always easy.

Research papers published by NITR scientists during 2001-2010 [data as seen from *Web of Science*]

Year	**No. of papers**
2010	181
2009	153
2008	106
2007	75
2006	50
2005	34
2004	36
2003	29
2002	28
2001	24
Total	**716**

The director of NIT Rourkela Prof. Sunil Sarangi who was keen on finding ways to come these challenges quickly accepted the posal of the library to set up an open access tional repository to enhance the visibility of the Institute's research output.

One of us in the library attended the following workshops:

- Workshop on "*Open access and institutional repository*", May 2-4 2004, organized by MSSRF, Chennai.
- National Workshop on *'Developing digital library using DSpace'* held in 28th June, 2004 to 3rd July, 2004 at Osmania University, Hyderabad.

Having gained conceptual knowledge on open access from the first workshop and learnt to install and customize the repository software *DSpace* from the second, Madhan Muthu, one of the librarians of NITR set up *Dspace@NITR*[110] – the open access institutional repository of NITR at the end of April, 2005.

Initially, many researchers were reluctant to upload papers in the repository. larly, no one preferred to archive the post-print version of the papers. Honestly, many did not have an idea what a post-print was. The library team identified the publishers of the journals in which NITR researchers published their papers and handed out copies of lisher's self-archiving policies and explained to them what a "post-print" was. Many searchers came forward to give their papers and asked the library to deposit them. How-

[110] http://dspace.nitrkl.ac.in/dspace.

ever, we could not persuade all.

Two months later, the repository had 50 papers. The library team intensified its campaign. Using the RSS feeds facility of licensed multi-disciplinary databases, the library easily received alerts about just published papers indexed in those databases. The library team started sending emails (with publisher self-archiving policies) to corresponding local authors requesting them to upload the post-prints of the papers. Seeing that many authors agreed and sent the post-prints, others also started doing the same.

The library team prepared download statistics for the uploaded papers, parsed from the server log file, and sent them privately to the authors. Also, the library team employed the official library blog to garner support for open access. We interviewed senior professors who were at once prolific authors and open access supporters and blogged the interviews. We developed stories on well-cited papers available in the repository and posted them on the blog.

The researchers who uploaded their papers could see creased visibility of their papers. They realized that they could reach a wider audience. "I am often receiving requests for consulting from small scale industries after I started loading papers in Dspace", says a professor of NITR. ously, small industries cannot afford to subscribe to even to a few journals. Many scientists started realizing the potential of the repository and started to send papers voluntarily for the repository. Through relentless campaign the library team could convince many scientists in favour of depositing their papers in the institutional repository. However, we wanted institutional policy support to open access in the form of a mandate to make archiving part of the mainstream work of our researchers. The library proposed to the Senate of NITR to mandate archiving of locally produced research output in the institutional tory. The Senate agreed to the proposal and formally issued a note on open access mandate on 12 May 2006[111].

A clause seeking repository handle number was inserted in the forms related to project approvals and permission to attend conferences. Through this step, it became necessary for researchers to upload all papers in order to get the handle numbers. Without the handle number the Finance Department will not process their travel reimbursement claims. At present the repository holds more than 1,300 documents. After mandate all conference papers are uploaded in the repository. As far as journal articles are concerned, 80 per cent of journal papers published are uploaded in the repository till 2009.

[111] http://roarmap.eprints.org/20.

In March 2009, the Centre for Internet and Society, Bangalore, nominated one of the librarians to take part in the International Repositories Workshop jointly organised by UKOLN, JISC, SURF Foundation and Driver and held at Amsterdam. This enlarged the vision and gave ideas for future work. On return, he helped at least five other institutions to set up their own repositories. In future he plans to develop repository add-ons such as linking it to citation databases.

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Three of the five CSIR laboratories, viz. the National Aerospace Laboratories (NAL) [See Box 10, Institutional Repository @ NAL], the National Institute of Oceanography (NIO) [See Box 11, NIO's Institutional Repository] and the National Metallurgical Laboratory (NML)[112], have more than 2,200 papers in their repositories according to ROAR as on 13 March 2011. CSIR also has a harvester called OARH to aggregate papers from repositories of all CSIR laboratories. Four ICAR laboratories have their own repositories, and CMFRI stands out with more than 7,900 papers.

Box 10, Institutional Repository @NAL

NAL's Institutional Repository was initiated in 2003 using Greenstone, with journal articles. Later, in early 2006 we switched over to Eprints 2.0 on Red Hat Enterprise form and then again to 3.2.0 on Fedora platform. NAL-IR started with well established archiving metadata, data, content, submission and preservation policies. Document types included in the repository were journal articles, conference papers, project documents, books, book chapters, presentation/lecture materials, images, etc. Care was taken to load the full text of unclassified documents without infringing copyright (as given in Sherpa- Romeo website). One can browse the documents by author, division, subject, date and document type. Both simple and advanced search facilities have been provided. During April 2009-March 2010 the repository received more than 500,000 hits (abstract views) and more than 3,300 full text papers were downloaded. Metadata is harvested by Google Scholar, ARC, OAISTER, Scientific Commons, CASSIR and CSIR Knowledge Harvester. The Repository has been indexed by ROAR and DOAR. NAL is also ing and indexing at present, the metadata of 5 CSIR IRs on 'CSIR Knowledge Harvester.[113]

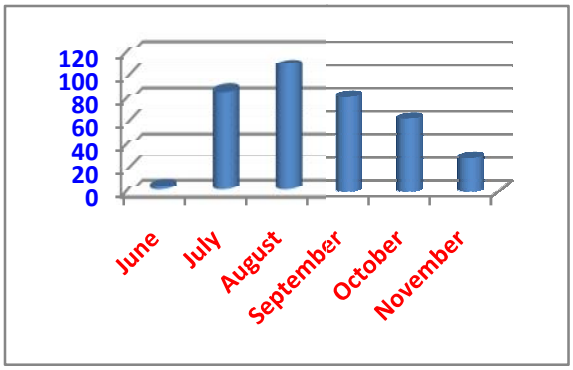
Initially we searched annual reports of NAL, bibliographic databases, e-journal

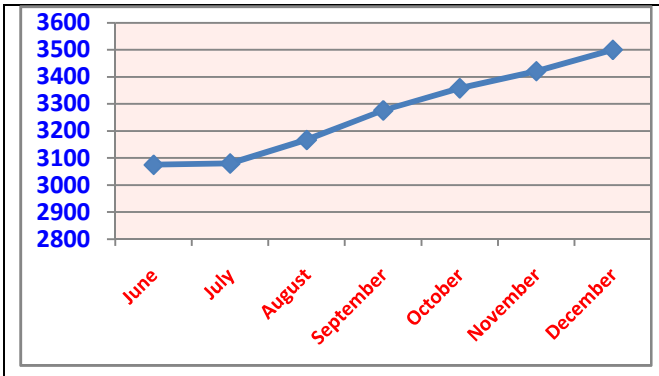
[112] http://eprints.nmlindia.org.
[113] http://csirpubls.nal.res.in.

bases, author profiles, etc., for papers published by NAL scientists. Full text papers available already at ICAST, a database maintained by NAL, were digitized and uploaded to IR. Authors were informally approached to contribute their publications. Training was imparted to ICAST staff about IR and uploading documents. Using these conventional techniques NAL-IR crossed 3,000 records by the second quarter of 2010.

To encourage the scientists at NAL to self archive their publications, a month long outreach program was conducted at each division during July 2010. Training was divided into two sessions, first covering resources and services of ICAST, concepts, advantages of open access, various nels of open access, copyright issues related to open access and Institutional repositories while the second concentrated on hands on experience of uploading to NAL-IR. The ticipants were educated about IR polices, technology used, work flow, and access statistics in detail. To boost scientists' morale, already available records for each division were listed and top ten authors who had deposited from the division were represented in graphical mode. This motivated many participants follow suit. It was observed that after successful completion of training program the Repository crossed the 3,500 mark at NAL-IR in just three months and interestingly all the new documents were deposited by authors thus setting up a fine example of self archiving.

Following graphs shows document deposition by users immediately after the training program:





Dr. Poornima Narayana
Head, ICAST
National Aerospace Laboratories[114]
Bangalore 560 017, E mail: poornima@nal.res.in

Box 11, NIO's Institutional Repository

National Institute of Oceanography's institutional repository[115] is an offshoot of NIO's contributions database (NIOPub) available on the website which facilitates requesting a reprint of the published papers. This facility was opened over the Internet in 2004. thused with the demand that we received for the reprints on this database, we soon realized the importance of the availability of the literature in an open access mode – the movement that had just picked up then.

With a quick review of the software available for the purpose, we settled on DSpace and used the institute's existing server to give birth to the "Digital Repository Service" (DRS) of the library in early 2006. Studying the copyright issues, sensitizing authors to upload their manuscripts, obtaining permissions from publishers to use their copies, decisions on how to obtain and upload the previously published full-texts were the challenges in the early phase of setting up the repository.

A lecture on "Open Access: Current Developments in India" sensitizing the staff of the institute in general and the authors in particular by an Indian missionary dedicated to the Open Access movement — Prof. Arunachalam, permissions to upload the scanned papers from the Indian society journals, and very strong moral and infrastructure support from the Institute's management placed the repository development on the right track.

Cool response of the authors in depositing their manuscripts, unavailability of manu-

[114] http://nal-ir.nal.res.in.
[115] http://drs.nio.org.

scripts of published papers of early years with authors, negative responses to the requests to place full-text articles from commercial publishers (their pdf files) on the repository helped us in formulating our decisions in going ahead on this effort.

Follow-up with the authors to upload their manuscripts after the publication of a paper was a very hard and time consuming task. We therefore realized the limitations of the 'voluntary' option and soon changed our voluntary mode of deposition to mandatory mode. We also realized that the authors would leave the organization one day but the organization would continue. In order to maintain that record and provide user service, designated staff for the service was considered essential. We plugged in a feature for a deposition of final manuscript for a repository in an existing workflow in the publications monitoring system of the Institute. Computerization of the workflow of disclosing a publication out of research being carried out at this Institute made the task easy for the authors and they had not to do the additional task of creating a record for the repository and uploading of the manuscript. This part of the work is now being done by the library staff (on behalf of the authors). Once the record is added, the maintenance of metadata and providing services to the end-user, if any, are taken care of by the library staff.

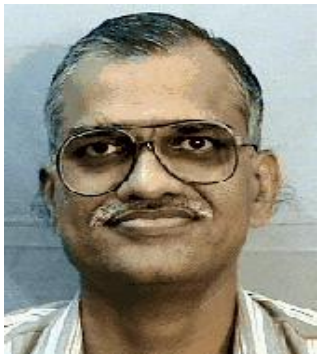
The total number of publications from NIO is about 150 per year. So it was realized that the repository would not show a growth in the initial period. Therefore deposition of full-text with 'restricted access' had been introduced for the older literature. The full-text item with this feature remains available within the institute (restricted access with login, etc) whereas, the users of the repository from outside the institute can only 'request' for the desired document. The request is then received in the form of mail with a link to the record. The library staff takes care of sending the document under restricted access to the requester after confirming that the request so received is from an authentic user. We used this feature for storing scanned copies of the old published literature way back until 1991. The half-life for oceanography literature is eight years and hence we felt that archiving this much old literature should serve most of the users.

The repository is currently listed on general and disciplinary as well as region-specific harvesters: Google Scholar (one place where the information seeker generally initiates his/her search for information across many disciplines and sources), OAIster (a union catalog of OCLC representing open access resources), Avano (a marine and aquatic sciences OAI harvester — the discipline the DRS belongs to), CASSIR (Cross-Access Search Service for Indian Repositories — the country DRS belongs to).

Besides browse feature, the records in the DRS can be searched (Advanced search) either by keyword (including a word in the full-text) or other specific fields in the data such as Author, title, source, abstract, document type and year. We limit the scope of this repository to the published and gray literature (such as doctoral theses and technical

reports). RSS Feeds facility exists to those who are routinely interested in being informed of new additions. As of now (early December 2010), there are over 3,700 records and approximately 15,000 downloads are noticed per month in the recent past.

The library does not stop with uploading the records and making them available to the users on Internet. The search expressions with which the users reach this repository and number of downloads' are continuously being monitored to find why the users downloaded the full-text of the documents. The data is too small to make any conclusive statements and therefore the results are yet to be published.



The repository today is considered as a good product by the researchers within the organization as well as by the tem that ranks the World's Open Access Repositories. This has always been among the first 10 Indian repositories and marine science repositories world over. It is a repository of a research laboratory with a limited number of researchers and tions and therefore we are aware that this would not populate as other repositories that have come up in the recent past. But we are satisfied with the developments within the given framework.

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Only three of the seven IITs (not counting those which were set up in the past two years) have set up institutional repositories as seen from ROAR. The Computer Science Department of IIT Kanpur has customized Drupal for hosting open access repository for agriculture and a plug-in called Agrotagger for both EPrints and DSpace. But they do not yet have an institutional repository for their own Institute! Madurai Kamaraj University has a mandate but their repository carries papers from only their School of Biotechnology and so far it has less than 100 papers.

Bangalore seems to be the happening place for open access. That is where both NCSI-IISc and DRTC-ISI held many workshops and training programmes. The first four repositories were set up there. One of the two harvesters, viz. CASSIR, operates from there. An important international conference that led to the Bangalore Declaration and a workshop on electronic journals was held at IISc. Much of the early activities that led to the open access movement in India happened in a small development research foundation in Chennai, viz. MSSRF, with a visit by Prof. Stevan Harnad in 2000. Conspicuously, Calcutta, which was the home of Renaissance in India in the 18th and 19th centuries and

which was the home of science in pre-Independent India, does not have a single OA repository, a clear indication of a city in decline.

A large majority of papers in the repositories of IISc (EPrints@IISc) and the National Metallurgical Laboratory (EPrints@NML) allow users the option of 'Request copy'.

Scientists' views

Most of the scientists discussing open access are from Bangalore and IISc. Also, among all Indian journals it is only *Current Science* that frequently gives some space for discussion on open access. There have been occasional editorials in *Indian Journal of Medical Research* and *National Medical Journal of India*, and comments in a few other journals, but nothing compared to *Current Science*.

While there is widespread support for open access among scientists in the advanced countries, only a few Indian scientists have expressed their views on open access. Here is what Prof. Balaram, Director, Indian Institute of Science, and a Member of the National Knowledge Commission as well as the Prime Minister's Science Advisory Council, wrote in an editorial in *Current Science*, "The idea of open, institutional archives is one that must be vigorously promoted in India. The introduction of legislation that vests copyright with institutions, in the case of publicly funded research, may also provide the necessary legal framework to avoid any contentious issues." He continued, "Mandating open access for all publicly funded research publications is easy to do by legislation. It is also a requirement that can be insisted upon by philanthropic private funding bodies like the Wellcome Trust and the Howard Hughes Medical Institute."[116] In one of his interviews, he reiterated this point: "I want to argue for 'open archives'. Every institution should be encouraged to set up a repository. This is a problem-free model I want to promote. There may be a few glitches at start, but the next generation of scientists will be comfortable with it. One issue that is yet to be resolved, however, is copyright. I argue that we should be permitted to put in the repository the full text article as it appears in a journal. For this, countries such as India should have a law specifying that the copyright for articles published with publicly-funded research always vests with the authors and their institutions."[117]

However, Stevan Harnad believes that ideally authors should self-archive the final refereed author's version of their papers and not the published journal version. Welcoming the IEEE's change of author self-archiving policy, which no longer allows authors to archive the published version of papers but only the final peer reviewed author's version, he said, "That's the procedure that will work, and the policy that can and will scale to all

[116] Balaram P (2008), Science Journals: Issues of Access, *Current Science*, 94: 837-838; http://www.ias.ac.in/currsci/apr102008/837.pdf.

[117] Interview with P Balaram: Jayaraman KS (2008), Open Archives — The Alternative to Open Access http://www.scidev.net/en/features/q-a-open-archives-the-alternative-to-open-access.html .

other universities, funders and publishers worldwide. Mandated self-archiving of authors' final drafts is also what will usher in universal Green open access and eventually also publisher downsizing and transition to Gold open access, with journals reducing their services and costs to just overseeing peer review — offloading all access-provision and archiving onto the worldwide network of mandated institutional repositories."[118] If institutions keep relying on importing the publisher's PDF, such a policy and procedure will not smoothly scale to the rest of the world's universities, funders and publishers, Green open access will be needlessly delayed and hamstrung, the current status quo and its modus operandi will be locked in, and any eventual cost-cutting, downsizing to peer review alone, and transition to Gold open access will be made far less likely, says Harnad.[119]

The most succinct expression of Balaram's support to open access, however, came out in his conversation with Leslie Chan.[120] Unfortunately his forceful arguments have fallen on deaf ears. Besides, the Indian Institute of Science he directs has not so far adopted an open access mandate. Scientists at IISc are not self-archiving their papers; whatever archiving is taking place is done by a few intermediaries trained in library science [See Box 3, EPrints@IISc — The First Indian Institutional Repository].

