ANNUAL REPORT, 2007–2008

cross**ref**

CrossRef is a not-for-profit membership association whose mission is to enable easy identification and use of trustworthy electronic content by promoting the cooperative development and application of a sustainable infrastructure.
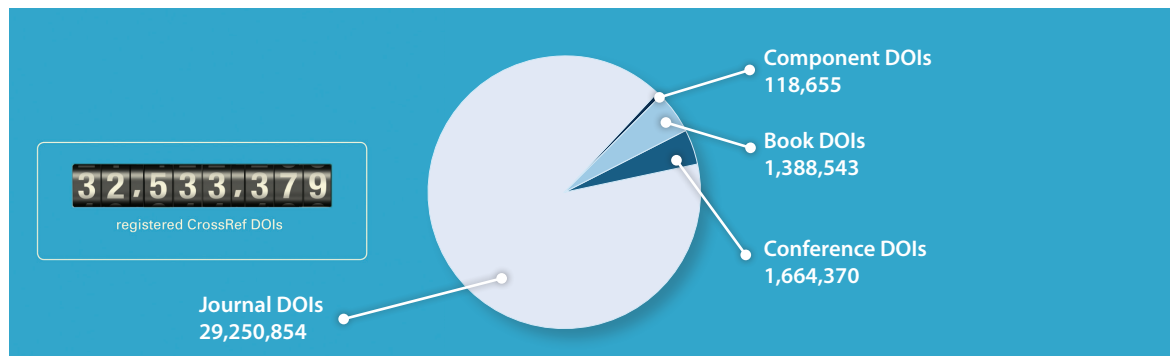
contents.

LETTER FROM THE EXECUTIVE DIRECTOR.

Now in its ninth year of operation, Publishers International Linking Association, Inc. (PILA), operating as CrossRef, is a well-established organization, financially secure and fulfilling its original mission of providing publishers with online reference linking. CrossRef continues to grow steadily in terms of activity, the amount of content registered, and its membership. There are now 2,568 participating publishers and societies, with more than 32 million content items registered in the system. The average monthly number of DOI resolutions—instances of scholars and researchers clicking on links—is nearly 22 million, an increase of more than 50 percent over the past year.

CrossRef Cited-by Linking (formerly known as Forward Linking) has continued to grow, with 125 members now participating. References have been deposited for almost six million articles, and over 78 million cited-by relationships have been established. Through Cited-by Linking, publishers can discover how their articles are being cited and then incorporate these "cited-by" links into their online publication platforms. We expect this service to grow significantly over the coming year.

At the same time, CrossRef has begun to fulfill the broader mandate of its Mission Statement, with the core provision "to enable easy identification and use of trustworthy electronic content." The June launch of CrossCheck, following a successful pilot, has brought publishers a service that helps them verify the originality of content submitted for publication, an essential concern of scholarly publishing. CrossMark, an initiative now in development, will create a framework for the ready identification of publisher versions of content items. It will incorporate a logo with which publishers will have the option of associating metadata informing researchers of the steps taken to ensure the content's integrity. Both CrossCheck and CrossMark underscore and advance the role of publishers not only in the dissemination of content, but also in verifying its quality. To assist in the administration of these and other offerings to come, CrossRef has created the position of Product Manager for New Services.

Component DOIs
118,655

Book DOIs
1,388,543

Conference DOIs
1,664,370

32,533,379
registered CrossRef DOIs

Journal DOIs
29,250,854

32 MILLION AND COUNTING. *CrossRef exceeded the 32 million DOI mark in May of 2008 comprised of a diverse range of content types.*

The growth in CrossRef's membership reflects both the broadening use of the DOI and the continuing emergence of new types of publishing ventures. BSI British Standards has joined CrossRef for the purpose of registering its standards, of which it has 27,000, to enable linking them to other scholarly and scientific publications. In addition, BSI British Standards and CrossRef are coordinating discussions with ISO, CEN, ASTM, IEEE, and other standards organizations to develop protocols for this application of the CrossRef DOI. Another new CrossRef member is Encyclopedia of Life, a joint undertaking of several major institutions that will provide an online reference source for every one of our planet's 1.8 million species. DOIs will initially be assigned to each species page, and subsequently at more granular levels and with dynamic linking functionality.

As researchers avail themselves of the Web's increasingly dynamic and interactive capabilities, CrossRef is making efforts to ensure that DOI-based linking is a component of citation wherever it occurs and that DOIs can be readily incorporated into researchers' workflows. In February, CrossRef launched the beta version of a plug-in tool that allows researchers to look up and insert DOI-enabled citations into their blog postings.

In the still-rapidly evolving environment of the Internet, CrossRef is building on the success of its collaborative reference linking service, extending its infrastructure to help publishers expand and promote the value they add to scholarly and scientific content.

