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Does CD-ROM Have a Future?

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Does CD-ROM Have a Future? — Some Opinions from the Field

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Where CD-ROM? Can the Internet Be Far Behind?

by **Czeslaw Jan Grycz** <cjg@stubbs.ucop.edu>

In 1979 Phillips introduced the CD-Audio diskette at the National Association of Record Manufacturers [NARM]. In 1982 the first CD-audio was released. By 1990 there was virtually no vinyl record pressing left in the U.S., in spite of the fact that pundits had predicted it would take to the end of the millennium for the new medium to make any "real" inroads into the existing marketplace of vinyl recordings.

In 1986 Microsoft sponsored the first of what was going to be an exciting string of extravagant CD-ROM conferences. The CD format had been identified as being useful for storing on one convenient platter large amounts of data, graphics, animations, and executable program code as well as sound files. Pundits claimed that the CD-ROM format would create a new home entertainment sub-industry (it has done so); that it would eliminate earlier low-density media (it hasn't entirely managed to displace floppy disks); and that it would revolutionize publishing (there are interesting examples of CD-ROM publishing, but none that would be called "revolutionary"). They also claimed that the archival medium of CD-ROMs would prove indispensable to the library and bibliographic community (which, while true, is only with decidedly mixed approval.)

The predictions made by those who addressed audiences at the very birth of the CD-ROM industry have largely come true: (1) CD-ROM drives are now bundled with multimedia computers; (2) statistically, the penetration of CD-ROM drives into the marketplace has been widespread and quick; (3) open industry standards have been indispensable in helping developer confidence, promoting rapid growth of the industry; (4) consumer-products capitalizing on CD-ROM technology have proliferated; (5) thousands of CD-ROM titles have been published, serving both the professional and consumer markets; (6) traditional publishers have felt comfortable with the CD-ROM, inasmuch as it is difficult to copy, and because it is a package that — as a sales artifact — closely resembles the artifact of the book.

Why is it, then, that there can be hesitancy about CD-ROM technology, at least so far as the bibliographic and library community is involved?

The contributions of the CD-ROM industry have been most dramatic in the software

side of development. Very little CD-ROM software technology was not first explored and developed in the environment of distributed networks. But in that more arcane environment, it was not visible to the broader consumer public. It was only in the emergence of the CD industry (and its various consumer products) that consumers in any numbers were introduced to the advantages and capabilities of large-scale data-handling technologies. The CD-ROM industry helped demonstrate the practicality of clear and open standards. The large (but not too large) digital capacity of a CD-ROM platter permitted developers and consumers, alike, to better understand (and systematically solve) problems of navigation, retrieval, user interface, and linking toolsets. More important, they permitted people to *imagine* what could be possible in an unconstrained digital environment. Work-

ing with the large capacity of a CD, engineers adapted tools developed in the online environment, and worked out CD-applicable mechanisms for compression, navigability, searching, indexing, and linking.

But the appetite, whetted by these capabilities also forced the industry to continually play "catch-up" with its hardware. The demands of replaying animated sequences, for example, required greater access speed than was possible on the initial CD-ROM drives. This led to the introduction of double-speed, then quad-speed drives (and the requirement for those who had purchased the slower drives to face purchasing another faster drive, or being unable to utilize the advanced performance of the programs encoded on the newer CDs).

The capacity of data storage proved to be problematic, as well. It is a truism that no matter how much storage capacity one has, it will not be enough within a short period of

time. Later this year, Philips, Toshiba, Sony, Thompson and others will introduce double-layer DVD (digital videodisks). These platters, the same physical size as CDs, will hold 4.7GB of digital information. The cost of the drives is expected to be \$500-800. Toshiba, alone, expects to sell 3,000,000 drives in 1997. Its predictions are more conservative than its competitors.

The hardware migration has been decidedly difficult for institutions interested in supplying services and resources for their constituents. Whereas an individual consumer can decide to buy a new drive with relatively little soul-searching, a comparable decision within an institutional setting involves scaled-up concerns about backward compatibility, staff support resources for changing technology, existing formats already supported within the system, the sufficiency (or redundancy) of patron workstations and the like. The decision to "keep up" — in a time when budget constraints are already eroding the capacity to buy fundamental and standard print resources is one that causes agony. The likely result — at least within an institutional bibliographic setting — will rule against the continual upgrading of CD-ROM-based technologies and resources, save for any that are truly essential resources for an organization, contain uniquely important materials, or are conveniently comprehensive (replacing other less easy-to-manage resources). Issues surrounding copyright, fair use, and contract rights related to CD-ROMs merely compound the hardware upgrade difficulties.