While Balaram welcomes the idea of setting up repositories for journal articles in every research performing institution he has reservations when it comes to theses and dissertations. Interviewed for *SciDev.Net*, he said "When I say 'open access', I mean open access to all published work. If your work is already published in a journal, then there is nothing to hide. The publisher may not make the work accessible to other people. On the other hand, putting up PhD theses that contain unpublished work may be a little bit debatable."[121] The reason may be that in the sciences, researchers mostly refer to published papers and rarely theses. Also there is a wide variation in the quality of Ph D and Masters theses submitted to Indian institutions.

But Peter Suber, a philosopher by training, believes it is worth archiving theses. He narrates how difficult it was during the print-on-paper era to obtain a copy of a dissertation from University Microfilms Inc. (UMI). Says Suber: "I wrote on a fairly obscure topic for which there wasn't much existing literature — a fairly common phenomenon, given the assignment. But I found a handful of dissertations on neighbouring topics in the UMI catalogue and one was better than every book I found on the same subject."[122] In fact, there is a worldwide movement, the Networked Digital Library of Theses and

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[118] Harnad S (2011), IEEE Endorses Self-Archiving of Author Final Draft: MIT Adjusts OA Mandate, Open Access Archivangelism; http://openaccess.eprints.org/index.php?/archives/803-IEEE-Endorses-Self-Archiving-of-Author-Final-Draft-MIT-Adjusts-OA-Mandate.html.

[119] Ibid.

[120] http://www.vimeo.com/3982826.

[121] Supra note 117.

[122] Suber P (2006), Open Access to Electronic Theses and Dissertations, SPARC Open Access Newsletter, issue #99; http://www.earlham.edu/~peters/fos/newsletter/07-02-06.htm.

Dissertations (NDLTD) that promotes open access archiving of theses and dissertations, with members in North America, Latin America, Australasia, Europe and Africa.[123]

In an editorial in *Current Science*, Prof. N V Joshi reiterates the advantages of open access: "… obvious that starting and filling an institutional e-print archive (containing the peer-reviewed publications from the institution) is easy, inexpensive, and immensely beneficial to all — a truly win-win-win situation. … A majority will be totally apathetic towards it, at least in the beginning — such is the human tendency. However, the higher powers (the funding agencies, especially the public/governments ones, though thankfully not yet in India) are beginning to see the advantages of such archives being set up. This is the surest way of truthfully declaring that the results of publicly funded research (at least, in the form of peer reviewed scientific publications) are indeed accessible to the public."[124]

Many open access journals charge from the authors a manuscript processing or publishing fee. No journal published in India charges a fee though. Both *BioMed Central* (*BMC*) and *Public Library of Science* (*PLoS*) charge article processing fees as do many other open access journals. *BMC* journals charge between $1,450 and 1,640, *PLoS ONE* charges $1,350, and *PLoS Medicine* and *PLoS Biology* $2,900, and other *PLoS* journals $2,250. Should Indian scientists publish in journals that charge a fee? There are conflicting views on this issue. Here are the views of three professors of Indian Institute of Science on this issue. Prof. M Vijayan, former President of INSA, believes that the funding agencies such as DST and DBT should include publication costs as an item in project budget.[125] Indeed, in the West, both NIH and the Wellcome Trust do provide grants to cover such costs charged not only by purely open access journals such as the BMC and PLoS journals but also by toll-access journals which are ready to make individual articles open access against a fee. Major publishers also enter into agreements with universities under which if the university pays a certain amount of money annually, the faculty can publish any number of papers without paying per paper fees. But Prof. P Balaram, opposes this view vehemently: "As an Indian scientist, I do not want my government funds to be subsidising…non-Indian open access journal. Some journals waive these charges for authors from developing countries. But I do not think we should go begging for waivers. They do nothing to counter the ever-present danger that authors who cannot pay will be squeezed out."[117]Talking about 'pay to publish and read for free' business model, Raghavendra Gadagkar, renowned ecologist, says, "The argument that it is the granting agency and not the author that pays does not wash" as the playing field for grants is

[123] http://www.ndltd.org.

[124] Joshi N V (2005), Institutional E-print Archives: Liberalizing Access to Scientific Research, *Current Science*, 89: 421-422; http://www.ias.ac.in/currsci/aug102005/421.pdf.

[125] Vijayan M (2011), Structure of Indian Science: Suggestions on Operation of Competitive Grants, Current Science, 100: 815-816.

grossly uneven and this practice of paying for publication "will undermine, rather than encourage, the whole area of grant free research."[126]

To Lawrence Liang of the Alternative Law Forum publicly-funded information is part of the knowledge commons and it needs to be protected from commercial barriers. He would like us "to resist a property discourse that conflates property rights with academic rights and turns the collegiality of academe into the hierarchy of property. No one could 'own' knowledge and that the greatest scientists are often called 'gifted', implying that their contribution was given to the world openly. The concept of selling such knowledge was alien to the academic world." Property in the English sense, he says, the conflation of 'self' and 'own' resting on exclusion, is something not common to other languages. In Hindi, '*apnapen*' is not a matter of owning, or property, but of closeness. Ownership in this sense has the obligation of care.[127]

Prof. T V Ramakrishnan, a former President of the Indian Academy of Sciences and a Fellow of the Royal Society, is a great supporter of open access too: "I believe that open access to all publicly funded research is a moral obligation, in the following sense. The greatest strength of science is that it is cooperative and 'open'. This is the main way I can understand the size and strength of the flood of knowledge represented by science. Given this, it is natural and a matter of self sustenance to have open access to its results." [Private communication]

When asked why open access was not picking up in India, a senior scientist told "I do not think that the science managers of India by and large think this is an important question. They are concerned about other issues, and generally in the spirit of *'prabhavah samayadushita'* (changing colours with changing times), in the language of Bhartrihari, the great poet and author of the *Nitishataka* (among other things). He says that the lords, the ones with power, have lost the capacity of surprise or being surprised, or the impurity of self satisfaction is within them." [Private communication]

[126] Gadagkar R (2008), Open-access more Harm than Good in Developing World, Nature, 453: 450; doi:10.1038/453450c.

[127] Supra note 90.

Chapter 5: Publisher Self-archiving Policies and Author Addenda

Self-archiving Policies

In the early years of the open access movement, there was a perception among some sections of the open access advocates that publishers were the villains stalling the advance of open access. And what some publishers and their association did — such as hiring a 'pit bull' public relations consultant who advised them to spread falsehood about the open access movement,128 and investing a huge sum of money to lobby a US senator who sponsored two amendments[129] to delete or weaken the NIH Open Access Mandate[130] in the FY 2008 Labour, Health and Human Services and Education Appropriations Bill[131] — did not help change the perception. But eventually, publishers realized that their best strategy would be to coexist with open access. They mellowed enough to share with authors some of the exploitation rights under the copyright agreement and allow authors to self-archive their papers in their institution's repository with some conditions. Today close to 91 per cent of journals allow some form of self-archiving rights to authors. We present in Appendix 4 the self-archiving policies of a few major publishers.

As long as the repositories are OAI compliant, distributed documents can be treated as if they were all in one place and one format and a search using a standard search engine will pick up relevant papers from all such repositories.

Copyright Addenda

Journal publishers send authors of accepted papers a copyright agreement form along with the proofs. Often the language used in these forms demand the authors to give away copyright of the papers to the publishers. Most authors sign on the dotted line and surrender all the rights.

In the past few years, authors are becoming aware of the benefits of retaining certain rights, such as right to reproduce figures, tables, etc., in future writings (review articles, monographs), right to reproduce multiple copies for use in a course they teach, and the right to archive the paper in their institution's repository. What is more, most publishers are ready to grant these rights if only authors request for them.

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[128] Gilles J (2007), PR's 'pit bull' takes on Open Access, *Nature*, 445:347; doi:10.1038/445347a.

[129] http://www.digital-scholarship.org/digitalkoans2007/10/21/text-of-the-inhofe-amendments-that-affect-the-nih-open-access-mandate/

[130] http://www.earlham.edu/~peters/fos/newsletter/08-02-07.htm#nih.

[131] Opensecrets.org lists Reed Elsevier as one of sen. Inhofe's top contributors, (2007), *DigitalKoans*; http://digital-scholarship.org/digitalkoans/2007/10/24/opensecretsorg-lists-reed-elsevier-as-one-of-sen-inhofes-top-contributors/.

To help authors negotiate with publishers, SPARC (the Scholarly Publishing & Academic Resources Coalition) and Science Commons have come up with author addenda to copyright forms as a free resource to authors everywhere [Appendix 5].

But Stevan Harnad believes that promoting this strategy — helping authors obtain part of the copyright they surrender to journal publishers through an author's addendum for every article they write, one by one — is "the equivalent of trying to combat smoking by trying to persuade smokers to write individually to tobacco companies to ask them to manufacture fewer cigarettes."[132] He argues:

(1) The goal is to provide Open Access, not to modify author copyright agreements.

(2) The SPARC author addendum[133] is much too strong in any case: gratuitously and self-defeatingly strong:

(3) No publisher permission is required by authors to deposit[134] the full-text of their refereed, revised, accepted final drafts in their own institutional repositories, immediately upon acceptance for publication.

(4) The bibliographic metadata (author, date, title, journal, etc.) are in any case immediately accessible to all would-be users.

(5) The majority[135] of journals (including just about all the top journals) have already formally endorsed setting access to the full text of the deposit as Open Access immediately upon deposit.

(6) If, for the remaining minority of journals, the author wishes to observe a publisher embargo on Open Access, access to the deposit full-text can be set to "Closed Access" rather than "Open Access" during the embargo, and the author can email eprints[136] to would-be users on request.

(7) This provides immediate Open Access to the majority of deposits plus "Almost Open Access" to the remaining minority, thereby providing for all immediate research usage needs and ensuring — once it is being done universally — that embargoes will die their natural, well-deserved deaths soon thereafter,[137] under the growing pressure from the universal deposits, the palpable benefits of the majority Open Access and the contrasting anomaly of the minority of embargoed

[132] Harnad S (2011), The Long, Wrong Road to Copyright Negotiation, *Open Acess Archivangelism*, 15 January 2011; http://openaccess.eprints.org/index.php?/archives/2011/01.html.
[133] http://www.arl.org/sparc/bm~doc/Access-Reuse_Addendum.pdf.
[134] http://openaccess.eprints.org/index.php?/archives/71-guid.html.
[135] http://romeo.eprints.org/stats.php.
[136] http://eprints.ecs.soton.ac.uk/18511/.
[137] http://eprints.ecs.soton.ac.uk/15617/.

access and the needless inconvenience and delay of individual email eprint requests.

(8) But the best author strategy[138] of all is to make all deposits immediately Open Access today, and to decide whether or not to Close Access to any one of them only if and when they ever receive a take-down notice from the publisher."

[138] http://openaccess.eprints.org/index.php?/archives/136-guid.html.

Chapter 6: Mandates

Prof. Balaram, Director, Indian Institute of Science says that he would like every institution to have a repository.[117] Unfortunately, merely having repositories is not enough. Faculty and students should deposit their research publications promptly in those repositories for them to be useful. Most repositories are not filling up largely thanks to author inertia. Experience has shown that mere knowledge that placing one's papers enhances visibility and increases its propensity to win more citations is not enough to persuade authors to self archive. People know smoking is injurious to health and yet many people smoke. That is why open access champions have been advocating for a long time that funding agencies and institutions should mandate open access to research they fund/ support. As Peter Suber has put succinctly, "Mandates work and exhortations don't. This is the universal lesson from open access mandates to date, whether at funding agencies or universities." What if some authors do not comply with a mandate? Do we advocate a policy of carrot and stick and reward those who deposit and punish those who do not? No, not necessarily. A policy of carrots all the way is all that is needed. Surely when there is a mandate a very large percentage of authors will follow the mandate. A study by Key Perspectives[139] had shown that a vast majority of authors — more than 85 per cent — will gladly agree to deposit their papers in an open access archive if either their institutions or their funders mandate open access. Once they realise the benefits of open access then they will no longer need any mandate or incentive.

At NIT Rourkela the Director followed an ingenious method. He stipulated that those who attend conferences must deposit their papers in the Institute's repository and get a handle number. Unless the travel reimbursement claim includes the handle number, the reimbursement would be made. In many institutions when faculty members are considered for promotion or tenure, they are asked to submit only the url of their best five or ten papers from the Institute's repository and not to submit wads of paper.

A few examples of open access mandates, some from universities and others from funding agencies, mostly from the advanced countries, are given in Appendix 6.

1. The School of Electronics and Computer Science of the University of Southampton, UK, was the first to adopt an open access mandate for all their research output.

2. The first university-wide mandatory policy was implemented at the Queensland University of Technology, Brisbane, Australia, in 2004 by Professor Tom Cochrane, Deputy Vice-Chancellor.

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[139] Swan A, and Brown S (2005) *Open Access Self-archiving: An Author Study*, Technical Report, Cogprints; http://cogprints.org/4385/.

3. The first university-wide mandate in Europe was implemented at the University of Minho, Braga, Portugal, in 2005 by Professor António Guimarães Rodrigues, Rector of the University.

These are followed by the open access mandates of (4) University of Tasmania, (5) University of Southampton, UK, both institution-wide mandates. We then give the mandates of three leading US institutions: (6) Harvard University Faculty of Arts and Science, (7) Stanford University School of Education, (8) MIT. These are followed by three funder mandates, viz. (9) National Institutes of Health mandate, which came into force on 7 April 2008, (10) Wellcome Trust, and (11) Research Councils UK. Then comes (12) the Ukraine Open Access Law, probably the first legislation on mandatory open access enacted by a Parliament, and (13) the open access mandate of ICRISAT, the first international research centre to adopt a mandate.

These are not the only open access mandates. What we have given is a select list of mandates that can serve as models. A summary of worldwide mandates distributed by type and country is given in Tables 7 and 8.

Chapter 7: Recommendations

I

We recommend that all publicly funded research in India should be made open access. This could be achieved by:

1. Each research performing institution setting up an interoperable institutional repository, where all authors will be **required** to deposit the full text of each one of their papers in its final accepted form immediately on acceptance; if there is a publisher embargo, one could still deposit the post-print immediately using the Immediate Deposit/Optional Access (ID/OA) model.

2. The heads (or the board of management) of each research performing institution (such as individual universities and laboratories) **mandating** open access to all research publications originating in the institution [these mandates can come from the faculty, e.g. Harvard University Faculty of Arts and Science, Stanford University School of Education, or from the office of the Vice Chancellor or Dean, Research]. The reality is only a few Indian institutions have an open access mandate in place so far.

3. Heads of Research Councils/ Apex bodies (such as CSIR, ISAR, ICMR, DRDO, UGC) mandating open access in all institutions coming under their purview. There was an effort of this kind at CSIR in 2009, but not many laboratories complied with the request from the headquarters.

3. The funding agencies [such as DST, DBT, DAE] **mandating** open access to all research papers resulting from projects funded by them, e.g. NIH and Howard Hughes Medical Institute in the USA, the Wellcome Trust and the Research Councils UK in the United Kingdom and the European Research Council

4. Science Academies (including Academies of Agriculture, Engineering and Medicine) should play an active role in bringing about a culture of open access. After all they are the custodians of standards. It is not enough if they make their journals open access. They should advise the government to mandate open access. So far they have not, whereas the National Knowledge Commission, which had a very short lifespan, did make a clear recommendation to the Prime Minister.

5. The Ministers in charge of Ministry of Human Resources Development and the Ministry of Science and Technology may together pilot an Open Access to Publicly Funded Research bill in the Parliament (similar to the FRPAA bill in the USA) and give open access legal status. Most research in the country is performed by institutions under these two Ministries. The current Minister in charge of Higher Education agreed to man-

date open access for publications by all Wellcome Trust - DBT Alliance Fellows when he was the Minister for Science & Technology.

II

It is not enough if open access mandates are in place. People should be trained to set up and maintain open access repositories. And researchers should be trained to self-archive and do so willingly. Indeed, research scholars and young faculty will benefit a great deal if they attend carefully designed workshops on scholarly communication and open access. Similarly library and information professionals will benefit from training programmes in access to knowledge.

We need to have a strong element of advocacy. We suggest the formation of Taxpayers Alliance (or Citizens) for Open Access and Students for Open Access. Concerned citizens can achieve what many formal organizations cannot.