Edward N. Pentz,

Executive Director/Secretary
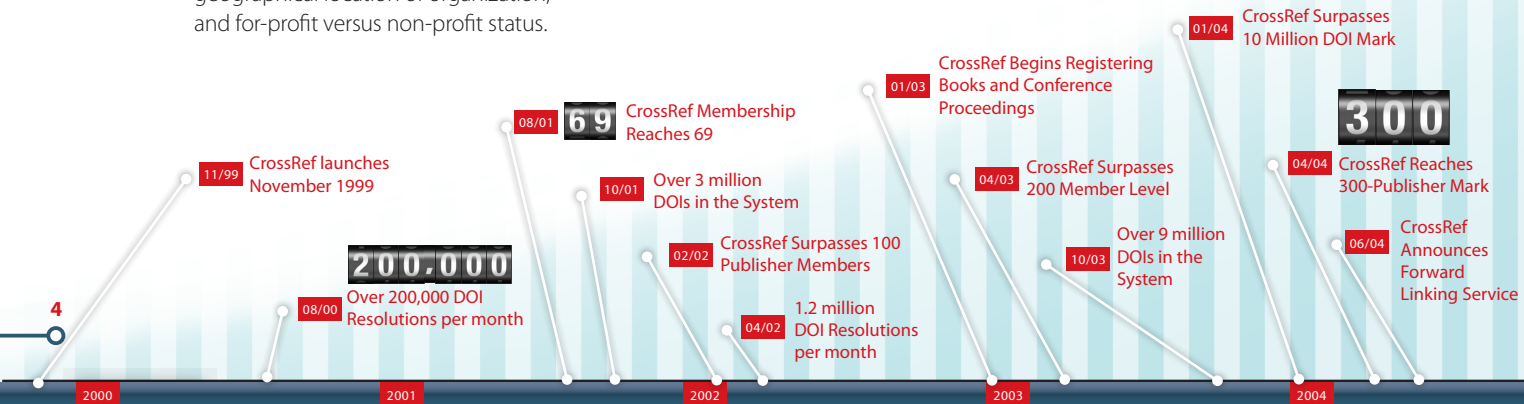
LETTER FROM THE CHAIRMAN.

As reported in the opening Letter from the Executive Director, CrossRef continues to make progress, building on the solid foundation we have succeeded in establishing.
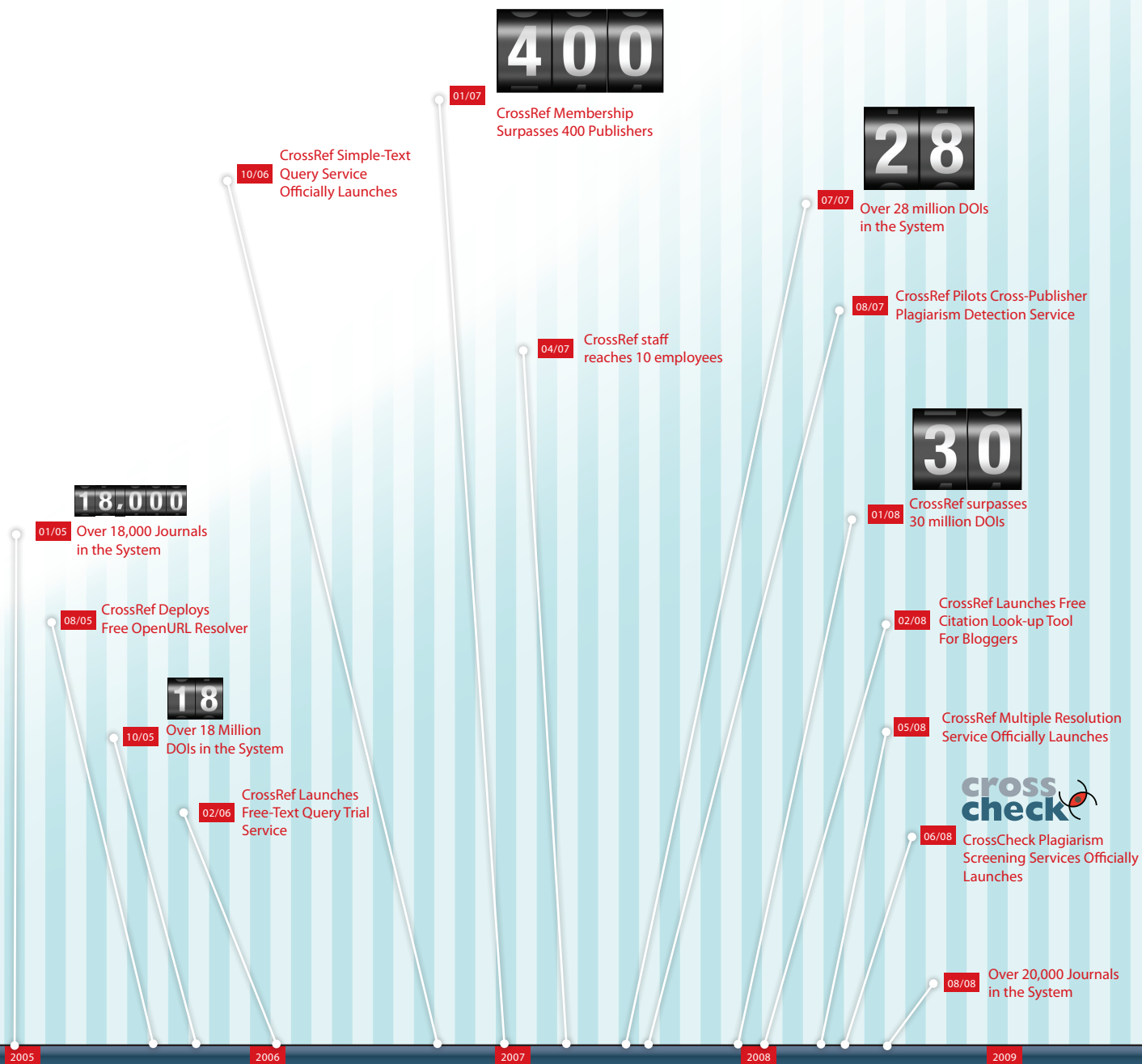
In addition to the development of the executive team, the Board of Directors has been addressing the question of whether the Board fairly represents the CrossRef membership. With the terms of six Board Members set to expire in 2008, we asked the CrossRef Nominating Committee to designate a slate for the upcoming election that would take into account issues of Board composition and balance with respect to type, size, and geographical location of organization, and for-profit versus non-profit status.