The environment of distributed networks (the Internet) is much more hospitable to institutional use, even though it comes with its own set of difficulties. With the development of Java and Java-like applets, institutional investment in software and hardware can be minimized. The unbounded growth of information resources coming onto the Internet is quite astounding. It is likely to continue to grow since there are more incentives to produce and mount information than there are against doing so. Ultimately, the rich and robust selection of materials that exists on the Internet, ever-growing, and always (potentially) up-to-date, will be a more attractive resource than can ever be possible in any CD-ROM format.

Two remarks might usefully be made at
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the conclusion of these comments. (1) The role of an editor has often been to synthesize and collect the most valuable pieces of research within a discipline. It may be fully expected that this kind of role will be usefully and importantly fulfilled by professional publishers, who might elect to use the capacity and convenience of the CD-ROM (in whatever format is available at the time) to publish CD-ROM products for a sizable and appreciative audience. There is a service to be provided in harvesting the best materials from the Internet into more manageable or convenient "bite-sized" chunks. There will be revenues to

garner from such services. In this consumer-oriented sense, the CD-ROM industry may be expected to thrive.

(2) Librarian's skills will grow to be in great demand in the virtually unrestrained environment of the Internet. What the Internet most lacks are the quality indicators and classification signposts by which one can rapidly retrieve data that can be known as qualitatively evaluated and important. Librarian's have learned to hone such skills over time. (Paradoxically, it might be claimed that the current budgetary constraints have sharpened these traditional skills even more, though few librarians consider this a positive thing.) Collection development, selection, and reference desk patron interactions are important sources

of knowledge about what people want and need. Librarians who possess this information will be increasingly important to the Internet community. The best engineering and software algorithms can merely create "search engines" that deal with data encoded within Internet data resources. Librarians need to provide the meta tools that help differentiate quality from chaff.

When this happens, the role of the CD in institutional settings will diminish even further, which will mean that CD-ROMs will live out their life within the markets to which they are most responsive: home entertainment, games, educational applications, and industrial and virtual laboratory simulations. This will be a decidedly robust market, in any event.

What CD-ROM Is All About Today

by Pete Goldie <pg@lbin.com>, Ph.D., President, Lightbinders,

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First, The Bad News... Last week I was notified that my largest customer, *The Journal of Biological Chemistry*, is discontinuing the CD-ROM at the end of 1996. In 1992, Lightbinders became the first producer of a complete basic research publication with JBC on CD-ROM. The JBC disc is being discontinued because of the 'success of JBC online' (more on this later). So, can we conclude that the brief and pathetic era of research journals on CD-ROM lasted 5 feeble years? Of the tens of thousands of professional journals published in the USA, only a few dozen ever became CD-ROM products, and many of these were not commercially viable. What went wrong? Let's round up the usual suspects...

During the last few years the academic publishers have approached electronic publishing with all of the insight of the railroad barons upon seeing their first horseless carriage. First it was ignored, then it was considered just a toy for rich people, finally it was labeled dangerous to intellectual property rights. As CD-ROM gained in popularity, the publishers began to acknowledge the demands of their customers and grudgingly decided to create a few electronic products. Typically, a title chosen for conversion into a CD-ROM had to be an 'orphan', that is, not a significant revenue generator for the publisher. The discs had to be made as cheaply as possible and were then marketed in such a way that they would not upset existing revenue from the print product. Some publishers, such as with JBC, aggressively marketed the CD-ROMs at a price far below the cost of production. Many publishers put little effort into promoting the CD-

ROMs, perhaps in fear of what it would mean if it succeeded.

Some publishers recognized their limited expertise in the area of electronic publishing, and so sought help from electronic publishing consultants. Unlike former congressmen seeking work with defense contractors, very few of the consultants had actual experience in the field they claimed expert knowledge in. Many publishers were (and continue to be) unduly influenced by these "experts". In the last few years, a new and even more unqualified subset of consultant has emerged, the SGML Con-

ers (forgive me, but I am assuming this publication is not read by lawyers). The demands of the customer have been a contradictory mix of unachievable goals. They seek the highest quality product, but it must operate on their personal computer, be immediately intuitive to operate without a manual, be full-featured, be delivered with or before the print product, and, of course, cost less than nothing. Once a serial title is produced, all subsequent CD-ROMs made must be compatible with the first disc issued, and ideally, use a browser application that they are already familiar with.