III

Both top-down and bottom-up approaches are needed in India to achieve anything. Bottom-up approaches will give a sense of participation. But often one finds top-down approaches are necessary, as India still remains a hierarchical and feudal society.

Tables

Table 1 – Indian research papers in SCI and SSCI during 2000 – 2009
[*SCI Science Citation Index - Expanded*; *SSCI Social Science Citation Index*]

Year	SCI		SSCI	
	No. of papers	No. of journals used	No. of papers	No. of journals used
2000	18144	2742	658	250
2001	19151	2782	575	267
2002	20664	2911	530	256
2003	22854	3113	677	242
2004	24810	3377	664	266
2005	27560	3610	695	300
2006	31004	3759	838	364
2007	36149	4036	923	440
2008	42037	4400	1165	477
2009	42833	4561	1265	569

Table 2 – India's share of world publications on Thomson Reuters databases in two periods [Reproduced from Adams et al.]

	1999-2003		2004-2008		Rank	
	Count	Share (%)	Count	Share (%)	Share	Growth
Chemistry	21,206	4.42	33,504	5.71	1	10
Agricultural Sciences	4,303	5.91	5,634	5.65	2	17
Materials Science	6,960	4.08	11,126	4.81	3	9
Pharmacology & Toxicology	2,034	2.8	3,866	4.25	4	3
Plant &Animal Science	8,132	3.58	10,190	3.77	5	19
Physics	11,700	3.00	17,295	3.70	6	14
Engineering	8,101	2.69	14,103	3.57	7	5
Geosciences	2,839	2.64	4,266	3.13	8	13
Space Science	1,322	2.44	1,665	2.79	9	18
Microbiology	1,078	1.62	2,273	2.79	10	2

Table 3 – Science in India, 2004-2008: Number of papers and relative impact compared to the world in different fields.[140]

Field	% papers from Science in India, 2004-08	Relative impact compared to world
Chemistry	5.71	-35
Agricultural Sciences	5.65	-53
Materials Science	4.81	-24
Pharmacology & Toxicology	4.25	-39
Plant & Animal Science	3.77	-60
Physics	3.7	-16
Engineering	3.57	-19
Geosciences	3.13	-52
India's overall percent share, all fields: 2.94		
Space Science	2.79	-40
Microbiology	2.79	-54
Biology & Biochemistry	2.74	-51
Environment/Ecology	2.72	-43
Mathematics	1.91	-43
Computer Science	1.73	-29
Immunology	1.58	-61
Molecular Biology & Genetics	1.43	-60
Clinical Medicine	1.38	-51
Neuroscience & Behavior	0.94	-58
Economics & Business	0.72	-51
Social Sciences	0.67	-39
Psychiatry/Psychology	0.29	-18

[140] Supra note 31.

Between 2004 and 2008, Thomson Reuters indexed about 143,186 papers listing at least one author address in India. Of those papers, the highest percentage appeared in the field of chemistry, followed by agricultural sciences and materials science. As the right-hand column shows, the impact of India-based chemistry authors was 35 per cent below the world impact average in the field for the five-year period (3.32 cites per paper for India versus the world mark of 5.06). On the other hand, India's performance was comparatively strong in physics (at 84 per cent of the world mark, or just 16 per cent below) and engineering (19 per cent below).

Source: *National Science Indicators*, 1981-2008 (containing listings of output and citation statistics for more than 170 countries; available in standard and deluxe versions from the Research Services Group).

Table 4 – Impact factors of Indian journals (Source: *Journal Citation Reports* 2009)

No.	Journal	Impact factor 2009
1	B Mater Sci	0.783
2	Curr Sci India	0.782
3	Indian J Agr Sci	0.102
4	Indian J Anim Sci	0.137
5	Indian J Biochem Bio	0.574
6	Indian J Chem A	0.617
7	Indian J Chem B	0.437
8	Indian J Chem Techn	0.267
9	Indian J Dermatol Ve	0.976
10	Indian J Eng Mater S	0.218
11	Indian J Exp Biol	0.55
12	Indian J Heterocy Ch	0.298
13	Indian J Hortic	0.062
14	Indian J Mar Sci	0.102
15	Indian J Med Res	1.516
16	Indian J Pediatr	0.539
17	Indian J Pharm Educ	0.15
18	Indian J Pharmacol	0.267
19	Indian J Phys	0.226
20	Indian J Pure Ap Mat	0.333
21	Indian J Pure Ap Phy	0.246
22	Indian J Tradit Know	0.087
23	Indian J Virol	0.276
24	Indian Pediatr	0.962

25	J Astrophys Astron	0.58
26	J Biosciences	1.956
27	J Chem Sci	0.993
28	J Earth Syst Sci	0.819
29	J Genet	0.762
30	J Indian Chem Soc	0.382
31	J Postgrad Med	1.389
32	Neurol India	0.796
33	P Indian As-Math Sci	0.382
34	Pramana-J Phys	0.349
35	Sadhana-Acad P Eng S	0.196

Table 5 – Average 2009 price of journals in scientific disciplines.[141]

Discipline	**Average price per title, $**
Chemistry	3,690
Physics	3,252
Engineering	2,047
Biology	1,980
Technology	1,950
Astronomy	1,781
Geology	1,632
Botany	1,581
Zoology	1,510
Math & Computer Science	1,472
Health Sciences	1,401
Food Science	1,390
General Science	1,174
Geography	1,145
Agriculture	1,089
Average cost of an ISI title: $1,302 Source: LJ Periodicals Price Survey 2009	

[141] Supra note43.

Table 6 – Growth of periodicals during 1788-1900

Year	No. of Journals
1788-1800	2
1801-1825	4
1826-1850	44
1851-1875	213
1876-1900	462
Total	**725**
http://eprints.rclis.org/handle/10760/7190	

Table 7 – Mandates worldwide distributed by type

Source: http://roarmap.eprints.org (as on 31st March 2010)

Mandate type	No. of mandates
Institutional Mandate	117
Thesis Mandate	75
Funder Mandate	47
Sub-Institutional Mandate	30
Proposed Funder Mandate	8
Proposed Institutional Mandate	5
Proposed Multi-Institutional Mandate	5
Proposed Sub-Institutional Mandate	3
X-Other (Non-Mandate)	2
Multi-Institutional Mandate	1

Table 8 – Mandates worldwide distributed by country
Source: http://roarmap.eprints.org
(as on 31st March 2010)

Country	No. of mandates
United States	60
United Kingdom	47
Finland	28
Australia	28
Italy	27
Canada	22
France	11
Germany	11
Sweden	9
India	8
Portugal	8
Spain	8
China	7
Ireland	6
Norway	6
Belgium	5
Switzerland	5
Netherlands	4
Denmark	3
Poland	3
Russia	3
Ukraine	3
Colombia	3
South Africa	3
Indonesia	2
New Zeland	2
Kenya	1
Nigeria	1
Azerbaijan	1
Japan	1
Taiwan	1
Turkey	1
Vietnam	1
Austria	1
Greece	1
Hungary	1
Bolivia	1
Brazil	1
Peru	1
Venezuela	1

Figures

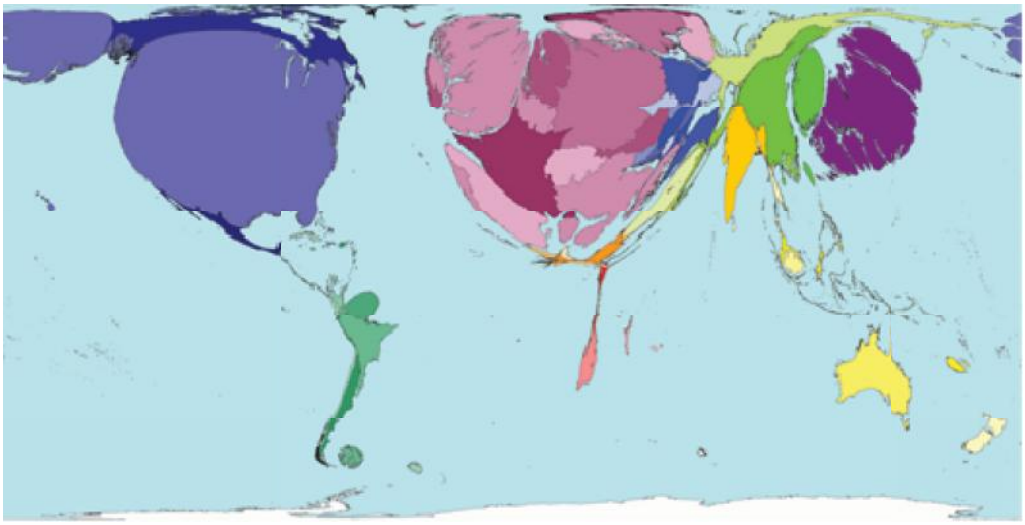


Figure1. Production of research papers by different countries. [Territory size shows the proportion of all scientific papers published in 2001 written by authors living there.] Image © Copyright SASI Group (University of Sheffield) and Mark Newman (University of Michigan). Available at Worldmapper.[142] The authors have been granted permission to reproduce this figure under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. Source of data used to create map: World Bank's 2005 World Development Indicators.

[142] http://www.worldmapper.org/display.php?selected=205.

Figure 2. Organogram of R&D in India [Source: DST, New Delhi]

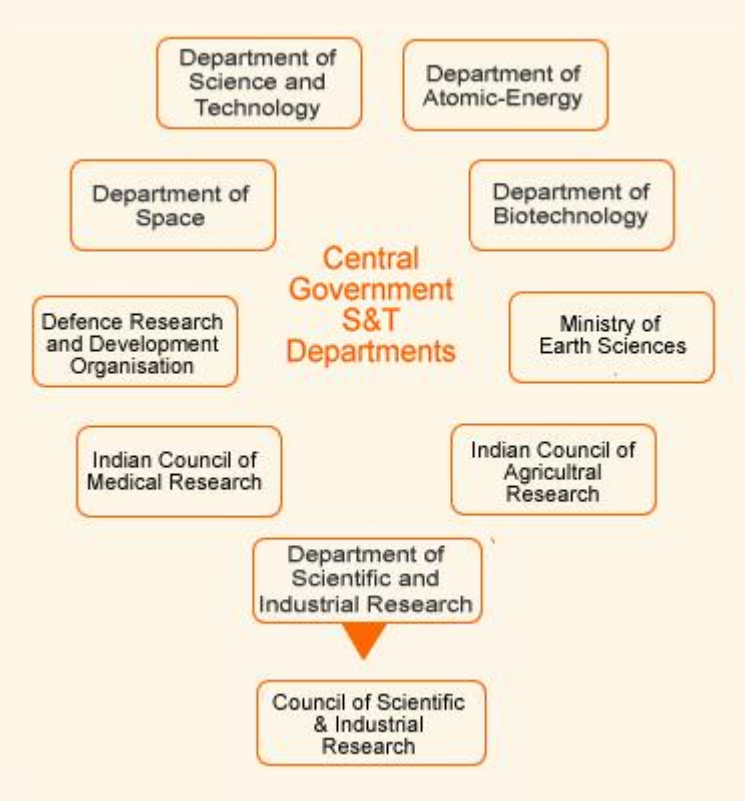


Figure 3. Research under the Central Government [Source: DST, New Delhi]

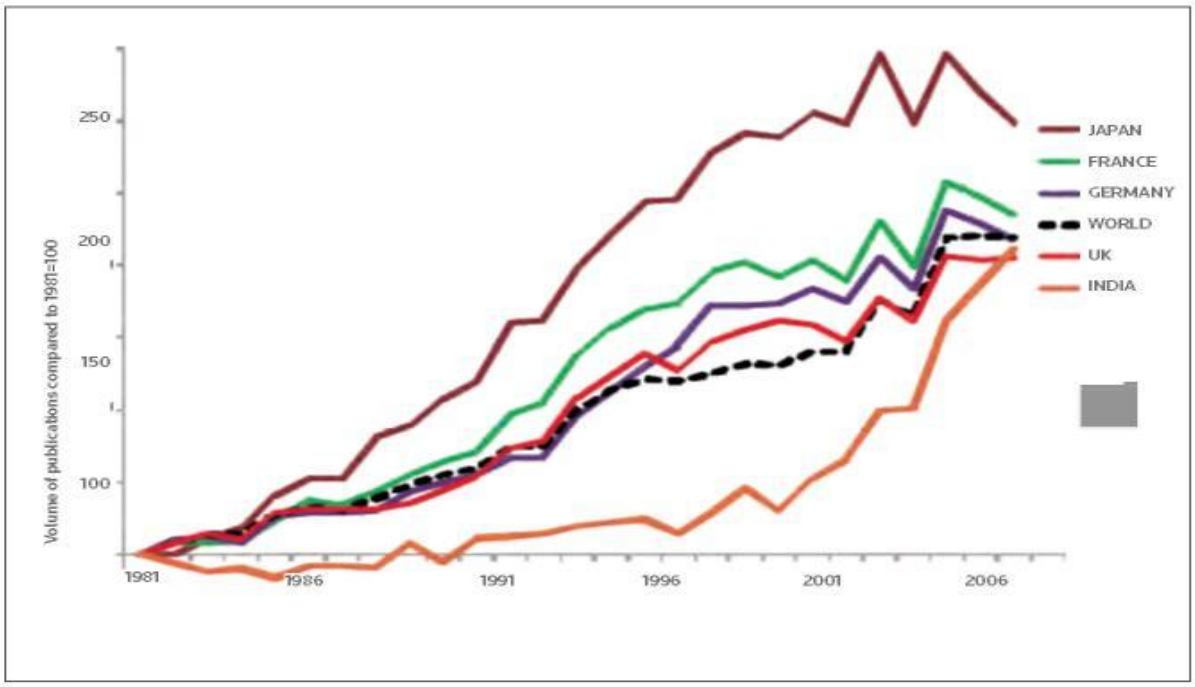


Figure 4. Growth of research India's output compared with that of some G8 countries [26]