The Nominating Committee has found that the Board has roughly equal representation from for-profit and non-profit organizations, and from those based within and outside of the U.S. Analysis by size, however, has revealed that the lower CrossRef fee categories are not adequately represented, and the committee has recommended the inclusion of two new candidates to rectify this imbalance.

In developing policy, CrossRef as a collaborative organization depends on the close interaction of the executive team and CrossRef's committees and working groups, which include both Board Members and participants drawn from the general membership. As we set goals and develop initiatives in the broader fulfillment of the CrossRef mission, we welcome and look forward to the input of all.
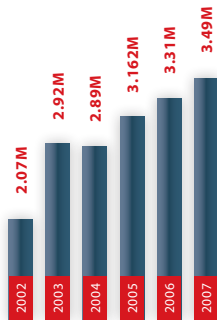
Robert Campbell, Chairman

4

11/99 CrossRef launches November 1999

08/00 Over 200,000 DOI Resolutions per month

08/01 69 CrossRef Membership Reaches 69

10/01 Over 3 million DOIs in the System

02/02 CrossRef Surpasses 100 Publisher Members

04/02 1.2 million DOI Resolutions per month

01/03 CrossRef Begins Registering Books and Conference Proceedings

04/03 CrossRef Surpasses 200 Member Level

10/03 Over 9 million DOIs in the System

01/04 CrossRef Surpasses 10 Million DOI Mark

300

04/04 CrossRef Reaches 300-Publisher Mark

06/04 CrossRef Announces Forward Linking Service

2000   2001   2002   2003   2004

400

01/07 CrossRef Membership Surpasses 400 Publishers

10/06 CrossRef Simple-Text Query Service Officially Launches

28

07/07 Over 28 million DOIs in the System

08/07 CrossRef Pilots Cross-Publisher Plagiarism Detection Service

04/07 CrossRef staff reaches 10 employees

30

01/08 CrossRef surpasses 30 million DOIs

18.000

01/05 Over 18,000 Journals in the System

08/05 CrossRef Deploys Free OpenURL Resolver

02/08 CrossRef Launches Free Citation Look-up Tool For Bloggers

05/08 CrossRef Multiple Resolution Service Officially Launches

18

10/05 Over 18 Million DOIs in the System

02/06 CrossRef Launches Free-Text Query Trial Service

cross check

06/08 CrossCheck Plagiarism Screening Services Officially Launches

08/08 Over 20,000 Journals in the System

2005

2006

2007

2008

2009

LETTER FROM THE TREASURER.

CrossRef completed 2007 in an even stronger position financially than the previous year. Revenue grew from $3,307,465 to $3,487,169, and unrestricted net assets increased by over 12 percent, from $1,740,160 to $1,954,560. These results reflect the success of the organization's operation, enhanced by its freedom from both tax liability and debt obligation following the repayment of the outstanding balance and interest on its original startup loans in May 2007.

As CrossRef continues to grow and offer new services that advance its mission, its expenses inevitably grow as well. In recognition of this, the Board of Directors has adopted a structured framework for the planning, development, and maintenance of strategic initiatives, with the central requirement that any such initiative be self-sustaining and incorporate a business plan showing how that is to be achieved. The framework, developed by Geoffrey Bilder, Director of Strategic Initiatives, ensures both the viability of all initiatives and that their ongoing operation is in keeping with the spirit of CrossRef's mission.

Also in line with prudent financial management, CrossRef has established a cash reserve fund in the amount of $500,000, to guard against any adverse impact of unforeseen circumstances.