A most important segment of the customer spectrum are the librarians. These persons are also prone to the same contradictory demands of individual customers, but their situations show that what may be inconvenient to an individual is intractable in a library. The issues of different user interfaces, available computers, disc storage and dissemination, cost, networking, upgrades, etc. are all magnified. It is the librarians who present CD-ROM producers with the most difficult challenges, and for which we have the fewest easy solutions.

The media of a CD-ROM looked incredible in 1989, when Lightbinders started making discs. Imagine 650 Mb of data space, with random access and a data transfer rate of 150 Kb per second, all for the price of about a dollar a copy. The problem then was not the media, it was the high price and slowness of CD-ROM drives. Today we all know how quickly we can fill a disc up, and now commonly see transfer rates of over 600 KB per second, enabling multimedia and video play-

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sultant. SGML consultants advise publishers on DTDs and translation of existing content into SGML. We frequently find these experts talking publishers out of big bucks and then handing them an off-the-shelf DTD, slightly warmed over as 'customized'. The money spent is often worse than wasted, as publishers can end up with a DTD and translation program that was designed without consideration of the final electronic delivery application.

We all work toward satisfying our custom-

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back. Now the problem is not lack of cheap, high speed drives, it is the capacity of the disc. Unfortunately, the proposed ultra-high capacity CD-ROMs now under development will require new drives.

Finally, I come to the most irresponsible player of all, The Media (with a big M). With its insatiable use of hyperbole, journalists have reported on and exaggerated every aspect of the fledgling electronic industry, starting with CD-ROMs in the early 90s, and now continuing with the Internet. Every potential benefit was portrayed as limitless and every problem was exposed as crippling. What we see and hear everyday about the Internet and the World Wide Web has usually been bad news to CD-ROM developers. The Media has helped perpetuate the myth that everything worthwhile is already online, free, and instantly available to everyone. Publishers are not fooled by these illusions, but in fear they will be left behind they are placing more effort into online Net products than into CD-ROM products.

In attempting to round up the usual suspects, I have excluded the CD-ROM producer as the villain ... at least this producer. After 7 years of working ourselves to the bone, we are not driving Mercedes, do not have shareholders' meetings in Maui, and have gotten somewhat used to surviving in an industry which requires complete retooling every 18 months. We have been the companies that have promoted electronic publishing standards, such as SGML, and had shown publishers that cross-

platform, full-featured multimedia products could be produced and sold for a profit. For this we have all too often earned little more than 'well done, thank you and good-bye'.

Each of the difficult challenges faced by CD-ROM producers has been overcome; high quality interface, multiple-platform support, industry standards for data preparation, large installed base of CD-ROM drives, and a growing market for quality CD-ROM products. It is ironic that a tangible, controllable and profitable product such as CD-ROM, deliverable to over 50 million installed CD-ROM drives in the USA alone is given so little attention by publishers, as they scramble to gamble on the uncertainties of the Internet. So...

...Now the good news! Lightbinders has more customers and is making more discs and electronic products than ever before. Despite the common Media impression of the Web, there are still many areas where CD-ROM delivery excels. There are some obvious limitations of the Internet vs. CD-ROM. The transmission rates are often very slow, easily broken, and access for most people is limited to the place of employment. Access outside of North America is generally very poor. The Web browsers such as Netscape, Mosaic, Spyglass, etc. cannot handle complex mathematics, special characters and most diacritical marks. High quality multimedia components often require locating and installing helper applications, and then require long delays to download. While these are serious limitations today, most are solvable in the next few years.

The 9 February 1996 issue of *Science* has a Special News Report entitled "Science Jour-

nals Go Wired," that describes a "tidal wave" of online publishing in the academic market. One telling quote is: "As of the end of 1995, the Internet was already home to over 100 peer-reviewed science, technical and medical journals." Some serious criticisms of this article are 1) very few of the 'over 100' journals are complete, most are just titles and abstract lists, and 2) almost none of the titles, including JBC, are existing under a commercial transaction model; they are free and open to all. Thus it is quite premature for JBC to have declared their online venture successful. I have been arguing for many years that basic research publishing would be the first major publishing application to fill the expanding Internet, as researchers created the Net and have been its most active users for decades. The first successful online title developers will be those who have successfully addressed the difficult formatting requirements for academic publishing, within a sustainable economic model. This has yet to be demonstrated for any scholarly publication.