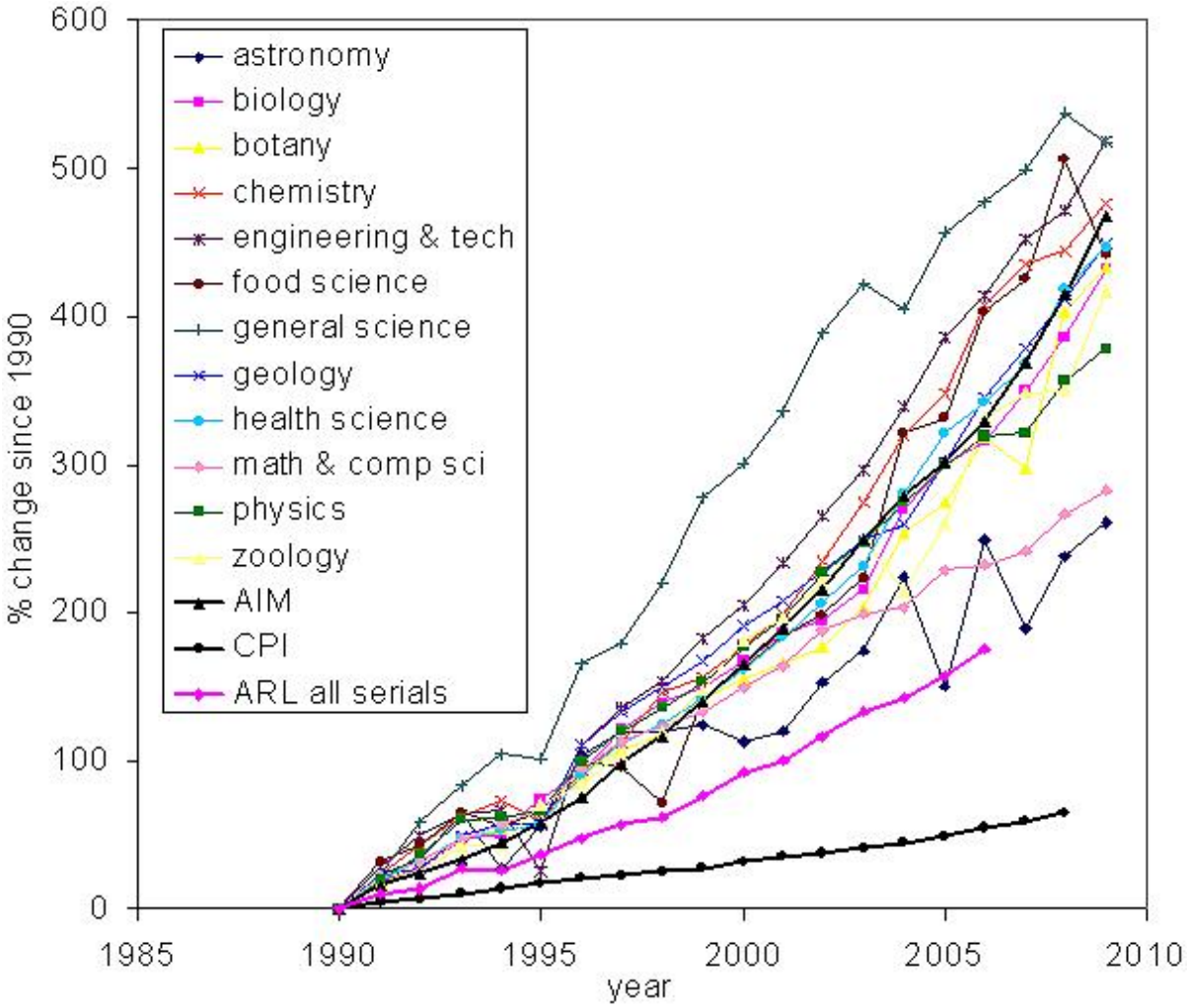
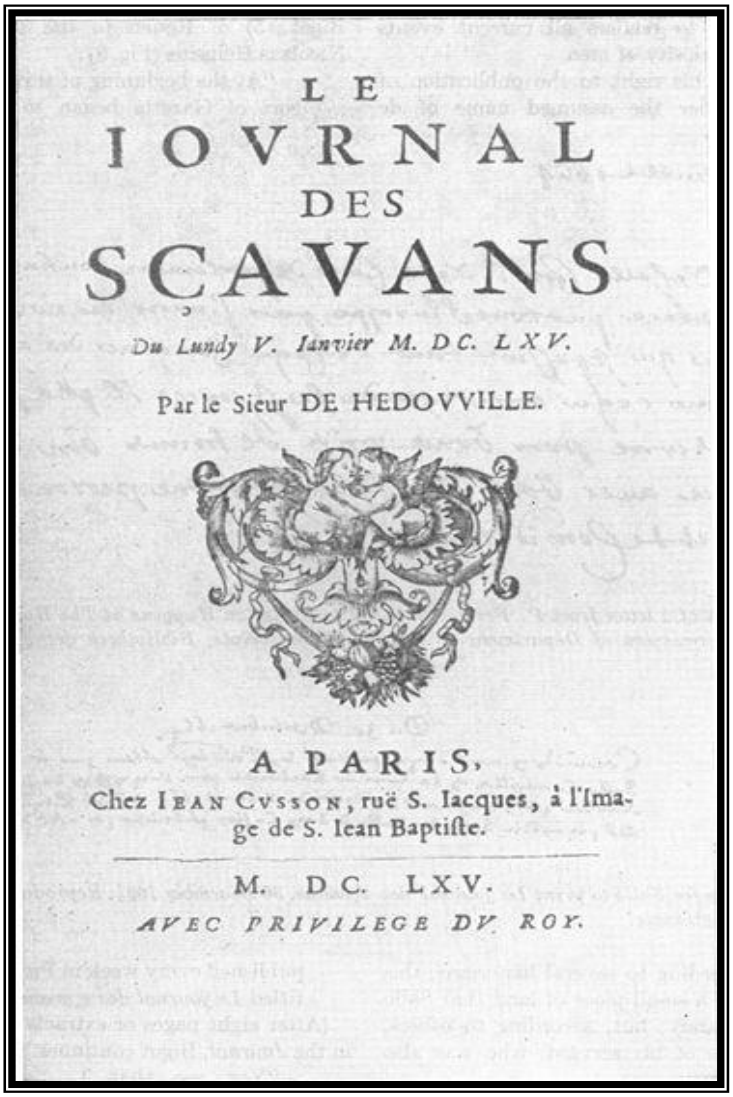


Figure 5. Per cent price increase of scientific journals between 1990 and 2008 in different fields



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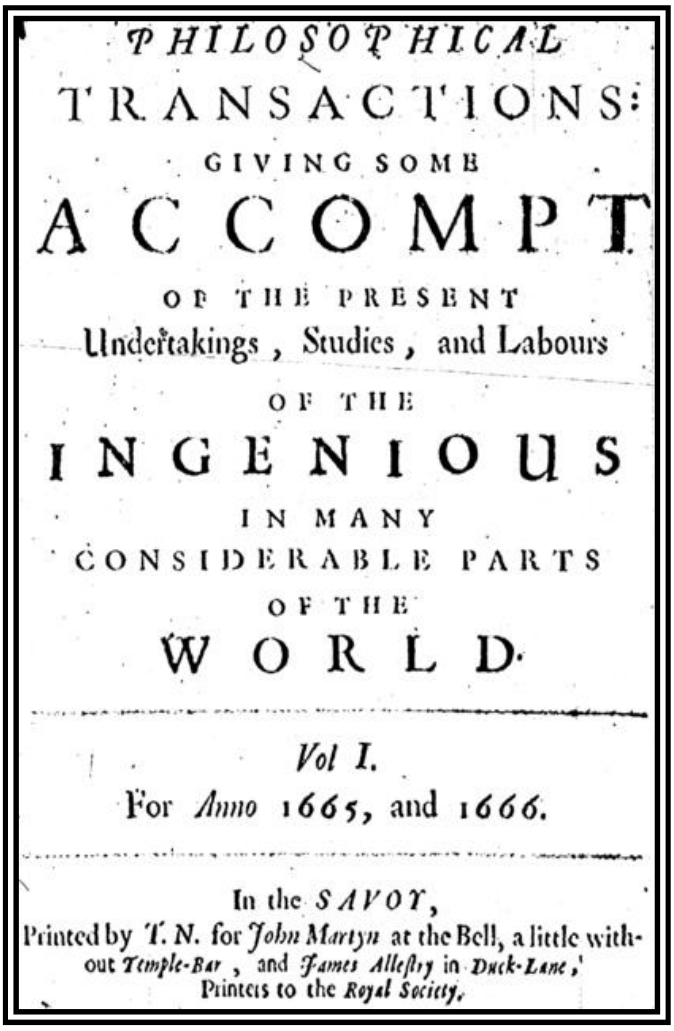
Du Lundy V. Ianvier M. DC. LXV.

Par le Sieur DE HEDOVVILLE.

A PARIS,
Chez IEAN CVSSON, ruë S. Iacques, à l'Image de S. Iean Baptiſte.

M. DC. LXV.
AVEC PRIVILEGE DV ROY.

Figure 6. The cover page of the inaugural issue of *Le Journal de Sçavans*

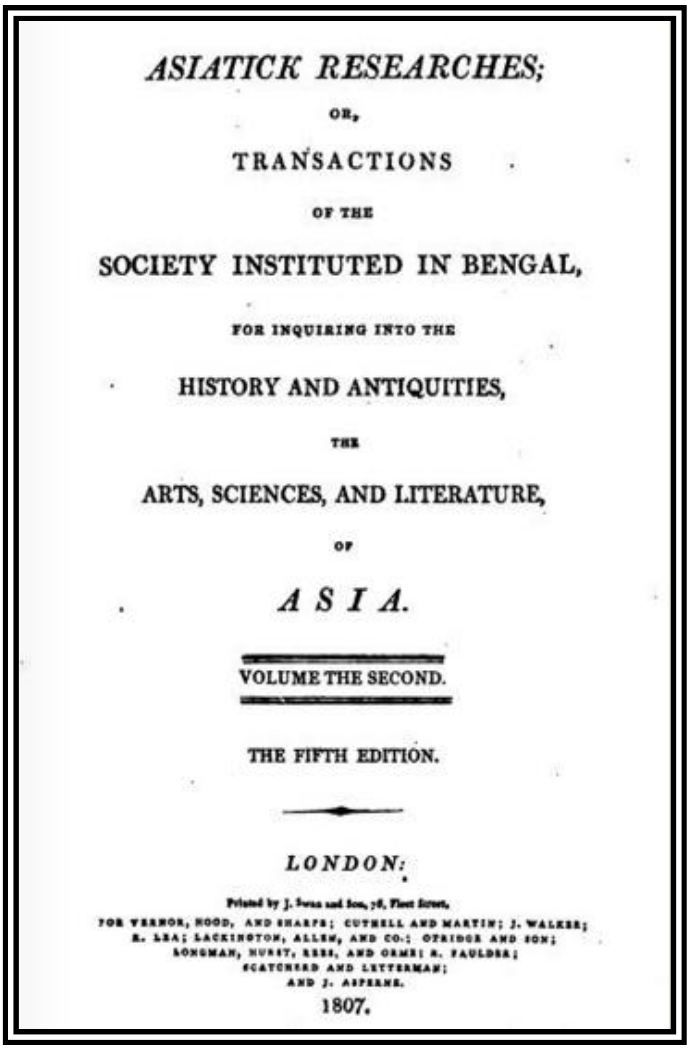


PHILOSOPHICAL
TRANSACTIONS:
GIVING SOME
ACCOMPT
OF THE PRESENT
Undertakings, Studies, and Labours
OF THE
INGENIOUS
IN MANY
CONSIDERABLE PARTS
OF THE
WORLD.

Vol I.
For Anno 1665, and 1666.

In the SAVOY,
Printed by T. N. for John Martyn at the Bell, a little without Temple-Bar, and James Allestry in Duck-Lane,
Printers to the Royal Society.

Figure 7. The cover page of the inaugural issue of *Philosophical Transactions*



ASIATICK RESEARCHES;

OR,

TRANSACTIONS

OF THE

SOCIETY INSTITUTED IN BENGAL,

FOR INQUIRING INTO THE

HISTORY AND ANTIQUITIES,

THE

ARTS, SCIENCES, AND LITERATURE,

OF

A S I A.

VOLUME THE SECOND.

THE FIFTH EDITION.

LONDON:

Printed by J. Swan and Son, 75, Fleet Street,

FOR VERNOR, HOOD, AND SHARPE; CUTHELL AND MARTIN; J. WALKER; R. LEA; LACKINGTON, ALLEN, AND CO.; OTRIDGE AND SON; LONGMAN, HURST, REES, AND ORME; R. FAULDER; CATCHSIDE AND LETTERMAN; AND J. ASPERNE.

1807.