Backfile deposits, originally expected to decline significantly from the high level of 2006, have in fact dropped off by only six percent. To encourage the continued growth of historical research content represented in the CrossRef system, the backfile deposit fee has been reduced from 17 cents to 12 cents per record. This adjustment is consistent with CrossRef's policy of holding down the cost of depositing DOIs to promote publisher participation in its core reference linking service. The increase in annual membership fees that went into effect at the beginning of 2008, the first such adjustment in several years, was designed to increase their proportional contribution to CrossRef's revenue, making lower DOI deposit fees possible.

Revenue bar chart: 2002: 2.07M; 2003: 2.92M; 2004: 2.89M; 2005: 3.162M; 2006: 3.31M; 2007: 3.49M

REVENUE GROWTH. *Revenue continues to increase at a steady pace and we have repaid all of our original startup loans.*

As a small organization, CrossRef would not be able to offer the range of services it does without the active support and participation of its membership. I would like to thank the Board of Directors and the members of the CrossRef committees for all they do to set policy and provide guidance. Once again, CrossRef's audit this year proceeded as smoothly as possible, due in no small part to the efforts of the Audit Committee.

With the recent launch of CrossCheck and the anticipated release of CrossMark, CrossRef is helping publishers advance the value they add to the scholarly and scientific content they disseminate by verifying and certifying its trustworthiness. These offerings exemplify CrossRef's broader mission, and as we move forward, the revenue from them and others to come will put us in an even stronger position to fulfill that mission.

Linda Beebe, Treasurer

PUBLISHERS INTERNATIONAL LINKING ASSOCIATION, INC.

STATEMENTS OF ACTIVITIES
Years Ended December 31, 2007 and 2006

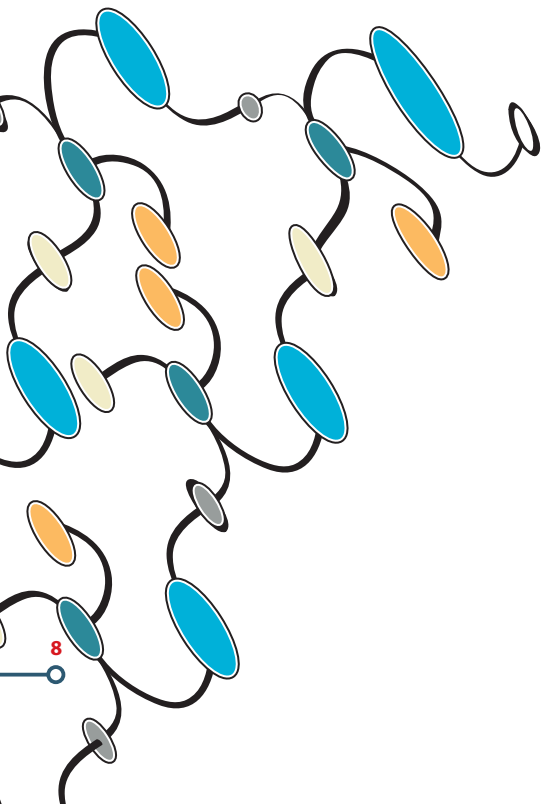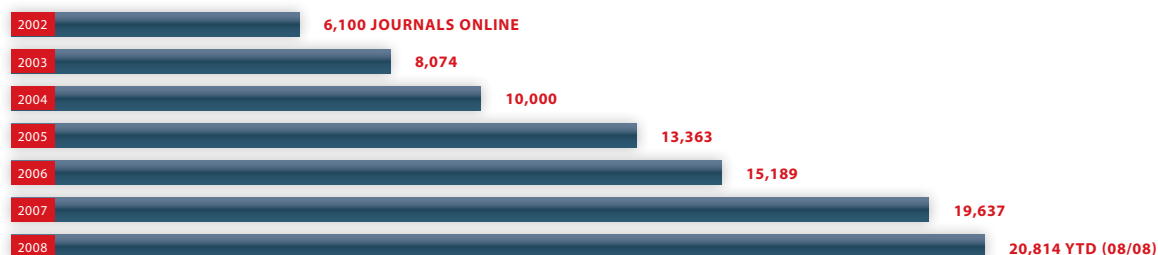|	2007	2006
Revenue and other support:		
Deposit fees	$2,319,043	$2,135,689
Member fees	1,122,344	1,019,299
Interest income	44,856	44,065
Non-linking fees	7,666	—
Search fees	3,000	46,787
Forward linking fees	—	43,475
Loss on sale of equipment	(1,069)	(1,105)
(Loss) gain on foreign exchange	(8,671)	19,255
Total revenue and other support	**3,487,169**	3,307,465
Expenses:		
Salaries and benefits	1,505,207	1,129,563
Data center	389,106	283,843
IDF fees	294,578	261,025
Travel and meetings	262,237	173,673
Depreciation and amortization	201,796	340,450
Professional fees	188,088	193,883
Contractor fees	124,841	129,031
Rent	84,370	65,975
Advertising and marketing	75,247	53,811
Interest	23,006	107,372
Insurance	18,707	11,654
New initiatives	10,955	—
Dues and subscriptions	10,205	11,159
Bad debts	—	646
Office and other	84,426	67,212
Total expenses	**3,272,769**	2,829,297
Change in unrestricted net assets	214,400	478,168
Unrestricted net assets, beginning of year	1,740,160	1,261,992
Unrestricted net assets, end of year	$1,954,560	$1,740,160

TECHNICAL OUTLOOK.

