feature

Buy gold or granite optical discs for longest life... or destroy a cheap version in a car on a hot, sunny day

Leo Enticknap assesses the ongoing problems of long-term storage

Consumer recordable optical discs, principally CDs and DVDs, are probably the most widespread storage media in mainstream use. Worldwide, almost a billion of them are burned every week. As it grew from an expensive and specialised niche technology in the late 1990s (the first CD-R disc I bought cost £15 in 1997) to an all-encompassing replacement for the compact cassette, the floppy disc and VHS by the close of the last decade (recordable CDs and DVDs typically cost around 30p now), the use of optical discs began to encompass an enormous range of media storage applications, both consumer and professional.

The majority of people who give barely a second thought to burning their family photos onto a CD-R, or the previous year of their company's scanned accounting documents onto a DVD-R, do so in the belief that it will hold their data reliably and indefinitely. They are almost certainly mistaken.

Archivists have learned the hard way to be very wary of media longevity issues. They have had their fingers burned (so to speak!) by nitrate decomposition, vinegar syndrome, sticky shed, format obsolescence and a litany of other problems which have taught them the hard way that you can't just put your media in a vault and forget about them. Like film and magnetic media, recordable optical discs are a complex chemical cocktail that is about as stable as a rubber dinghy in a tsunami.

Concerned at the increasing use of optical discs for critical data archiving applications, an American representative body, the Council on Library and Information Resources, commissioned a detailed research study into their suitability as a long-term storage medium in 2003.[1] It is essential reading for anyone charged with looking after significant collections of CDs and DVDs.

A recordable optical disc has two essential components: a rigid, transparent disc, or 'substrate', and a layer of an organic dye into which tiny indentations are 'burned' by the recording drive's laser to represent the ones and zeroes of the data stream. Three dye types are currently used by manufacturers (cyanine, pthalocyanine and azo). Expert opinion is sharply divided over the question as to whether, all other factors being equal, some offer better long-term stability than others. I have often heard it said that pthalocyanine is supposed to be a better bet than either of the other two, but have yet to see any hard data to suggest that this is anything more than an urban legend.

Degraded by light

However, one thing we can be sure of is that because the recording medium is a photosensitive dye, it is degraded by light. The most important storage consideration, therefore, is that CDs and DVDs should be kept in as dark a place as possible. Ensure that containers are opaque (not transparent) and that media is stored either in a room that is unlit for most of the time, or in cupboards or cabinets. If you don't believe me, try making a CD-R copy of your favourite album and then leaving it, playing surface (i.e. the opposite side from the label) face up on your car's dashboard for the duration of a sunny day. It is about as likely to be playable at the end of it as I am to have a torrid affair with Sarah Palin.


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Various adhesives and binder layers are used to complete the complex chemical sandwich of dye and substrate, and so storage in steady, constant atmospheric conditions is also important. It is also believed by some that burning discs at the slowest speed your drive will support will maximise the accuracy of the recorded data stream, thereby maximising its chances in long-term storage.

Various products have been marketed claiming to provide a long-term archival storage solution. A Colorado-based company, MAM-A, produces recordable CD, DVD and BluRay media incorporating a gold reflective layer, which it claims offers a 200-year period of reliable storage (compared to the generally accepted 3-6 year reliable storage period of a mass-produced CD-R or DVD-R).[2] However, the advanced technology in these discs is reflected in their price. An experimental system is also being developed to burn data onto discs made entirely from granite using a high-powered laser: being entirely inorganic, these discs are said to be immune from chemical decomposition.

It is likely that in the long-term, optical discs will be replaced by other forms of non-volatile memory. Solid state hard drives consisting entirely of flash memory (no moving parts) are already starting to make an appearance in high-end laptops, and with holographic storage close to becoming a commercial reality, it is likely that BluRay will be the final incarnation of the now ubiquitous 12cm optical disc. That in turn will create a data migration headache of the sort that anyone with significant collections of 5¼ inch floppy discs, UMatic tapes and a myriad of other obsolete media types will be wearily familiar with. But migration will only be possible if the data has survived in the first place, and that is much less of a foregone conclusion than many anticipate.

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1 – For the full report, see http://www.clir.org/pubs/abstract/pub121abst.html .

2 – See http://www.mam-a.com/