Figure 8. Cover page of an early issue of *Asiatick Researches*

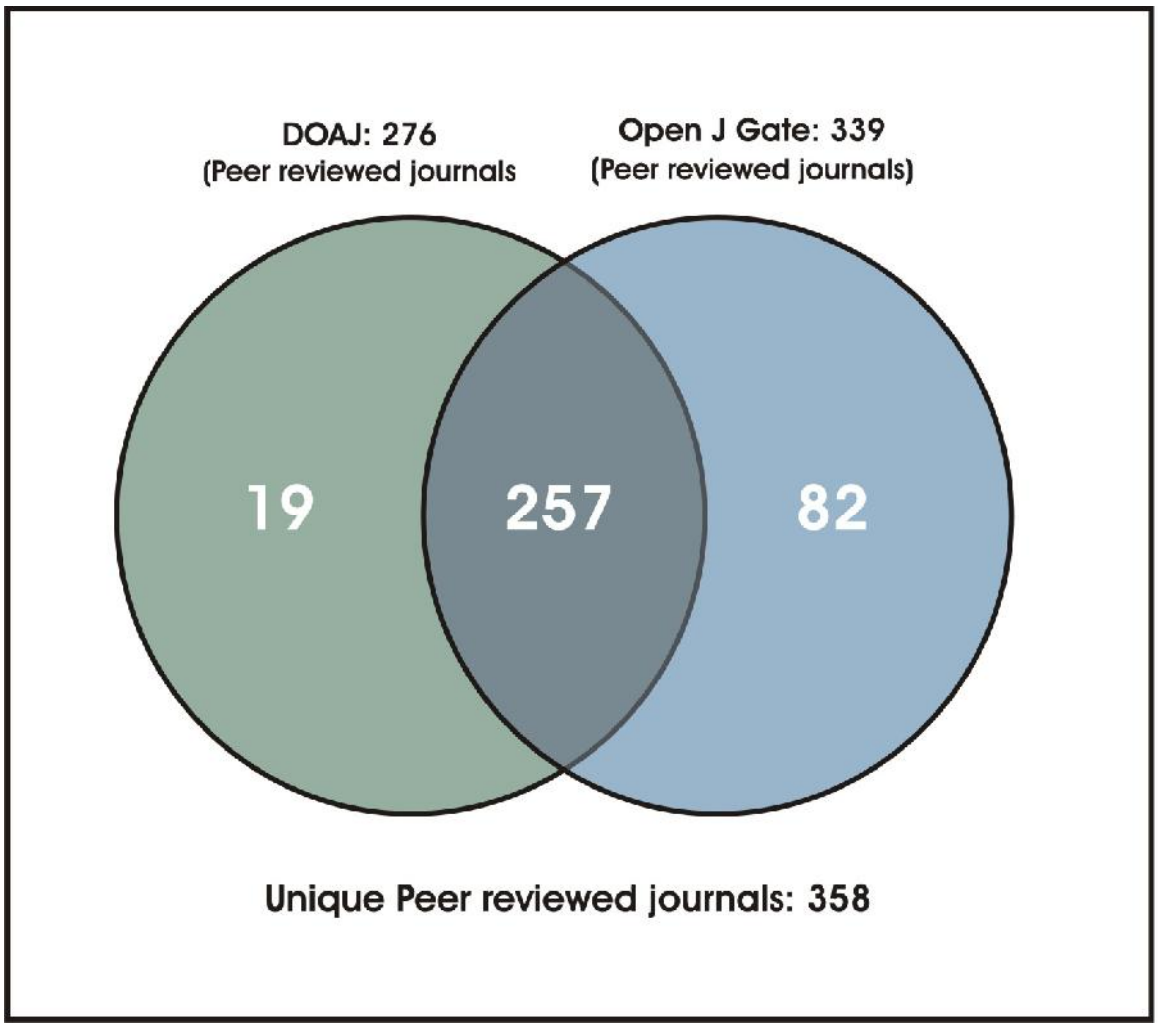


Figure 9. Indian open access journals indexed in DOAJ and Open J-Gate

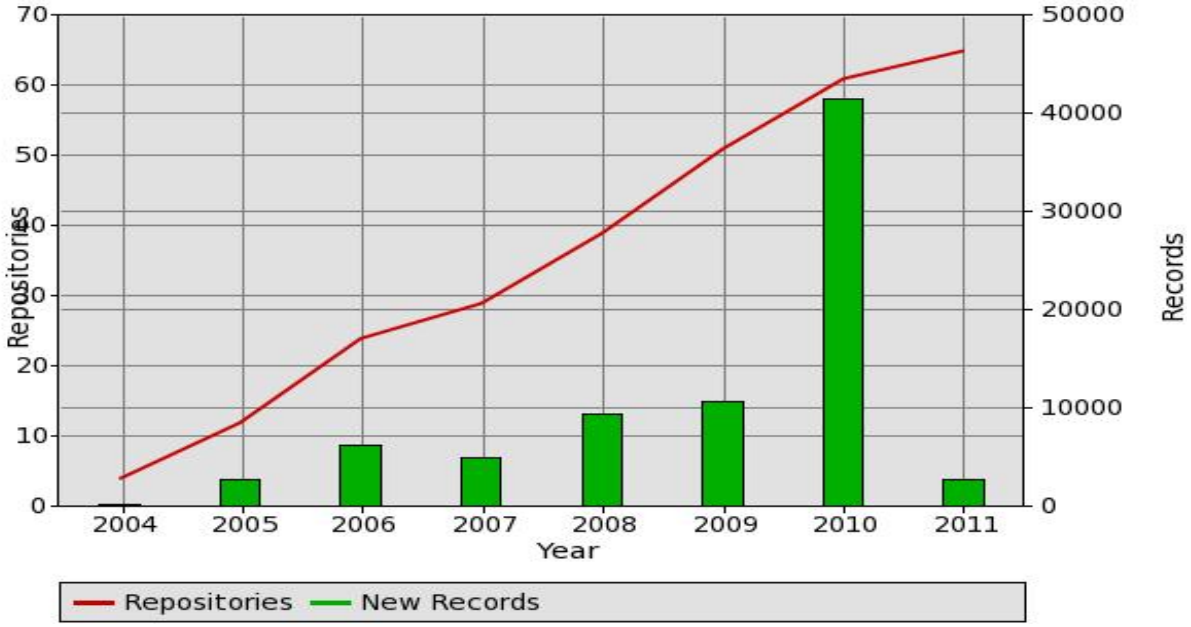
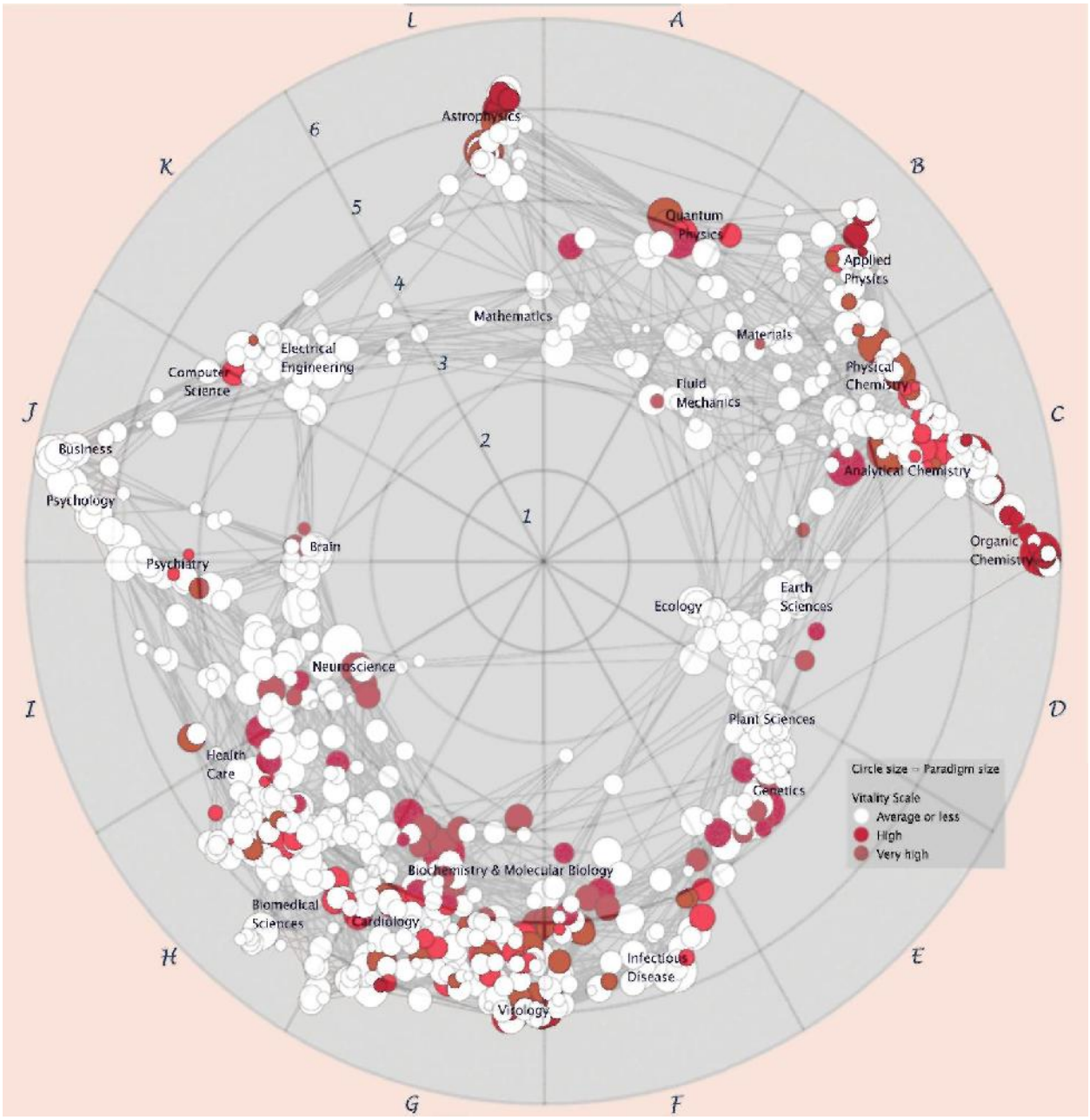


Figure 10. Growth of repositories in India and the papers deposited in them
[*Source: ROAR* as on 2 April 2011]

Appendices

Appendix 1: Science paradigms showing the unity of science



The map and the following explanatory text were taken from Börner K (2010), Atlas of Science: Visualizing What We Know,[143] The MIT Press,184;[144] The map with a different explanatory text appeared in Klavans R & Boyack K W (2008), Thought leadership: A new indicator for national and institutional comparison, *Scientometrics*, 75(2),

[143] http://scimaps.org/atlas/.
[144] http://scimaps.org/atlas/part4-2.html.

239-250. The map, created using data from SCI and SSCI (Thomson Reuters), appeared originally in Maps of Science.[145]

Science can be thought of as containing themes and paradigms. Themes are areas of current research, while paradigms comprise the dominant tool sets and existing knowledge that are used by today's researchers. This map shows 776 major paradigms in science along with the dominant relationships between these paradigms. Paradigms are shown as circles; strong relationships between paradigms are indicated by the lines connecting the circles. The map was created by recursively clustering the 820,000 papers referenced most often in 2003. Clustering at each level was done using VxOrd, a force-directed graph layout routine. These papers formed 53,000 clusters, 6,100 higher-level clusters, and finally 776 paradigms. Although each paradigm contains, on average, 1000 papers, some are larger and some are smaller, as shown by different sized circles on the map.

The ring-like structure that formed by scientific paradigms is very robust. We find similar structures for different years, and for maps generated from scientific journals. "The structure of Science", a galaxy map shown in the first iteration of Places & Spaces, is a map based on clustering of scientific journals, with superimposition of papers on the journal structure, whereas this map was generated directly from highly-cited papers. "The Structure of Science" shows current science in a disciplinary context, while this map shows the breadth of disciplines that contribute to single paradigms.

Because of the robust nature of the structure of science paradigms, we have placed our 776 scientific paradigms within a reference system containing 12 radial slices and 6 rings. This allows the position of each paradigm to be codified and available for lookup; for instance Fluid Mechanics paradigms are in grid B3.

We have also calculated and displayed the vitality of each paradigm. Vitality is a measure of the speed at which a group of researchers reaches consensus about major improvements. Paradigms are constantly being improved, but it usually takes years to reach consensus about which improvements are major. The white circles represent communities where consensus is reached relatively slowly. This is a common phenomenon in the social sciences, ecological sciences, computer sciences, and mathematics disciplines. The red circles represent communities of researchers where consensus is reached relatively rapidly. This is more common in physics, chemistry, biochemistry and many medical disciplines. Very dark circles (such as those in Astrophysics L5-6) represent communities where consensus is reached extremely quickly.

The map of scientific paradigms and its reference system can be used for multiple purposes. Countries, industries, companies, universities, and individual researchers can

[145] http://www.mapofscience.com.

all locate themselves within the map, either as single points, or as a specific collection of paradigms. Various metrics, such as vitality, can be overlaid on this reference system to highlight specific impacts. Science educations and personal discovery can also be enhanced by linking stories and facts to the map that highlight scientific history, current advances and relationships between scientific paradigms.

Appendix 2: Indian open access journals indexed in DOAJ and Open-J-Gate (as on the first week of December 2010)

No.	Journal	Open J-Gate Start Year	DOAJ Start year	Publisher
1	Advanced Materials Letters	2010	2010	VBRI Press, Allahabad
2	Advances in Applied Science Research	2010	2010	Pelagia Research Library
3	Advances in Computational Research	2009	2009	Bioinfo Publications
4	Advances in Information Mining	2009	2009	Bioinfo Publications
5	African Journal of Paediatric Surgery	2004	2008	Medknow Publications
6	Al Ameen Journal of Medical Sciences	2008	2008	Al Ameen Charitable Fund Trust
7	Anil Aggrawal's Internet Journal of Forensic Medicine and Toxicology	2000	2000	Anil Aggrawal
8	Annals of Cardiac Anaesthesia	2002	2005	Indian Association of Cardiovascular Thoracic Anaesthesiologists
9	Annals and Essences of Dentistry	2009	2009	Dentaquest
10	Annals of Indian Academy of Neurology	1998	2006	Staff Society of Seth G. S. Medical College and K. E. M. Hospital
11	Annals of Library and Information Studies	2002	2002	NISCAIR
12	Annals of Neurosciences	2008	2005	Indian Academy of Neurosciences
13	Annals of Pediatric Cardiology	2009	2008	Medknow Publications
14	Annals of Thoracic Medicine	2006	2006	Medknow Publications
15	Anthropologist	2004	2003	Kamla-Raj Enterprises
16	Asian Journal of Experimental Biological Sciences	2010	2010	Society of Applied Sciences

No.	Journal	Open J-Gate Start Year	DOAJ Start year	Publisher
17	Asian Journal of Management Research	2010	2010	Integrated Publishing Association
18	Asian Journal of Pharmaceutical and Clinical Research	2009	2009	Abhilasha Jain
19	Asian Journal of Transfusion Science	2007	2007	Indian Society of Blood Transfusion and Immunohematology
20	Bharatiya Vaigyanik evam Audyogik Anusandhan Patrika	2007	2007	NISCAIR
21	Bioinformation	2005	2005	MANIT, Bhopal
22	Biology and Medicine	2009	2009	E Business Navigators
23	Biomirror	2010	2010	Xinnovem Publishing Group
24	Bulletin of Materials Science	2002	2000	Indian Academy of Sciences
25	Calicut Medical Journal	2003	2003	CMC Alumni Vellore Association
26	Carbon -Science and Technology	2008	2008	Applied Science Innovations Private Limited
27	Chronicles of Young Scientists	2010	2010	Open Publications
28	Conservation and Society	2003	2003	Ashoka Trust for Research in Ecology and Environment
29	Contemporary Clinical Dentistry	2010	2010	Maharishi Markandeshwar University
30	Contemporary Issues and Ideas in Social Sciences	2005	2005	Society for Research in Social Sciences
31	Current Science	1932	1932	Current Science Association
32	Defence Science Journal	2007	1950	Defence Scientific Information and Documentation Centre
33	Der chemica Sinica	2010	2010	Pelagia Research Library
34	Der Pharmacia Sinica	2010	2010	Pelagia Research Library
35	Drug Invention Today	2010	2009	Association of Pharmaceutical Innovators
36	Earth Science India	2008	2010	Society of Earth Scientists
37	E-Journal of Chemistry	2004	2006	E-Journal of Chemistry

38	Electronic Journal of Plant Breeding	2009	2009	Indian Society of Plant Breeders
39	Global Journal of Enterprise Information System	2009	2009	Kedar Amar Research and Academic Management Society
40	Hepatitis B Annual	2004	2004	Kalinga Gastroenterology Foundation
41	IETE Journal of Research	2007	2008	Institution of Electronics and Telecommunication Engineers
42	IETE Technical Review	2007	2007	Institution of Electronics and Telecommunication Engineers
43	IIOAB Journal	2010	2010	Institute of Integrative Omics and Applied Biotechnology
44	Indian Anaesthetists Forum	2005	2000	Indian Anaesthetists Forum
45	Indian Folklife	2005 (only)	2000	National Folklore Support Centre
46	Indian Journal of Anaesthesia	2003	2010	Indian Society of Anaesthesiologists
47	Indian Journal of Biochemistry and Biophysics	2006	2007	NISCAIR
48	Indian Journal of Biotechnology	2006	2004	NISCAIR
49	Indian Journal of Cancer	2002	2002	Indian Cancer Society
50	Indian Journal of Chemical Technology	2002	2007	NISCAIR
51	Indian Journal of Chemistry - Section A	2006	2007	NISCAIR
52	Indian Journal of Chemistry - Section B	2006	2006	NISCAIR
53	Indian Journal of Chest Diseases & Allied Sciences	2000	2000	Indian Journal of Chest Diseases and Allied Sciences
54	Indian Journal of Commerce & Management Studies	2010	2010	Educational Research Multimedia & Publications
55	Indian Journal of Community Medicine	2000	2005	Ind Medica Ltd
56	Indian Journal of Computer Science and Eng	2010	2010	Engg Journals Publications
No.	**Journal**	**Open J-Gate Start Year**	**DOAJ Start year**	**Publisher**
57	Indian Journal of Critical Care			Indian Society of Critical Care

	Medicine	2003	2003	Medicine
58	Indian Journal of Dental Research	2005	2005	Medknow Publications
59	Indian Journal of Dental Sciences	2009	2009	Himachal Dental College
60	Indian Journal of Dermatology	1995	2005	Medknow Publications
61	Indian Journal of Dermatology, Venereology & Leprology	1995	1995	Medknow Publications
62	Indian Journal of Engineering & Materials Sciences	2006	2007	NISCAIR
63	Indian Journal of Fibre and Textile Research	2003	2007	NISCAIR
64	Indian Journal of Human Genetics	1995	2002	Indian Society of Human Genetics
65	Indian Journal of Marine Sciences	2002	2001	NISCAIR
66	Indian Journal of Medical & Paediatric Oncology	2001	2004	Indian Society of Medical & Pediatric Oncology
67	Indian Journal of Medical Microbiology	2001	2001	Indian Journal of Medical Microbiology
68	Indian Journal of Medical Research	2003	2003	Indian Council of Medical Research
69	Indian Journal of Medical Sciences	2003	2000	Indian Journal of Medical Sciences
70	Indian Journal of Medical Specialities	2010	2010	Indian Journal of Medical Specialities
71	Indian Journal of Nephrology	2001	2007	Indian Society of Nephrology
72	Indian Journal of Neurotrauma	2004	2004	Neurotrauma Society of India
73	Indian Journal of Occupational and Environmental Medicine	2003	2003	Medknow Publications
74	Indian Journal of Ophthalmology	1953	2005	All India Ophthalmological Society
75	Indian Journal of Orthopaedics	2001	2007	Indian Orthopaedic Association
76	Indian Journal of Palliative Care	2003	2003	Medknow Publications
77	Indian Journal of Pathology and Microbiology	1995	2008	Indian Association of Pathologists and Microbiologists
78	Indian Journal of Pharmaceutical Sciences	1990	2006	Indian Pharmaceutical Association
79	Indian Journal of Physical Medicine and Rehabilitation	2009	1993	Indian Association of Physical Medicine & Rehabilitation

No.	Journal	Open J-Gate Start Year	DOAJ Start year	Publisher
80	Indian Journal of Plastic Surgery	2003	2003	Medknow Publications
81	Indian Journal of Psychiatry	1970	2006	Indian Psychiatric Society
82	Indian Journal of Psychological Medicine	2008	2008	Indian Psychiatric Society
83	Indian Journal of Pure and Applied Physics	2002	2007	NISCAIR
84	Indian Journal of Radio & Space Physics	2006	2006	NISCAIR
85	Indian Journal of Radiology and Imaging	2000	1999	Indian Journal of Radiology and Imaging
86	Indian Journal of Science and Technology	2007	2007	Indian Society for Education and Environment
87	Indian Journal of Sexually Transmitted Diseases	2004	2007	Indian Journal of Sexually Transmitted Diseases
88	Indian Journal of Stomatology	2010	2010	Indian Journal of Stomatology
89	Indian Journal of Traditional Knowledge	2004	2006	NISCAIR
90	Indian Journal of Urology	2000	2005	Medknow Publications
91	Indian Pacing and Electrophysiology Journal	2002	2001	Indian Pacing and Electro-physiology Group
92	Indian Pediatrics	1996	1997	Indian Academy of Pediatrics
93	Indian Review of World Literature in English	2005	2005	Indian Institute of World Literature
94	Industrial Psychiatry Journal	2009	2008	Medknow Publications
95	International Journal of Ad hoc, Sensor & Ubiquitous Computing	2010	2010	Academy & Industry Research Collaboration Center
96	International Journal of Advanced Research in Computer Science	2010	2010	International Journal of Advanced Research in Computer Science
97	International Journal of Advancements in Technology	2010	2010	International Journal of Advancements in Technology Foundation
98	International Journal of Advances in Pharmaceutical Sciences	2010	2010	Advanced Research Journals
99	International Journal of Agriculture Sciences	2009	2010	Bioinfo Publications
100	International Journal of Applied			International Journal of