From a technical perspective, the CrossRef system can now be viewed in two ways—in the context of CrossRef's core linking service, which now includes Cited-by Linking, and as it pertains to the advanced services being developed through CrossRef's strategic initiatives.

The May rollout of Multiple Resolution extends the core linking service by bringing publishers and third-party hosts a mechanism for managing the metadata associated with multiple resolution, which allows a DOI-enabled link to resolve onto any of a number of choices. The intention is that this capability be adopted in a range of ways. One valuable application of Multiple Resolution will be in linking to journals no longer associated with an active publisher, allowing a researcher to see lists of archive sites that have taken over their hosting.

Ongoing refinements continue to improve the system's performance. An adjustment in May to the schema for book deposits has clarified the categorization of titles published in a series, and query matching for books in general has been made more effective through the correction of some logic errors in the matching algorithm that were uncovered during work on the schema.

As part of its ongoing Metadata Quality initiative, CrossRef has instituted a $2 penalty fee for DOI deposits that create conflicts with existing DOIs and necessitate the intercession of CrossRef staff. The distinction is that when a publisher mistakenly makes redundant deposits for its own content that it then removes, the fine is not assessed. But in the event that a publisher acquires a journal and assigns new DOIs to articles for which the previous publisher has already made deposits,

Year	Value
2002	6,100 JOURNALS ONLINE
2003	8,074
2004	10,000
2005	13,363
2006	15,189
2007	19,637
2008	20,814 YTD (08/08)

JOURNALS IN THE CROSSREF SYSTEM. *The numbers of journals, book and other content types covered by CrossRef continues to grow.*

the fine is applicable because CrossRef, which has issued clear guidelines for the transfer of journal ownership, must then engage with both parties to resolve the conflict. CrossRef has taken a conservative approach to assessing the fine, applying it on a case-by-case basis.

CrossRef now operates two full-text search mechanisms, Simple Text Query and the plug-in tool released in February that allows bloggers to look up and insert DOI-based citations into their postings. Simple Text Query has been enhanced with a well-received file upload capability. Where in the past researchers needed to copy and paste their references into a text box to submit them, they can now upload their bibliographies as text files, with the system emailing them the query results on an HTML page.

As a whole, the CrossRef system continues to function very well, meeting all the needs of the core services. That said, the current software is six years old and based on requirements developed in 2001, and the staff has identified the need for a major update to create what will be CrossRef's third-generation system.

Planning for the system must now take into account the requirements of CrossRef's advanced services as well as lessons learned over the past six years about how to implement existing services most effectively. While CrossCheck does not draw on the resources of the CrossRef infrastructure, it is quite likely that Contributor ID and CrossMark will have elements that do, and although the current system can support such additions, they would exist as islands of functionality. Planning for a full system rewrite is currently underway. A report detailing the rationale for the rewrite has been presented to and

accepted by the Board of Directors, and a group has been formed to develop a requirements document. Working with consultant Simon Inger, the group plans to issue a Request for Proposal by the end of year. The responses to it will make it possible to assess the cost of the rewrite and the various options for its development and implementation. The ultimate goal is to provide an infrastructure that can support the full realization of CrossRef's mission in an integrated fashion.
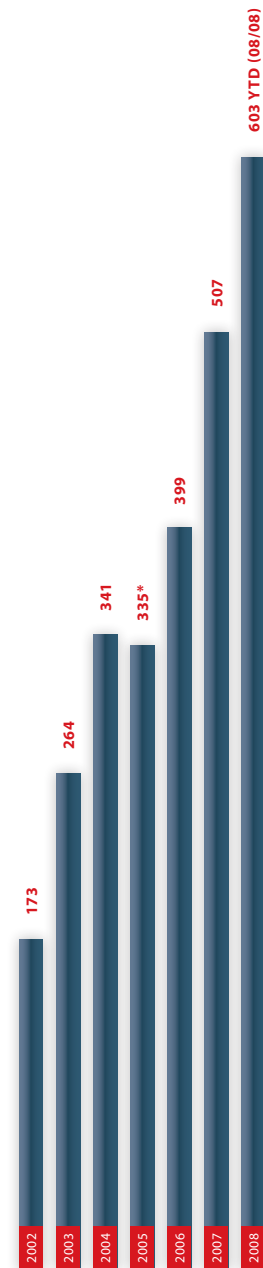
REVIEW OF THE ORGANIZATION.