The most important reason we are growing and optimistic about our future is because of the increasing knowledge and experience of our main customers, the publishers. Although Lightbinders is still considered primarily to be a CD-ROM producer, publishers have realized that our major contribution to their electronic products is high quality data preparation as SGML, in addition to multimedia integration. They know the result of working with us is clean accurate data, ready for either CD-ROM or online delivery. Almost

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all of the Web publications today are using either extremely simplified HTML or Adobe Acrobat/PDF files. Neither of these formats will survive the maturation of Web browsers and servers as they learn to handle SGML. It should be no surprise that much of today's online content will require major reworking into SGML to remain competitive.

Another reason we are optimistic about the future of CD-ROM is the growing market for products in the professional, medical and clinical fields. In the past, these fields were limited by lack of CD-ROM equipment, and the 'old guard' of doctors who did not grow

up using computers. Today, these professionals are computer savvy, less prone to Web browsing, and need products specifically created to give them accurate answers quickly. CD-ROM titles aimed at these populations are selling quite well.

Finally, we are creating electronic publications that are either entirely new or are compilations and collections that could never have been brought together until now. This began on a small scale as we cumulated indices of serial publications. Our best example of a new title is Academic Press's *Methods in Enzymology — Recombinant DNA* CD-ROM. Here, we interlinked 18 volumes on nucleic acid research spanning 20 years of publication, to produce a compendium of highly fo-

cused information for a select audience. Many exciting projects similar to this are now in production.

In summary, the state of scholarly publishing on CD-ROM today can be compared to young adulthood, having acquired a modicum of maturity from having been slapped around by the cold cruel world. While all of the attention today is on the unruly youth of the Internet, expect CD-ROM to continue to mature, becoming even more productive and profitable. But don't take your eye off the Internet. While it may be the pride of Wall Street today, it's more likely to steal your car for a joyride than pay you back anytime soon!

CD-ROM Does Not the WWW Make

by Julia Gelfand (UC, Irvine) <jgelfand@uci.edu>

About nine or ten years ago when the early generations of CD-ROM products were being released and commonly found in libraries, I was an invited member of a panel of librarians and representatives of the publishing and information-producing worlds and was loudly booed when I suggested that: "CD-ROM is a passing fad." In reviewing those notes, I said, "CD-ROM, unless it is a networked resource allowing for multiple simultaneous users, will have limited interest in a library setting. To achieve that will require a revision of the site licensing agreements information producers have been generous with to date. CD-ROM will obviously have a very strong future in the independent markets serving individual users replacing microform products. Reduction and storage is each so powerful with CD-ROM, search engines so promising, and the medium so easy, clean and upscale, that libraries and other institutions as well as individuals will welcome CD-ROM for many reasons."

What has transpired in nearly the decade since those remarks were shared, includes a litany of technological developments and new expectations users have for complex searching and retrieving fulltext documentation. Nearly all personal computers are currently released with internal CD-ROM drives today. Costs for this technology have dramatically fallen and familiarity with the product is wide-

spread. Adding to that, further exploration of site licensing and copyright interpretation, the choices of information available via CD-ROM have proliferated multitudes. It is a medium of choice for many things, often requiring affiliated peripherals to serve it — extended towers, network links and dialup capabilities. The real growth has been in multimedia entertainment products for which it is very well suited.

However, the more recent experiences of publishing on the Web and widespread Internet access, have redirected CD-ROM to different markets. I believe the institutional markets will continue to find CD-ROM attractive for individual end-user searching all but ending the practice of mediated searching. Conversions of microform sets to CD-ROM have already taken place, developments in copying images and nontextual information with color and other enhancements makes for exciting times in CD-ROM. Network access and a more relaxed site-licensing environment invite libraries and other large-scale information repositories to consider CD-ROM.

The real home for CD-ROM will be with the independent user who will acquire it for reading, searching, storage of research and personal information and integrated technologies, bridging the ability to enjoy recreation

online with games, animation, with sound and color. The WWW may be a more fluid mechanism of delivery, with a longer lifespan offering simpler revision practices. CD-ROM is not dead, but has more restricted uses with alternative technologies becoming more widespread. Scholarship will look to more interactive media that has fewer obstacles in access. I see CD-ROM as a migration tool in an institutional setting and that publishers will utilize the Internet for the transfer medium. There are still plenty of things to sort out with the WWW and the Internet, but it appears to have greater promise for more things. I will keep my CD-ROM reader and player for sure and expect to use those products best suited to CD-ROM in libraries for quite some time, but not forever. If not for the ROM part, sound will always be welcome. CD-ROM just does not evoke much emotion, nor stimulate sufficient creativity as a product, nor create much confusion or offer stability that it is anything so special anymore. It certainly offers no comfort like a good book and sometimes is difficult to use, so it is not my favorite toy or research strategy. The Web may be problematic, but it is fun, and the choices are endless. One can get totally absorbed in a far different way than with CD-ROM, which may be becoming old and boring these days.