	Biology and Pharmaceutical Technology	2010	2010	Applied Biology and Pharmaceutical Technology
101	International Journal of Applied Engineering Research	2010	2010	Integrated Publishing Association
102	International Journal of Applied Mathematics and Computation	2009	2009	Darbose Printice Hall
103	International Journal of Artificial Intelligence & Applications	2010	2010	Academy & Industry Research Collaboration Center
104	International Journal of Ayurveda Research	2010	2010	Medknow Publications
105	International Journal of Bioinformatics Research	2010	2009	Bioinfo Publications
106	International Journal of Biological Sciences and Engineering	2010	2010	Cafet-Innova Technical Society
107	International Journal of Biotechnology Appl	2009	2009	Bioinfo Publications
No.	**Journal**	**Open J-Gate Start Year**	**DOAJ Start year**	**Publisher**
108	International Journal of Chemical Research	2009	2009	Bioinfo Publications
109	International Journal of Chemistry Research	2010	2010	Academic Sciences
110	International Journal of ChemTech Research	2009	2009	Sphinx Knowledge House
111	International Journal of Civil and Structural Engineering	2010	2010	Integrated Publishing Association
112	International Journal of Computer Networks & Communications	2009	2009	Academy & Industry Research Collaboration Center
113	International Journal of Computer Science & Information Technology	2009	2009	Academy & Industry Research Collaboration Center
114	International Journal of Computer Science and Applications	2004	2004	Technomathematics Research Foundation
115	International Journal of Computer Science and Engineering Survey	2010	2010	Academy & Industry Research Collaboration Center
116	International Journal of Computer Science and Information Technologies	2010	2010	International Journal of Computer Science and Information Technologies
117	International Journal of Contemporary Dentistry	2010	2010	eDent Journals
118	International Journal of Contemporary Research and Review	2010	2010	International Journal of Contemporary Research and Review
119	International Journal of Criminal Justice Sciences	2006	2006	International Journal of Criminal Justice Sciences
120	International Journal of Cyber			Serials Publications

	Criminology	2007	2007	
121	International Journal of Database Management Systems	2009	2010	Academy & Industry Research Collaboration Center
122	International Journal of Dental Clinics	2010	2009	Celesta Software private limited
123	International Journal of Diabetes in Developing Countries	2001	2001	Medknow Publications
124	International Journal of Drug Delivery	2009	2009	Advanced Research Journals
125	International Journal of Drug Development & Research	2009	2009	International Journal of Drug Development & Research
126	International Journal of Drug Discovery	2009	2009	Bioinfo Publications
127	International Journal of Educational Sciences	2009	2009	Kamla-Raj Enterprises
128	International Journal of Engineering and Technology	2009	2009	Engineering Journals Publications
129	International Journal of Engineering Science and Technology	2009	2009	Engg Journals Publications
130	International Journal of Environmental Sciences	2010	2010	Integrated Publishing Association
131	International Journal of Genetics	2009	2009	Bioinfo Publications
132	International Journal of Geomatics and Geosciences	2010	2010	Integrated Publishing Association
No.	**Journal**	**Open J-Gate Start Year**	**DOAJ Start year**	**Publisher**
133	International Journal of Green Pharmacy	2007	2007	Medknow Publications
134	International Journal of Human Genetics	2005	2001	Kamla-Raj Enterprises
135	International Journal of Integrative Biology	2007	2007	Omics Group
136	International Journal of Machine Intelligence	2009	2009	Bioinfo Publications
137	International Journal of Managing Information Technology	2009	2010	Academy & Industry Research Collaboration Center
138	International Journal of Microbiology Research	2009	2009	Bioinfo Publications
139	International journal of Multimedia & Its Applications	2009	2010	Academy & Industry Research Collaboration Center
140	International Journal of Network Security & Its Applications	2009	2009	Academy & Industry Research Collaboration Center
141	International Journal of Next-Generation Networks	2009	2009	Academy & Industry Research Collaboration Center

142	International Journal of Parasitology Research	2009	2009	Bioinfo Publications
143	International Journal of Pharma Sciences and Research	2010	2010	KEJA Publications
144	International Journal of Pharmaceutical and Biological Archive	2010	2010	Mandsaur Institute of Pharmacy
145	International Journal of Pharmaceutical and Biological Research	2010	2010	KEJA Publications
146	International Journal of Pharmaceutical and Biomedical Research	2010	2010	PharmSciDirect Publications
147	International Journal of Pharmaceutical Research and Development	2009	2009	International Journal of Pharmaceutical Research and Development
148	International Journa of Pharmaceutical Science: Review and Research	2010	2010	Pharmacy and Materia Medica
149	International Journal of Pharmaceutical Sciences and Drug Research	2009	2009	International Journal of Pharmaceutical Sciences and Drug Research
150	International Journal of Pharmacy and Pharmaceutical Sciences	2009	2009	International Journal of Pharmacy and Pharmaceutical Sciences
151	International Journal of Pharmacy and Technology	2009	2009	Pharmacy and Materia Medica
152	International Journal of PharmTech Research	2009	2009	Sphinx Knowledge House
153	International Journal of Phytomedicine	2009		Advanced Research Journals
154	International Journal of Pure and Applied Sciences and Technology	2010	2010	International Journal of Pure and Applied Sciences and Technology
155	International Journal of Research in Ayurveda and Pharmacy	2010	2010	International Journal of Research in Ayurveda and Pharmacy
No.	**Journal**	**Open J-Gate Start Year**	**DOAJ Start year**	**Publisher**
156	International Journal of Research in Pharmaceutical Sciences	2010	2010	JK Welfare & Pharmascope Foundation
157	International Journal of Shoulder Surgery	2007	2007	Medknow Publications
158	International Journal of Software Engineering & Applications	2010	2010	Academy & Industry Research Collaboration Center

159	International Journal of Systems Biology	2009	2009	Bioinfo Publications
160	International Journal of Ubiquitous Computing	2010	2010	Academy & Industry Research Collaboration Center
161	International Journal of VLSI Design & Communication Systems	2010	2010	Academy & Industry Research Collaboration Center
162	International Journal of Web & Semantic Technology	2008	2010	Academy & Industry Research Collaboration Center
163	International Journal of Wireless & Mobile Networks	2009	2009	Academy & Industry Research Collaboration Center
164	International Journal of Yoga	2008	2008	Medknow Publications
165	International Journal on Applications of Graph Theory in Wireless Ad hoc Networks and Sensor Networks	2009	2010	Academy & Industry Research Collaboration Center
166	International Journal on Computer Science and Engineering	2009	2009	Engineering Journals Publications
167	JK Science: Journal of Medical Education & Research	2004	2004	JK Science
168	Journal of Advanced Pharmaceutical Technology & Research	2010	2010	Society of Pharmaceutical Education & Research
169	Journal of Advances in Developmental Research	2010	2010	Journal of Advances in Developmental Research
170	Journal of Anaesthesiology Clinical Pharmacology	2002	2002	Research Society of Anaesthesiology Clinical Pharmacology
171	Journal of Ayurveda and Integrative Medicine	2010	2010	Medknow Publications
172	Journal of Basic and Clinical Pharmacy	2010	2010	Global Scientific Research Forum
173	Journal of Biochemical Technology	2008	2008	Sevas Educational Society
174	Journal of Biomedical Sciences and Research	2009	2009	PharmaInfo Publications
175	Journal of Biopesticides	2008	2008	Crop Protection Research Centre
176	Journal of Biosciences	1999	1998	Indian Academy of Sciences
177	Journal of Cancer Research and Therapeutics	2005	2005	Association of Radiation Oncology of India
178	Journal of Carcinogenisis	2002	2002	Medknow Publications
179	Journal of Chemical and Pharmaceutical Research	2009	2009	Journal of Chemical and Pharmaceutical Research
180	Journal of Chemical Sciences (PIAS-Chem Sci)	2000	2000	Indian Academy of Sciences

No.	Journal	Open J-Gate Start Year	DOAJ Start year	Publisher
181	Journal of Clinical and Diagnostic Research	2007	2007	Premchand Shantidevi Research Foundation
182	Journal of Conservative Dentistry	2005	2005	Medknow Publications
183	Journal of Craniovertebral Junction and Spine	2010	2010	Medknow Publications
184	Journal of Current Pharmaceutical Research	2010	2010	MediPOEIA Publication
185	Journal of Cutaneous and Aesthetic Surgery	2008	2008	Association of Cutaneous Surgeons of India
186	Journal of Cytology	2007	2007	Medknow Publications
187	Journal of Dental Sciences and Research	2010	2010	Sri Siddhartha Academy of Higher Education
188	Journal of Emergencies Trauma and Shock	2009	2010	Medknow Publications
189	Journal of Environmental Biology	2006	2006	Triveni Enterprises
190	Journal of Forensic Dental Sciences	2009	2009	Medknow Publications
191	Journal of Global Infectious Diseases	2009	2009	Medknow Publications
192	Journal of Global Pharma Technology	2009	2009	Journal of Global Pharma Technology
193	Journal of Global Research in Computer Science	2010	2010	Journal of Global Research in Computer Science
194	Journal of Gynecological Endoscopy and Surgery	2009	2009	Medknow Publications
195	Journal of Human Ecology	2004	2004	Kamla-Raj Enterprises
196	Journal of Human Reproductive Sciences	2008	2008	Medknow Publications
197	Journal of Indian Association for Child and Adolescent Mental Health	2005	2005	Indian Association for Child and Adolescent Mental Health
198	Journal of Indian Association of Pediatric Surgeons	2004	2002	Journal of Indian Association of Pediatric Surgeons
199	Journal of Indian Society of Pedodontics and Preventive Dentistry	2005	2000	Indian society of Pedodontics and Preventive Dentistry
200	Journal of Indian Society of Periodontology	2008	2008	Indian Society of Periodontology
201	Journal of Innovative trends in Pharmaceutical Sciences	2010	2010	Trendz Publications
202	Journal of Intellectual Property			NISCAIR

	Rights	2006	2006	
203	Journal of Life Sciences	2009	2009	Kamla-Raj Enterprises
204	Journal of Medical Physics	2000	2006	Association of Medical Physicists of India
205	Journal of Mid-life Health	2010	2010	Medknow Publications
206	Journal of Minimal Access Surgery	2005	2005	Indian Association of Gastrointestinal Endosurgeons
207	Journal of Natural Products	2008	2008	Journal of Natural Products
208	Journal of Oral and Maxillofacial Pathology	2007	2007	Medknow Publications
209	Journal of OroFacial Sciences	2010	2009	Sibar Institute of Dental Sciences
No.	**Journal**	**Open J-Gate Start Year**	**DOA J Start year**	**Publisher**
210	Journal of Orthopaedics	2005	2004	Calicut Ortho Alumni Association
211	Journal of Pediatric Neurosciences	2006	2006	Medknow Publications
212	Journal of Pharmaceutical Education and Research	2010	2010	Punjab College of Technical Education
213	Journal of Pharmaceutical Research and Health Care	2009	2009	Journal of Pharmaceutical Research and Health Care
214	Journal of Pharmaceutical Science and Technology	2009	2009	PharmaInfo Publications
215	Journal of Pharmaceutical Sciences and Research	2009	2009	PharmaInfo Publications
216	Journal of Pharmacy and BioAllied Sciences	2009	2009	Open Publications
217	Journal of Pharmacy Research	2008	2008	Journal of Pharmacy Research
218	Journal of Physical Therapy	2010	2010	Journal of Physical Therapy
219	Journal of Postgraduate Medicine	1977	1990	Medknow Publications
220	Journal of SAT Agricultural Research	2007	2005	International Crops Research Institute for the Semi-Arid Tropics
221	Journal of Scientific Review	2009	2009	Scientific Review Board
222	Journal of Social Sciences	2004	2004	Kamla-Raj Enterprises
223	Journal of the Association of			Association of Physicians of

	Physicians of India	2000	2003	India
224	Journal of the Indian Academy of Geriatrics	2005	2005	Indian Academy of Geriatrics
225	Journal of Threatened Taxa	2009	2009	Wildlife Information Liaison Development Society
226	Journal of Tropical Agriculture	2001	2001	Kerala Agricultural University
227	Journal of Vector Borne Diseases	2003	2003	Indian Council of Medical Research
228	Journal of Young Pharmacists	2009	2009	InPharm Association
229	Law, Environment and Development Journal	2005	2005	School of Oriental and African Studies
230	Lung India	2007	2004	Indian Chest Society
231	Madras Agricultural Journal	2007	2003	Madras Agricultural Students Union
232	Mens Sana Monographs	2007	2003	Medknow Publications
233	Middle East African Journal of Ophthalmology	2007	2009	Medknow Publications
234	Modern Journal of Applied Linguistics	2009	2009	Dr.R.Narayanan
235	National Journal of Community Medicine	2010	2010	National Journal of Community Medicine
236	Natural Product Radiance	2007	2009	NISCAIR
237	Neurology India	1999	1999	Neurological Society of India
238	Online Journal of Health & Allied Sciences	2002	2002	Online Journal for Health and Allied Sciences
No.	**Journal**	**Open J-Gate Start Year**	**DOAJ Start year**	**Publisher**
239	Open Access Journal of Medicinal and Aromatic Plants	2010	2010	Medicinal and Aromatic Plants Association of India
240	Pharma Science Monitor-An International Journal of Pharmaceutical Sciences	2010	2010	Pharma Science Monitor
241	Pharmacognosy Magazine	2005	2005	Pharmacognosy Network Worldwide
242	Pharmacognosy Research	2009	2009	Pharmacognosy Network Worldwide
243	Pramana	2002	1973	Indian Academy of Sciences
244	Pravara Medical Review			Pravara Institute of Medical

		2008	2009	Sciences
245	Proceedings of the Indian Academy of Sciences: Mathematical Sciences	1997	2000	Indian Academy of Sciences
246	Rasayan Journal of Chemistry	2008	2008	Rasayan Journal
247	Research Journal of Pharmaceutical, Biological and Chemical Sciences	2010	2010	Research Journal of Pharmaceutical, Biological
248	Researchers World - Journal of Arts Science & Commerce	2010	2010	Educational Research Multimedia & Publications
249	Rupkatha Journal on Interdisciplinary Studies in Humanities	2009	2009	Tarun Tapas Mukherjee
250	Sadhana	2000	2000	Indian Academy of Sciences
251	Streamdent : SRM University Journal of Dental Sciences	2010	2010	SRM Publications Pvt. Ltd
252	Studies of Tribes and Tribals	2003	2003	Kamla-Raj Enterprises
253	Studies on Ethno-Medicine	2007	2007	Kamla-Raj Enterprises
254	Studies on Home and Community Science	2007	2007	Kamla-Raj Enterprises
255	Trade, Law and Development	2009	2009	National Law University
256	Trends in Biomaterials & Artificial Organs	2002	2001	Society for Biomaterials and Artificial Organs - India
257	Vet Scan	2006	2006	Kashvet Society, Kashmir

Appendix 3: Open access Indian journals indexed in Open J-Gate but not listed in DOAJ

No.	Journal	Publisher
1	Advances in Algebra	Research India Publications
2	Advances in Applied Mathematical Analysis	Research India Publications
3	Advances in Fuzzy Mathematics	Research India Publications
4	Ancient Asia ;Journal of the Society of South Asian Archaeology	Ubiquity Press Ltd
5	Anesthesiology Research and Practice	H P C Publishers Distributors Pvt. Ltd.
6	Annals of Biological Research	Scholars Research Library
7	Archives of Applied Science Research	Scholars Research Library
8	Archives of Dental Sciences	Manav Aiwan Paryawaran Sarachan Samiti
9	Archives of Pharmaceutical Sciences and Research	Archives of Pharmaceutical Sciences and Research

10	Archives of Physics Research	Scholars Research Library
11	Asian Journal of Experimental Sciences	Asian Journal of Experimental Sciences
12	Asian Student Medical Journal	Virtualmed
13	AYU	Medknow Publications
14	Biomedical Research	Scientific Publishers
15	Bulletin of the Astronomical Society of India	Astronomical Society of India
16	BVICAM's International Journal of Information Technology	Bharati Vidyapeeth's Institute of Computer Applications & Management
17	Current Neurobiology	Scientific Publishers of India
18	Current Pediatric Research	Scientific Publishers
19	Cytojournal	Medknow Publications
20	Dental Practice	MediMedia India Pvt. Ltd
21	Der Pharmacia Lettre	Scholars Research Library
22	Folklore and Folkloristics	National Folklore Support Centre
23	Indian Folklore Research Journal	National Folklore Support Centre
24	Indian Journal of Aerospace Medicine	Indian Society of Aerospace Medicine
25	Indian Journal of Allergy Asthma and Immunology	Indian College of Allergy Asthma and Immunology
26	Indian Journal of Clinical Biochemistry	All India Institute of Medical Sciences
27	Indian Journal of Human Development	Institute for Human Development
28	Indian Journal of Medical Informatics	Indian Association for Medical Informatics
29	Indian Journal of Occupational Therapy	All India Occupational Therapists Association
30	Indian Journal of Physiotherapy and Occupational Therapy	Ind Medica Ltd
31	Indian Journal of Rheumatolgy	Indian Rheumatology Association.
32	Indian Journal of Social Science Researches	Manovaigyanik Parikshan Sansthan
33	Indian Journal of Tuberculosis	Tuberculosis Association of India
34	International Journal of Advanced Biotechnology and Research	Bi Publication-BioIT Journals
35	International Journal of Advanced Computing	Gokaraju Rangaraju Institute of Engineering and Technology
36	International Journal of BioEngineering and Technology	International Journal of BioEngineering and Technology
No.	**Journal**	**Publisher**
37	International Journal of BioSciences and Technology	International Journal of BioSciences and Technology
38	International Journal of BioSciences, Agriculture and Technology	International Journal of BioSciences, Agriculture and Technology
39	International Journal of BioSciences, Psychiatry and Technology	International Journal of BioSciences, Psychiatry and Technology