The current activities of the CrossRef organization are focused in accordance with the following goals and projects, determined by the PILA Board of Directors:

Goals for 2008

○ Continue to deliver value to the industry and fulfill the CrossRef mission while expanding activities

○ Maintain and develop the core CrossRef system while enabling new services; develop procedures for moving projects from the development and pilot phases to production

○ Increase data quality by tightening submission standards.

Projects for 2008

○ Roll out CrossCheck as a production service by the second quarter of 2008

○ Develop a Contributor ID prototype in preparation for a technical and business plan in early 2009

○ Continue the Metadata Quality initiative through improved quality checks on submissions

○ Roll out MyCrossRef, a Web-based reporting interface consolidating all system usage information on a publisher-by-publisher basis and providing customizable publisher areas

○ Relaunch CrossRef Web Services and integrate development of the Metadata Hub service into it

○ Implement the mEDRA reseller agreement as a model for working with other Registration Agencies

○ Increase the deposit of components, standards, theses and dissertations, and new content types through outreach to members and recruitment of non-journal publishers

○ Increase book deposits and book reference linking

○ Add new international members and members from developing countries

○ Promote the CrossRef DOI as a key element of bibliographic data and public identifier for content

○ Review administrative procedures with a view to streamlining operations

○ In line with long-term planning for the core technology of the CrossRef system, investigate options for greater ownership of the system code; develop system specifications and solicit bids from potential vendors for a rewrite of the CrossRef system

○ Continue to participate in relevant industry groups and associations such as Transfer, TicTOCS, SSP, STM, ALPSP, NISO, and IDF.
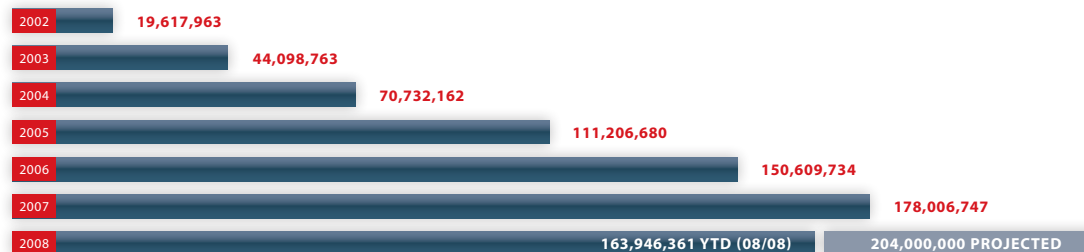
◀ **CROSSREF CITED-BY.** *Our rebranding of CrossRef Forward Linking System is growing in popularity with 123 members now signed up as participants and over 78 million cited-by links established, representing some 15,000 journals.*

Chart data — CrossRef Membership:

Year	Members
2002	173
2003	264
2004	341
2005	335*
2006	399
2007	507
2008	603 YTD (08/08)

CROSSREF MEMBERSHIP.
CrossRef gained 126 members in 2007.

*Publisher mergers and CrossRef's sponsoring member policy mean that some existing members no longer pay dues to CrossRef.

Year	Value
2002	19,617,963
2003	44,098,763
2004	70,732,162
2005	111,206,680
2006	150,609,734
2007	178,006,747
2008	163,946,361 YTD (08/08) 204,000,000 PROJECTED

DOI RESOLUTIONS *are a measure of the number of times end-users have clicked on CrossRef links.*

The CrossRef Advisory Board was created in 2007 to help inform CrossRef's expanding activities and strategic initiatives, with an official mandate that has been revised and approved by the Executive Committee to read as follows:

The CrossRef Advisory Board (or CAB) will consist of members of the academic, library, corporate, and vendor community who have demonstrated expertise and vision on new directions in scholarly publishing. CAB is intended to serve as an open forum for discussion with the CrossRef staff and Board of Directors about the behavior of researchers, and their evolving publishing and communication needs. Discussion will cover a broad range of issues in scholarly communications today, with a special focus on topics that pertain to then-current strategic initiatives at CrossRef. Such topics may include (but are not strictly limited to)

ongoing technical developments at CrossRef; citation linking and indexing; identifier registries; institutional repositories and the changing role of libraries; document versioning and authentication; and metadata use, quality, and standards.

Since April 2007, all CrossRef strategic initiatives have been carried out in accordance with a structured framework developed by Geoffrey Bilder, Director of Strategic Initiatives, and presented to the Board of Directors in the Strategic Initiatives Lifecycle document (SIL). The SIL provides a series of steps or phases for the planning, development, and maintenance of strategic initiatives, and ensures their financial viability and adherence to the spirit of CrossRef's mission.

cross check

CrossCheck, which launched in June as a service to help publishers verify the originality of content submitted for publication, is the first project to go through the complete cycle of SIL phases. It confirms the workability of the SIL concept, and supports both the CrossRef mission and the important role of publishers by promoting the trustworthiness of content. CrossCheck joins the iThenticate software to a continuously growing database of archival and current scholarly literature that is created through the participation of CrossRef member publishers, against which submitted work can be screened. In this way, CrossRef has again tapped the power of publisher collaboration to deliver a solution that

would not otherwise be possible, as it did for its reference linking service.