CD CD On the Wall, Will You Be Around AfterAll?

by Martin Kesselman (Special Projects Librarian, Rutgers University Library of Science and Medicine, P.O. Box 1029, Bevier Road, Piscataway, New Jersey 08855; Tel: 908/445-3850; Fax: 908/445-3208.)
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It's now been over two years since I stopped writing my ongoing column, "CD-ROM/Online Update," for *Wilson Library Bulletin*. I now welcome the opportunity to take another look at the continuing role CD-ROM

might play in libraries in the coming years. Looking back, CD-ROM changed the landscape of end-user searching in libraries dramatically. Here was a technology that offered for the first time, unlimited searching (albeit

by a limited number of simultaneous users) of a database at a fixed-cost: no online connect charges and no printing charges. This was an accomplishment none of the online services

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had been able to make available. At that time CD-ROM was definitely the most appropriate technology for providing access to heavily used databases and LAN technology provided the capabilities for providing access to more than one user at a time and even, with some difficulties and expense, access beyond the library building.

However, CD-ROM is still a slow-technology and provides challenges when trying to provide network access across a campus, especially a campus which might be supporting several hardware platforms. A few advances in the past two years have made, for many libraries, other options possible. First of these is the Net. In the last two years, because of the phenomenal growth of the Internet, there has been a parallel increase in the number of databases that are available for a fixed cost over a campus network via the Internet from services such as First Search, Ovid Technologies and Eureka. In many cases, the library does not have to invest in expensive hardware and maintenance costs in mounting databases. The second advancement is that the cost of magnetic storage has decreased immensely. Magnetic storage is faster and easier to network than CD-ROMs. Many vendors now offer options of using CD-ROMs only as a distribution vehicle. The library then downloads the CD onto a high capacity hard drive and provides access to the database over their campus network or local LAN. Client-

server architecture has also enabled that databases offered via magnetic storage or over the Net to be more end-user friendly as they can be searched by a variety of interfaces available for various client platforms such as Macintosh, Windows, and DOS.

Where I have seen the greatest boom in CD-ROM has been in the consumer arena. Almost every computer sold nowadays comes with a CD-ROM drive and for others the costs of a CD-ROM drive as an added peripheral can be less than \$100. More and more books come with enclosed CDs and even the con-

sumer online services, such as America Online and CompuServe, are distributing their communications software and web browsers via CD-ROMs. Where CD-ROMs just 2 years ago were only for expensive databases, CDs are here in books, in magazines, and it has become the vehicle of choice for distribution of games, full-text reference sources, and multimedia.

One other area CD-ROM has made inroads in is for archival information. With CD Recordable, a library can even archive information and make it available elsewhere at an affordable cost (some CD-Recordable systems

are now available for less than \$1000). And coming on the horizon are DVDs, digital versatile discs, which are being developed by several CD-ROM drive developers such as Sony and NEC. DVDs look like CDs but where a CD now stores only 600mb (a phenomenal amount of storage when CDs first came on the market), DVDs can store over 4.5 gigabytes of storage!

So, where do I see CD-ROM after all? In the past, CD-ROM was the technology that opened up end-user searching to our users for the first time and provided an important avenue for libraries in developing new services of instruction and outreach. This momentum will not stop, even if CDs take on less prominence. At present, CD-ROM is the format of choice for the delivery of consumer information, plays an important role in the distribution and archiving of information, and still has this role for some information databases, particularly in areas with poor telecommunications infrastructure. However, with the exponential growth in the Internet and faster and greater capacity coming down the pike, I see the Net quickly becoming the vehicle of choice for the distribution of databases and multimedia and full-text information. Also, where CD-ROM databases are purchased by individual libraries, libraries can use consortial arrangements to provide access to databases over the Net. In the near term, I think there will still be a place for CDs in libraries, particularly as an adjunct or surrogate for books, but I think libraries need to work together and put their money and energies on the Net. 🐀

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