40	International Journal of Chemical and Analytical Science	Susmita Parial in association with Association of Pharmaceutical Innovators
41	International Journal of Chemical Engineering Research	Research India Publications
42	International Journal of Chemical Sciences and Applications	Bi Publication-BioIT Journals
43	International Journal of Computer and Engineering	Academic Sciences
44	International Journal of Current Pharmaceutical Research	Academic Sciences
45	International Journal of Economics and Business Modeling	Bioinfo Publications
46	International Journal of Electronics Engineering Research	Research India Publications
47	International Journal of Engineering Studies	Research India Publications
48	International Journal of Innovation	International Journal of Innovation
49	International Journal of Medical Sciences and Technology	International Journal of Medical Sciences and Technology
50	International Journal of Pharmaceutical Applications	Bi Publication-BioIT Journals
51	International Journal of Pharmaceutical Sciences and Research	Institute of Pharmacy, Bundelkhand University
52	International Journal of Trichology	Medknow Publications
53	International Journal of Wireless Communication and Simulation	Research India Publications
54	International Research Journal of Pharmaceutical Sciences	International Research Journal of Pharmaceutical Sciences
55	Journal of Advanced Bioinformatics Applications and Research	Bi Publication-BioIT Journals
56	Journal of Family Welfare	Family Planning Association of India
57	Journal of Hospitality Application and Research	Birla Institute of Technology
58	Journal of Indian Prosthodontic Society	Medknow Publications
59	Journal of Management and Public Policy	Management Development Research Foundation
60	Journal of Neonatology	National Neonatology Forum
61	Journal of Neurogastroenterology and Motility	Asian Neurogastroenterology & Motility Association
62	Journal of Obstetrics and Gynecology of India	Federation of Obstetric & Gynaecological Societies of India
63	Journal of Oral Health Research	Consortium of Research Ardent Dentists.
64	Journal of Pharmacology & Pharmacotherapeutics	InPharm Association

No.	Journal	Publisher
65	Journal of Prenatal Diagnosis and Therapy	Indian Society for Prenatal Diagnosis and Therapy
66	Journal of the Anatomical Society of India	Anatomical Society of India
67	Journal of the Australasian College of Road Safety	Journal of the Indian Medical Association
68	Journal of the Indian Institute of Science	Indian Institute of Science
69	Karnataka Journal of Agricultural Sciences	University of Agricultural Sciences
70	Language in India	Language in India
71	Medical Journal of Armed Forces India	Medical Journal Armed Forces India
72	Medico-Legal Update	World Information Syndicate
73	National Journal of Maxillofacial Surgery	Maxillofacial Society of India
74	Oral & Maxillofacial Pathology Journal	Kairali Society of Oral & Maxillofacial Pathologists
75	Perspectives in Clinical Research	Indian Society for Clinical Research
76	Pharmaceutical Chemica	Scholars Research Library
77	Present Pasts	Ubiquity Press Ltd
78	Science & Culture	Indian Science News Association
79	Signal & Image Processing :An International Journal	Academy & Industry Research Collaboration Center
80	Surgical Neurology International	Medknow Publications
81	Transportation Research Record: Journal of the Transportation Research Board	National Academy of Sciences
82	Universal Journal of Computer Science and Engineering Technology	Universal Journal of Computer Science and Engineering Technology

Appendix 4: Open access Indian journals indexed in DOAJ but not in Open J-Gate

No.	Journal	Start year	Publisher
1	Asian Journal of Pharmaceutics	2008	Medknow Publications
2	Hygeia	2009	Pharmacy and Materia Medica
3	Indian Journal of Experimental Biology	2008	NISCAIR
4	Indian Journal of Pharmacology	1969	Medknow Publications
5	International Journal of Ayurvedic Medicine	2010	Ayurveda Sahiti Prabha
6	International Journal of Current Research Review	2009	Radiance Bahu-uddeshiya Sanstha

7	International Journal of Distributed and Parallel Systems	2010	Academy & Industry Research Collaboration Center
8	Internatinoal Journal of Pharmaceutical Science and Biotechnology	2010	Pharmacy and Materia Medica
9	Journal of Advanced Pharmaceutical Research	2010	Pharmacy and Materia Medica
10	Journal of Astrophysics and Astronomy	2001	Indian Academy of Sciences
11	Journal of Earth Systems Sciece	1978	Indian Academy of Sciences
12	Journal of Genetics	1910	Indian Academy of Sciences
13	Journal of Scientific and Industrial Research	2005	NISCAIR
14	Journal of Stem Cells and Regenerative Medicine	2007	German Stem Cell Society
15	PVRI Review	2009	Medknow Publications
16	Pharma research	2009	Pharmacy and Materia Medica
17	Philosophic Nature	2009	Excogitation & Innovation Laboratory
18	Scholars Research Journal	2010	Society of United Life Sciences
19	Sri Ramachandra Journal of Medicine	2010	Sri Ramachandra University

…….If you wish to self-archive your work, please use the accepted author's version for posting to your own website or your institution's repository. You may further deposit the accepted author's version on a funder's repository at a funder's request, provided it is not made publicly available until 12 months after publication.[146]

[146] http://www.springer.com/open+access/authors+rig.

…….In most cases authors are permitted to post their version of the article (e.g. in Word or Tex form) to their personal website or institutional repository. Authors requiring further information regarding Elsevier's archiving and manuscript policies are encouraged to visit.[147]

- You may circulate or post on any repository or website the version of the article that you submitted to the journal (i.e. the version before peer–review) – **'version 1'**.
- You may post on any non–commercial* repository or website* the version of your article that was accepted for publication – **'version 2'**. The article may not be made available earlier than 12 months after publication in the Journal issue and may not incorporate the changes made by SAGE after acceptance.[148]

[147] http://www.elsevier.com/copyright.
[148] http://www.uk.sagepub.com/authors/journal/permissions.sp

….In November 2010, the IEEE Publication Services and Products Board revised author posting policy in order to exercise better control over IEEE's intellectual property, while still offering authors essential reuse of their own created works. The new policy retains substantial rights for authors to post on their personal sites and their institutions' servers, but only the accepted versions of their papers, not a published version as might be downloaded from IEEE Xplore®.[149]

> …authors may…..post their version of the Article on their personal website, their employer's website/repository and on free public servers in their subject area after the embargo period stipulated by the journal has been passed (note that the embargo period will vary by journal, e.g. 6 months or 12 months, and that some journals do not have any embargo on self-archiving at all – see note below).[150]

[149] http://www.ieee.org/documents/authorversionfaq.pdf.
[150] http://www.wiley.com/bw/static/selfarchive.asp

Appendix 5: Indian journals in DOAJ and Open J-Gate distributed by publishers

No.	Publisher	No. of journals
1	Medknow Publications	32
2	Academy & Industry Research Collaboration Center	16
3	National Institute of Science Communication and Information Resources (NISCAIR)	15
4	Bioinfo Publications	12
5	Kamla-Raj Enterprises	9
6	Indian Academy of Sciences	6
7	Integrated Publishing Association	5
8	Advanced Research Journals	3
9	Pelagia Research Library	3
10	PharmaInfo Publications	3
11	Educational Research Multimedia & Publications	2
12	Engg Journals Publications	2
13	Engineering Journals Publications	2
14	Indian Council of Medical Research	2
15	Indian Psychiatric Society	2
16	Institution of Electronics and Telecommunication Engineers	2
17	KEJA Publications	2
18	Open Publications	2
19	Pharmacognosy Network Worldwide	2
20	Pharmacy and Materia Medica	2
21	Sphinx Knowledge House	2
22	Abhilasha Jain	1
23	Academic Sciences	1
24	Al Ameen Charitable Fund Trust	1
25	All India Ophthalmological Society	1
26	Anil Aggrawal	1
27	Applied Science Innovations Private Limited	1
28	Ashoka Trust for Research in Ecology and Environment	1
29	Association of Cutaneous Surgeons of India	1
30	Association of Medical Physicists of India	1
31	Association of Pharmaceutical Innovators	1
32	Association of Physicians of India	1
33	Association of Radiation Oncology of India	1
34	CMC Alumni Vellore Association	1
35	Cafet-Innova Technical Society	1
36	Calicut Ortho Alumni Association	1
37	Celesta Software private limited	1
38	Crop Protection Research Centre	1
39	Current Science Association	1

No.	Publisher	No. of journals
40	Darbose Printice Hall	1
41	Defence Scientific Information and Documentation Centre	1
42	Dentaquest	1
43	Dr.R.Narayanan	1
44	E Business Navigators	1
45	E-Journal of Chemistry	1
46	Global Scientific Research Forum	1
47	Himachal Dental College	1
48	InPharm Association	1
49	Ind Medica Ltd	1
50	Indian Academy of Geriatrics	1
51	Indian Academy of Neurosciences	1
52	Indian Academy of Pediatrics	1
53	Indian Anaesthetists Forum	1
54	Indian Association for Child and Adolescent Mental Health	1
55	Indian Association of Cardiovascular Thoracic Anaesthesiologists	1
56	Indian Association of Gastrointestinal Endosurgeons	1
57	Indian Association of Pathologists and Microbiologists	1
58	Indian Association of Physical Medicine & Rehabilitation	1
59	Indian Cancer Society	1
60	Indian Chest Society	1
61	Indian Institute of World Literature	1
62	Indian Journal Of Stomatology	1
63	Indian Journal of Chest Diseases and Allied Sciences	1
64	Indian Journal of Medical Microbiology	1
65	Indian Journal of Medical Sciences	1
66	Indian Journal of Medical Specialities	1
67	Indian Journal of Radiology and Imaging	1
68	Indian Journal of Sexually Transmitted Diseases	1
69	Indian Orthopaedic Association	1
70	Indian Pacing and Electrophysiology Group	1
71	Indian Pharmaceutical Association	1
72	Indian Society for Education and Environment	1
73	Indian Society of Anaesthesiologists	1
74	Indian Society of Blood Transfusion and Immunohematology	1
75	Indian Society of Critical Care Medicine	1

76	Indian Society of Human Genetics	1
77	Indian Society of Medical & Pediatric Oncology	1
78	Indian Society of Nephrology	1
79	Indian Society of Periodontology	1
80	Indian Society of Plant Breeders	1
81	Indian society of Pedodontics and Preventive Dentistry	1
82	Institute of Integrative Omics and Applied Biotechnology	1
83	International Crops Research Institute for the Semi-Arid Tropics	1
84	International Journal of Advanced Research in Computer Science	1
85	International Journal of Advancements in Technology Foundation	1
86	International Journal of Applied Biology and Pharmaceutical Technology	1
87	International Journal of Computer Science and Information Technologies	1
No.	**Publisher**	**No. of journals**
88	International Journal of Contemporary Research and Review	1
89	International Journal of Criminal Justice Sciences	1
90	International Journal of Drug Development & Research	1
91	International Journal of Pharmaceutical Research and Development	1
92	International Journal of Pharmaceutical Sciences and Drug Research	1
93	International Journal of Pharmacy and Pharmaceutical Sciences	1
94	International Journal of Pure and Applied Sciences and Technology	1
95	International Journal of Research in Ayurveda and Pharmacy	1
96	JK Science	1
97	JK Welfare & Pharmascope Foundation	1
98	Journal of Advances in Developmental Research	1
99	Journal of Chemical and Pharmaceutical Research	1
100	Journal of Global Pharma Technology	1
101	Journal of Global Research in Computer Science	1
102	Journal of Indian Association of Pediatric Surgeons	1
103	Journal of Natural Products	1

104	Journal of Pharmaceutical Research and Health Care	1
105	Journal of Pharmacy Research	1
106	Journal of Physical Therapy	1
107	Kalinga Gastroenterology Foundation	1
108	Kashvet Society, Kashmir	1
109	Kedar Amar Research and Academic Management Society	1
110	Kerala Agricultural University	1
111	MANIT, Bhopal	1
112	Madras Agricultural Students Union	1
113	Maharishi Markandeshwar University	1
114	Mandsaur Institute of Pharmacy	1
115	MediPOEIA Publication	1
116	Medicinal and Aromatic Plants Association of India	1
117	National Folklore Support Centre	1
118	National Journal of Community Medicine	1
119	National Law University	1
120	Neurological Society of India	1
121	Neurotrauma Society of India	1
122	Omics Group	1
123	Online Journal for Health and Allied Sciences	1
124	PharmSciDirect Publications	1
125	Pharma Science Monitor	1
126	Pravara Institute of Medical Sciences	1
127	Premchand Shantidevi Research Foundation	1
128	Punjab College of Technical Education	1
129	Rasayan Journal	1
130	Research Journal of Pharmaceutical, Biological and Chemical Sciences	1
No.	**Publisher**	**No. of journals**
131	Research Society of Anaesthesiology Clinical Pharmacology	1
132	SRM Publications Pvt. Ltd	1
133	School of Oriental and African Studies	1
134	Scientific Review Board	1
135	Serials Publications	1
136	Sevas Educational Society	1
137	Sibar Institute of Dental Sciences	1
138	Society for Biomaterials and Artificial Organs - India	1
139	Society for Research in Social Sciences	1
140	Society of Applied Sciences	1
141	Society of Earth Scientists	1

142	Society of Pharmaceutical Education & Research	1
143	Sri Siddhartha Academy of Higher Education	1
144	Staff Society of Seth G. S. Medical College and K. E. M. Hospital	1
145	Tarun Tapas Mukherjee	1
146	Technomathematics Research Foundation	1
147	Trendz Publications	1
148	Triveni Enterprises	1
149	VBRI Press	1
150	Wildlife Information Liaison Development Society	1
151	Xinnovem Publishing Group	1
152	eDent Journals	1
	Total	**257**

Scholar's Copyright Addendum Engine

The Scholar's Copyright Addendum Engine will help you generate a PDF form that you can attach to a journal publisher's copyright agreement to ensure that you retain certain rights.[151]

Yes. The SPARC Author Addendum is a legal instrument that modifies the publisher's agreement and allows you to keep key rights to your articles. The Author Addendum is a free resource developed by SPARC in partnership with Creative Commons[152] and Science Commons,[153] established non-profit organizations that offer a range of copyright options for many different creative endeavours.[154]

[151] http://scholars.sciencecommons.org/#form.
[152] http://www.creativecommons.org.
[153] http://science.creativecommons.org.
[154] http://www.arl.org/sparc/bm~doc/Access-Reuse_Addendum.pdf.