Two other strategic initiatives, CrossMark (formerly Version of Record Record) and Contributor ID, are currently in SIL phase two, in which a full plan for a project is formulated and presented to the Board. CrossMark will provide a mechanism by which a publisher will be able to indicate visually that a particular content item is a version of record, and also communicate the processes by which it has been vetted for quality and integrity. This is a valuable function, particularly in a time when transparency is broadly regarded as a prerequisite of trustworthiness in many industries. Beyond that, CrossMark will enable publishers to alert readers to corrections, errata, retractions, and other post-publication events that are difficult to manage in the print world, again helping to advance and highlight publishers' role in the scholarly value chain.

Contributor ID will make it possible to be certain of the identity of individuals involved in the creation of content, dispelling any ambiguity that might arise from variant name forms, identical names, and name changes. It is a complex project, and CrossRef is engaged in discussions with organizations including OCLC, CNI, SciLink, Thomson Reuters, Elsevier, and a number of libraries, to develop a concrete plan.

Metadata Hub was proposed in 2007 as a common distribution point for publisher-submitted metadata that would be able to accommodate a range of business models. During the requirements gathering process, it emerged that there was a lack of consensus among the membership about how it should operate, and the initiative has accordingly been given a lower priority. Additionally, some of the proposed functions of Metadata Hub may be provided by CrossMark.

New Working Groups were formed in the spring of 2008 to assist in the creation of CrossMark and Contributor ID. A third new Working Group is helping to establish policies, guidelines, and possible system modifications to promote the use of DOI-based citations for books. Although not a strategic initiative, this extension of CrossRef's core linking service is challenging; not only are books structurally more complex than journal articles, they can appear in multiple editions and versions, and it is critical to ensure that a researcher clicking on a citation for a book be led to the right one.

The CrossRef staff has grown to 11 with the addition of the position of Product Manager for New Services, to help manage the expanding range of CrossRef's offerings.

To convey its function more clearly, the CrossRef Forward Linking service was renamed CrossRef Cited-by

Year	DOIs		
2002	6,467,161		
2003	9,960,631		
2004	13,917,354		
2005	18,463,054		
2006	24,269,753		
2007	30,054,766		
2008	32,533,395 YTD (08/08)	34,000,000 PROJECTED	

DOIs IN THE CROSSREF SYSTEM. *CrossRef currently adds 15,000 new DOIs each day.*

Linking on July 1, 2008. Uptake has been strong, with 123 members now signed up as participants and over 78 million cited-by links established, representing some 15,000 journals. There will be an official relaunch of the service, including the creation of a CrossRef Cited-by logo, increased outreach to the membership (including instructional Webinars), improved documentation, and new tools to facilitate reference deposit.

CrossRef's core linking service began as a business-to-business protocol, with member publishers linking to each other's content. As blogs and other new forms of scholarly communication have appeared on the Internet, researchers are increasingly interested in incorporating DOI-enabled linking into their postings. To encourage and facilitate this, CrossRef released a free plug-in tool in February that allows bloggers to look up and insert DOI-based citations. The code for the plug-in, which is available for both the WordPress and Moveable Type platforms, is open source, with the intention that users wishing to build similar tools can easily do so.

As part of its ongoing effort to extend the use of the DOI, CrossRef issued a Request for Proposal for Innovative Uses of CrossRef Metadata in June 2007, offering free access to CrossRef's metadata as a prize. The winning proposal, submitted by the Smithsonian/NASA Astrophysics Data System (NASA ADS), calls for the addition of DOI-based links to millions of records in the ADS database. CrossRef has also created guidelines to improve the implementation of DOI-based linkage from PubMed Central to the publisher versions of record of journal articles.

With digital content delivery now the mainstay of scholarly publishing, publishers are focusing on archiving their electronic journal holdings, entering into agreements with archiving organizations like Portico, CLOCKSS, and the Dutch National Library. CrossRef is working with these entities to establish policies for maintaining DOI-based links should a "trigger event" (such as the discontinuation of a publication or a publisher's going out of business) open such an archive. CrossRef is also taking steps to ensure the continuity of its own organizational structure, formulating an "organizational will" to complement the alternate data center and disaster recovery plan already in place.
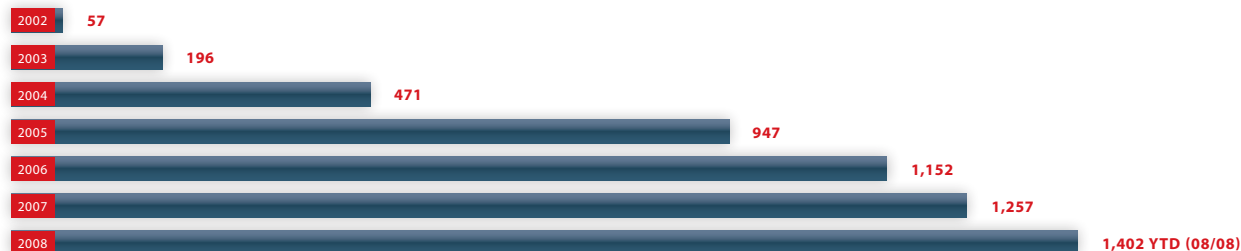
The PILA Board of Directors comprises 16 representatives, listed further on in this report and also at www.crossref.org. Four Board members were re-elected, and one newly elected, at the 2007 Annual Member Meeting in London, U.K., on November 1. Jerry Cowhig, IOP, who had been appointed by the Board to fill the Blackwell vacancy, was elected to serve out the term expiring in 2008. Re-elected were Beth Rosner, AAAS (Science); Karen Hunter, Elsevier; Howard Ratner, Nature Publishing Group; and Thomas Connertz, Thieme Publishing Group. Newly elected was Wim van der Stelt, Springer Science+Business Media.

For the 2008 elections, the Nominating Committee has been charged with the task of producing a slate of candidates who represent the full range of CrossRef's membership in terms of size, geographical location, and type of organization.

The 2007 Annual Member Meeting was a great success, on the theme "Trust, authority, and quality in academic publishing today." The 2008 meeting will be held on November 18, 2008, in Boston, Massachusetts. Speakers will include Karen Hunter of Elsevier; John Wilbanks of Science Commons; Natalie Angier, Pulitzer Prize-winning *New York Times* columnist; and Jonathan Zittrain, author of *The Future of the Internet — And How to Stop It*.

In addition to publisher membership, PILA continues to encourage the participation of intermediaries. There are currently over 50 Affiliates, including such organizations as secondary database publishers, subscription agents, abstracting and indexing services,

2002	57
2003	196
2004	471
2005	947
2006	1,152
2007	1,257
2008	1,402 YTD (08/08)

LIBRARY MEMBERSHIP *continues to grow. For a complete list of library affiliates, see www.crossref.org.*

and software vendors, all of which can use CrossRef to obtain the DOIs and metadata deposited by CrossRef members. A new category of Affiliate, for which CrossRef provides free access, integrates DOI look-up into authoring, reference, and content management tools for researchers. CrossRef Affiliates are listed further on in this report, and also at www. crossref.org.

There is continued strong growth in the Library Affiliate category, which now includes well over 1,200 members. CrossRef is currently developing new outreach materials to help librarians inform students and faculty about CrossRef and the use of the DOI.

As the first of eight official IDF (International DOI Foundation) Registration Agencies, PILA is actively collaborating with other Registration Agencies to extend DOI-based linking. CrossRef has entered into an

agreement with mEDRA, a European DOI Registration Agency established by the AIE (the Italian Publishers Association) and Cineca (a consortium of Italian universities providing technical services), by which Italian publishers can join CrossRef through mEDRA, with mEDRA handling the administrative tasks and DOI registration. This is the first such formal cooperation between DOI Registration Agencies and provides a model for extension to others where appropriate.

The DOI System is currently in the process of becoming an ISO standard, with CrossRef a member of the IDF's ISO Working Group. It is anticipated that the final standard will be published in late 2008 or early 2009.

CrossRef continues to engage with its communities of interest. Executive Director Ed Pentz is now a member of the Main Committee of the UKSG (UK Serials Group), which is working to

standardize and facilitate the process of journal transfer between publishers, and he is also Chair of the UKSG Transfer Working Group. CrossRef staff members are active in the world of publishing and digital information management: Amy Brand, Director of Business and Product Development, is a Director of the Society for Scholarly Publishing and Chair of the Society's Scholarly Communications Curriculum Development Initiative, Geoffrey Bilder is an Editorial Board member of Learned Publishing (the journal of ALPSP, the Association of Learned and Professional Society Publishers), and Chuck Koscher, CrossRef's Director of Technology, is Vice-Chair of the Board of Directors of NISO, the National Information Standards Organization. CrossRef continues to promote awareness of its services through industry press exposure and a strong presence at major industry events and conferences.

BOARD OF DIRECTORS.

What links some of the world-changing
institutions of our time?

THE INTERNATIONAL ATOMIC ENERGY AGENCY

THE WORLD HEALTH ORGANIZATION

PEACE AND CHANGE: A JOURNAL OF PEACE RESEARCH

INTERNATIONAL UNION FOR CONSERVATION OF NATURE

crossref.org

making research easier

**find out more
at www.crossref.org**

crossref

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3,617,600 BTUs energy not comsumed

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CrossRef is committed to the conservation of precious natural resources and the continued health of our planet. As a global citizen, we continually strive to reduce the environmental impact of the work we do.