Appendix 6: List of non peer reviewed Indian open access journals/magazines indexed in Open J Gate

No.	Journal	Publisher
1	ASCI Journal of Management	Administrative Staff College of India
2	Asia Pacific Technical Monitor	Asian and Pacific Centre for Transfer of Technology
3	Bharatiya Vaigyanik evam Audyogik Anusandhan Patrika	Council of Scientific and Industrial Research
4	Biotech News	Department of Biotechnology
5	Bombay Hospital Journal	Bombay Hospital Institute of Medical Sciences
6	Bulletin of Occupational & Environmental Health	Ind Medica Ltd
7	Carbon -Science and Technology	Applied Science Innovations
8	C-DAC Connect	Centre for Development of Advanced Computing
9	CSIR News	National Institute of Science Communication and Information Resources
10	Current Trends in Biotechnology & Pharmacy	Association of Biotechnology and Pharmacy
11	Digital Learning	Centre for Science, Development and Media Studies
12	E-Government	Egov
13	EHealth	eHEALTH
14	Endodontology	Indian Endodontic Society
15	Express Computer	Indian Express Group
16	Express Healthcare	Indian Express Group
17	Express Pharma Pulse	Indian Express Group
18	Express TravelWorld	Indian Express Group
19	FIEO News	Federation of Indian Export Organisations
20	Financing Agriculture	Agricultural Finance Corporation Limited
21	Fire Engineer	Institution of Fire Engineers
22	Frontline	Kasturi & Sons Ltd.
23	Global Technoscan	Global TechnoScan Consultants
24	Gobar Times	Centre for Science and Enviornment
25	Hardy-Ramanujan Journal	Indian Institute of Science
26	Health Administrator	Indian Society of Health Administrators
27	i4d: Information for Development	Centre for Science, Development and Media Studies

No.	Journal	Publisher
28	ICMR Bulletin	Indian Council of Medical Research
29	IETE Journal of Research	Medknow Publications
30	IIC Monthly Newsletter	Indian Investment Centre
31	Indian Journal for the Practising Doctor	Regional Institute of Health and Family Welfare
32	Indian Journal of Gerontology	Indian Gerntological Association
33	Indian Journal of Medical Ethics	Forum for Medical Ethics Society
34	Indian Journal of Natural Products and Resources	National Institute of Science Communication and Information Resources
35	Indian Journal of Pharmaceutical Education and Research	Association of Pharmaceutical Teachers of India
36	Indian Journal of Physics	Indian Association for the Cultivation of Science
37	Indian Journal of Public Health	Indian Journal of Public Health
38	Indian Journal of Secularism	Centre for Study of Society and Secularism
39	Indian Journal of Sleep Medicine	Indian Sleep Disorders Association
40	Indian Pulp and Paper Technical Association Journal	Indian Pulp and Paper Technical Association
41	Indian Research Journal of Extension Education	Society of Extension Education
42	Indian Textile Journal	IPF Online Limited
43	Industrial Economist	Economist Communications Ltd
44	Informatics	National Informatics Centre
45	Information Technology in Developing Countries	International Federation for Information Processing
46	Information Today & Tomorrow	National Information System for Science & Technology
47	Institution of Engineers: Aerospace Engineering	Institution of Engineers, India
48	Institution of Engineers: Agricultural Engineering	Institution of Engineers, India
49	Institution of Engineers: Architectural Engineering	Institution of Engineers, India
50	Institution of Engineers: Chemical Engineering	Institution of Engineers, India
51	Institution of Engineers: Civil Engineering	Institution of Engineers, India
52	Institution of Engineers: Computer Engineering	Institution of Engineers, India

No.	Journal	Publisher
53	Institution of Engineers: Electrical Engineering	Institution of Engineers, India
54	Institution of Engineers: Electronics and Telecom Engineering	Institution of Engineers, India
55	Institution of Engineers: Environmental Engineering	Institution of Engineers, India
56	Institution of Engineers: Marine Engineering	Institution of Engineers, India
57	Institution of Engineers: Mechanical Engineering	Institution of Engineers, India
58	Institution of Engineers: Metallurgical and Materials Engineering	Institution of Engineers, India
59	Institution of Engineers: Mining Engineering	Institution of Engineers, India
60	Institution of Engineers: Production Engineering	Institution of Engineers, India
61	Institution of Engineers: Textile Engineering	Institution of Engineers, India
62	International Journal of Advanced Networking and Applications	Eswar Publication
63	International Journal of Applied Mathematics and Mechanics	GBS Publishers and Distributors
64	International Journal of Applied Pharmaceutics	International Journal of Applied Pharmaceutics
65	International Journal of Computational Intelligence Techniques	Bioinfo Publications
66	International Journal of Dynamics of Fluids	Research India Publications
67	International Journal of Molecular Biology	Bioinfo Publications
68	International Journal of Pharmaceutical Sciences	International Journal of Pharmaceutical Sciences
69	International Journal of Pharmaceuticals Analysis	Bioinfo Publications
70	International Journal of South Asian Studies	Pondicherry University
71	Internet Health	Virtualmed
72	J.K. Practitioner	JK-Practitioner
73	Journal of Indian Geophysical Union	Indian Geophysical Union
74	Journal of Research, SKUASTJ	Sher-e-Kashmir University of Agricultural Sciences and Technology-Jammu
75	Journal of the Academy of Hospital Administration	Ind Medica Ltd
76	Journal of the Indian Academy of Foren-	Indian Academy of Forensic

	sic Medicine	Medicine
77	Journal of the Indian Medical Association	Journal of the Indian Medical Association
78	Journal of the Instrument Society of India	Instrument Society of India
79	Journal of the Textile Association	Textile association of India
80	Journal, Indian Academy of Clinical Medicine	Indian Academy of Clinical Medicine
81	Labour File	Information and Features Trust
82	Madras Law Journal	Madras Law Journal
83	Management Accountant	Institute of Cost And Works Accountants
84	Mathematics Applied in Science and Technology	Research India Publications
85	Money and Finance	ICRA Limited
86	Mysore Journal of Agricultural Science	University of Agricultural Sciences
87	Namma Janapadaru	National Folklore Support Centre
88	National Journal of Integrated Research in Medicine	Academy for Continuing Medical Education
89	National Medical Journal of India	Indian Academy of Sciences
90	Network Computing	Jasubhai Media Pvt Ltd
91	Network Magazine: Technology Decisions for the Enterprise	Indian Express Group
92	Opsearch	Operations Research Society of India
93	Outlook Money	iInvestor.com
94	PC Quest	Cyber Media (India) Limited
95	Pharmacognosy Reviews	Pharmacognosy Network Worldwide
96	Philosophy and Social Action	Philosophy and Social Action
97	Prabuddha Bharata	Advaita Ashrama
98	Pumps and Systems	Pumps India
99	Reserve Bank of India Bulletin	Reserve Bank of India
100	Reserve Bank of India Bulletin: Weekly Statistical Supplement	Reserve Bank of India
101	Sankhya	Indian Statistical Institute
No.	**Journal**	**Publisher**
102	Sankhya Series A	Indian Statistical Institute
103	Sankhya Series B	Indian Statistical Institute
104	Scientific Transactions in Environment and Technovation	Balavidya Ganapathy Educational and Charitable Trust
105	Security Research Review	Bharat-Rakshak
106	South Asia Defence & Strategic Review	Akash Media
107	South Asian Language Review	Indian Institute of Language Studies

108	Sportstar	Kasturi & Sons Ltd.
109	Strategic Marketing	Times of India
110	Tamilnadu Journal of Veterinary and Animal Sciences	Tamil Nadu Veterinary and Animal Sciences University
111	Technology Focus	Defence Scientific Information and Documentation Centre
112	Tropical Ecology	International Society for Tropical Ecology
113	USI Journal	United Service Institution of India
114	Veterinary World	Veterinary world
115	Young Scientists Journal	Medknow Publications

Appendix 7: Open Access Repositories in India (as on March 13 2011)

A. Institutional Repositories

No.	Repository Name	Institution Name	Type	Place	Birth Date	No. of records	Soft-ware	ROAR
1	Eprints@IISc	Indian Institute of Science	Academia	Bangalore	05-Apr-04	25355	EPrints	Yes
2	NAL-IR	National Aerospace Laboratory	CSIR	Bangalore	09-Nov-04	3482	EPrints	Yes
3	IIA Prints	Indian Institute of Astrophysics	DST	Bangalore	11-Nov-04	3060	DSpace	Yes
4	RRI Digital Repository	Raman Research Insititute	DST	Bangalore	19-Apr-05	3773	DSpace	Yes
5	DSpace@NITR	National Institute of Technology Rourkela	Academia	Rourkela	18-May-05	1329	DSpace	Yes
6	Eprints@IITD	Indian Institute of Technology Delhi	Academia	New Delhi	28-May-05	2143	DSpace	Yes
7	DSpace@IIMK	Indian Institute of Management Koz-hikode	Academia	Kozhikode	29-Dec-05	503	DSpace	yes
8	Kautilya	Indira Gandhi Institute of Development Research (IGDIR)	Academia	Mumbai	27-Feb-06	204	DSpace	Yes
9	DRS@NIO	National Institute of Oceanography	CSIR	Goa	06-Apr-06	3757	DSpace	Yes
10	DSpace@INFLIBNET	Information and Library Network	Academia	Ahmedabad	15-Jun-06	505	DSpace	Yes
11	DSpace@NACOR	National Centre for Antartic and Ocean Research	NCAOR	Goa	13-Nov-06	489	DSpace	Yes
12	Catalysis Database	National Centre for Catalysis Research IIT Chennai	Society	Chennai	4-Feb-07	1634	EPrints	Yes
13	Eprints@SBT MKU	Madurai Kamarajar University	Academia	Madhurai	02-Jul-08	92	EPrints	Yes
14	Dyuthi Digital Repository	Cochin University of Science and Technology	Academia	Cochin	08-Jul-08	1400	DSpace	Yes

No.	Repository Name	Institution Name	Type	Place	Birth Date	No. of records	Soft-ware	ROAR
15	Allama Iqbal Library Digital Collection	University of Kashmir	Academia	Kashmir	05-Mar-09	443	DSpace	Yes
16	Eprints@IMMT	Institute of Minerals and Materials Technology	CSIR	Bhubaneswar	30-May-09	33	EPrints	Yes
17	Eprints@NML	National Metalurgical Laboratory	CSIR	Jamshedpur	19-Sep-09	2203	EPrints	Yes
18	Eprints@MDRF	Madras Diabetes Research Foundation	Private	Chennai	24-Sep-09	525	EPrints	Yes
19	Eprints@IARI	Indian Agricultural Research Institute	ICAR	Delhi	09-Nov-09	204	EPrints	Yes
20	EPrints@MoES	Ministry of Earth Sciences	MoES	Delhi	18-Jun-09	156	EPrints	No
21	DKR@CDRI	Central Drug Research Institute	CSIR	Lucknow	17-Nov-09	329	DSpace	Yes
22	ICRISAT – Institutional Repository	International Crops Research Institute for Semi-Arid Tropics	International – Research	Hyderabad	21-Dec-09	3413	DSpace	No
23	CMFRI Digital Repository	Central Marine Fisheries Research Institute	ICAR	Cochin	25-Feb-10	7055	EPrints	Yes
24	DSpace@IIT Bombay	Indian Institute of Technology, Bombay	Academia	Mumbai	25-Apr-10	1659	DSpace	Yes
25	Dspice@IISR	Indian Institute of Spices Research	ICAR	Calicut	17-Jun-10	489	DSpace	Yes
26	DSpace@DTU	Delhi Technological University	Academia	Delhi	08-Nov-10	650	DSpace	Yes
27	EPrints@ATREE	Ashoka Trust for Research in Ecology and the Environment	NGO	Bangalore	17-Dec-10	171	EPrints	Yes
28	Knowledge Repository	Indian Institute of Horticultural Research	ICAR	Bangalore	09-Jan-11	170	DSpace	Yes
29	Bahirathi	Indian Institute of Technology, Roorkee	Academia	Roorkee	20-Feb-11	823	DSpace	Yes

B. Subject Repositories

Repository Name	Institution Name	Type	Place	Total records	Birth Date	Software	ROAR
Openmed@NIC	National Informatics Centre	Subject-Medical and Allied Sciences	Delhi	2759	22-Mar-05	Eprints	Yes
Librarians Digital Library	Documentation Research and Training Centre DRTC Bangalore	Subject-Library and Information Science	Bangalore	188	17-Jan-04	DSpace	Yes
Open Agri	Indian Council of Agricultural Research	Subject-Agriculture	Kanpur	NA	10-Feb-10	Unknown	Yes

C. Electronic Theses and Dissertations Repositories (Dedicated)*

Repository Name	Institution Name	Type	Place	Total records	Birth Date	Software	ROAR
etd@IISc	Indian Institute of Science Bangalore	Academy	Bangalore	986	08-Feb-05	DSpace	Yes
Ethesis@NITR	National Institute of Technology Rourkela	Academy	Bangalore	809	17-Apr-09	Eprints	Yes

Explorations _ Open Access Repository of Indian Theses	Council of Scientific and Industrial Research	Central	Delhi	649 (Abstracts)	02-Jul-09	Eprints	Yes
Vidhyanidhi	University of Mysore	Central	Mysore	5480	23-Nov-07	DSpace	No
Online Thesis Library	Mahatma Gandhi Univ	Acad-emy	Kotta-yam	NA	NA	Unknown	No

*Often these are referred to as Digital Library of Theses and Dissertations or Collections of Electronic Theses and Dissertations

Open Access in India – Timeline

1998

- *Pramana*, the physics journal of IASc, goes open access

1999

- Meeting on Public Access to Indian Geographical Data, held on 14–15 July 1999 at the Indian Academy of Sciences, Bangalore.
- Mysore University, influenced by Ed Fox of Virginia Tech, planned building an ETD repository.

2000

- Stevan Harnad spoke about 'Scholarly Skywriting' at a conference on Advances in Information Access and Science Communication, MSSRF, Chennai, 16-17 September 2000.

2001

- The Indian Academy of Sciences convened a meeting in April 2001, where it was decided to encourage Indian S&T journal publishers to adopt electronic publishing.

2002

- Two three-day workshops for editors of S&T journals were held at the Indian Institute of Science during 8-10 and 13-15 March 2002, with Dr Leslie Chan and Ms Barbara Kirsop of the Electronic Publishing Trust for Development as the resource persons.

- India's first institutional repository, EPrints@IISc was set up by Dr T B Rajasekhar of the National Centre for Science Information, Indian Institute of Science.

2003

- A special session on open access was organized as part of the Annual General Meeting of the Indian National Science Academy (INSA), held at the National Chemical Laboratory, Pune.
- INSA signed the Berlin Declaration.
- The Indian Medlars Centre commenced hosting open access versions of many Indian medical journals.

2004

- MSSRF organized two three-day workshops on setting up institutional repositories using EPrints software with the help of Dr Leslie Carr of the University of Southampton, Dr Leslie Chan, Dr D K Sahu, and Dr T B Rajasekhar.

- The birth of three other Indian repositories: Librarians Digital Library, the first DSpace-based repository of India; and the repositories of National Aerospace Laboratories and Indian Institute of Astrophysics.

2005

- The birth of six other repositories - Electronic theses repository of IISc, OpenMed@NIC , Raman Research Institute Digital Repository, National Institute of Technology Rourkela, Indian Institute of Technology Delhi and Indian Institute of Management Kozhikode.

2006

- Alma Swan spoke at the Annual Meeting of the Indian Science Congress Association held at Hyderabad. Also, she met a small group at ICRISAT and spoke about the advantages of open access institutional repositories
- Informatics India launched Open J Gate.
- International workshop on Electronic Publishing and Open Access was held in Bangalore. A national policy document for developing countries that could be used by governments or their science-funding organizations to speed up the scientific progress was produced at the end of the workshop.
- NIT Rourkela mandated open access to local research output.
- National Knowledge Commission recommended Open Access.
- Four more repositories: Indhira Gandhi Institute of Development Research, National Institute of Oceanography, INFLIBNET and National Institute of Antarctic and Ocean Research.

2007

- Two more repositories: National Centre for Catalysis Research and Vidhyanidhi, electronic theses and dissertation repository.

2008

- All 17 journals published by National Institute of Science Communication and Information Research (NISCAIR) became open access .
- Open Source Drug Discovery (OSDD) was launched.
- INSA convened a half-day brainstorming meet on open access, FOSS and copyright law for scholarly communication and literary work on 26 April 2008.

- Two institutional repositories launched: Cochin University of Science and Technology and Madurai Kamaraj Univeristy.

2009

- A memorandum was sent by CSIR headquarters to directors of all 37 CSIR laboratories on 6 February 2009 requesting them to set up institutional open access repositories in each one of the laboratories.
- The Centre for Internet and Society was represented by the authors of this report at the International Repositories Workshop jointly hosted by JISC, UKOLN and SURF Foundation and held at Amsterdam.
- Centre for Internet and Society (CIS) and CSIR jointly hosted a one-day conference on open access, in Delhi, which was attended by over 100 participants. Prof. John Willinsky of the Public Knowledge Project, and Dr Leslie Chan, University of Toronto, were the key speakers.
- CIS and NAL jointly hosted a one-day conference at NAL, Bangalore, where Prof. Balaram moderated a discussion and Sunil Abraham spoke about copyright and open access.
- The Wellcome Trust and DBT formed an Alliance to support outstanding Indian biomedical scientists with fellowships. All fellows are required to make the research outputs open access.
- I0 more repositories launched: University of Kashmir, Institute of Minerals and Materials Technology, National Metallurgical Laboratory, Madras Diabetes Research Foundation, Indian Agricultural Research Institute, Ministry of Earth Sciences, Central Drug Research Institute, ICRISAT institutional Repository and two electronic theses and dissertations repository from NIT Rourkela and CSIR.
- ICRISAT Mandated open access to local research outputs through institutional repository.

2010

- Six repositories were launched: Central Marine Fisheries Research Institute, Indian Institute of Technology Bombay, Indian Institute of Spices Research, Delhi Technological University, Ashoka Trust for Research in Ecology and the Environment and a subject repository OpenAgri from ICAR.
- NIO Goa mandated open access to all institutional research outputs

2011

- UNESCO–CIS Seminar on Open Access March 2011, New Delhi
- Two repositories: Indian Institute of Horticultural Research (Also mandated open access to lnstititutional research outputs) and Indian Institute of Technology Roorkee.
- This report will be submitted to CIS

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