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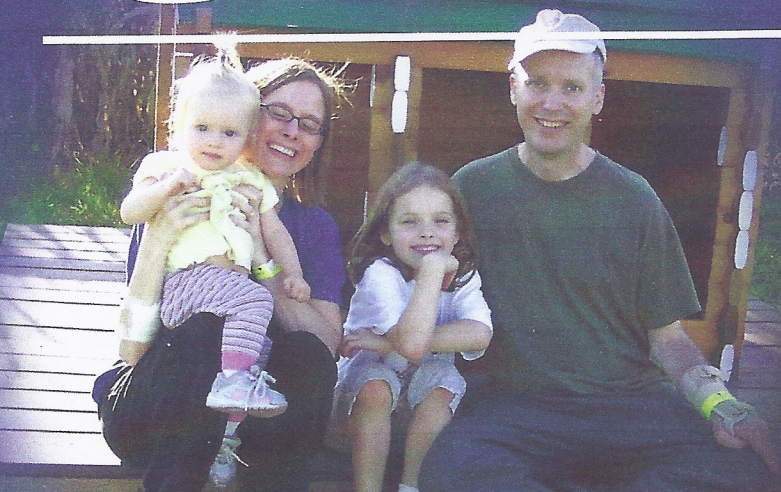
# CRYONICS

APRIL 2013 · VOLUME 34:4



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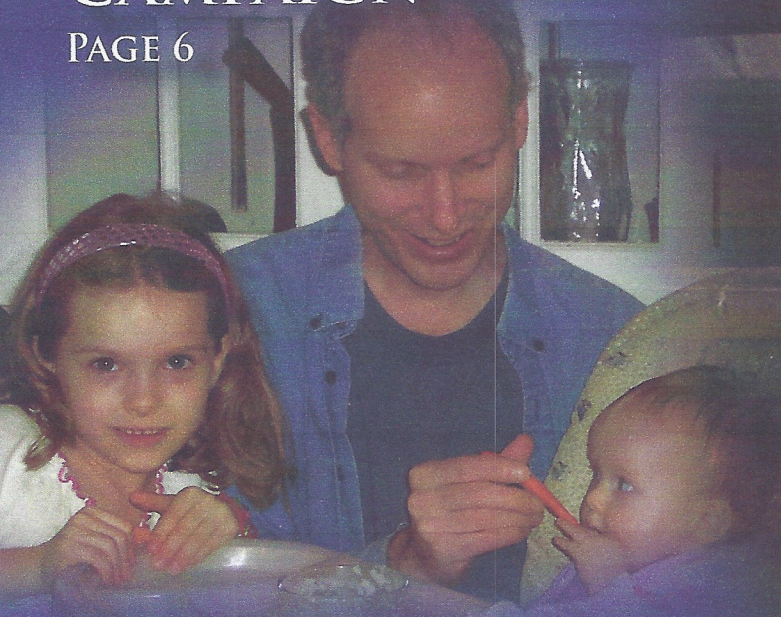

## ALTERNATIVES FOR VERY LONG-TERM STORAGE OF PERSONAL INFORMATION & MATERIALS

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ISSN 1054-4305

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# ALTERNATIVES FOR VERY LONG-TERM STORAGE OF PERSONAL INFORMATION & MATERIALS

By Mike Anzis

## INTRODUCTION

An important consideration for many cryonicists and other immortalists is the long-term storage of information and materials such as audio and video recordings, photos, documents and records, to be retrieved at the time of revival or cloning. In the future these simply may be welcome and enjoyable connections to one's prior life, or they could serve as aids in reconstructing one's identity and personality. Storage may also include objects such as memorabilia or those with possible future value such as precious metals and jewels, or even tissue and DNA samples. Assuming that revival could take as long as a hundred or hundreds of years to become feasible, it would not be reasonable to expect that one can leave records and material with friends or relatives and expect them to be continually guarded, maintained, and passed on through future generations.

This article is a brief survey of currently available methods of potentially very long-term storage, including discussion of their respective advantages and disadvantages, and some recommendations by the author. As a disclaimer, technologies and available services are always changing, and some information is not readily available. Therefore I can only state that this represents the best information I could obtain at the time of article submission, and additions and corrections are welcome. My analysis and recommendations are based on my personal perspective, and anyone seeking such services should verify the information they rely on and make their own choices.

## STORAGE ALTERNATIVES

The various alternatives examined are summarized on the chart in this article. A term that may not be familiar to the lay reader is "cloud services." This refers to the technology and services available today that allow a user or customer to load digital files via the Internet to remote computers that are managed and maintained by an outside service company or organization. Also, to clarify the column "Longevity Representation," it describes any implicit or explicit assertions or contractual obligations the provider makes regarding the very long-term storage that would be needed, i.e. until revival. In addition, for the non-tech oriented, "GB" means gigabyte, or one billion bytes or characters, and TB means terabyte, or one trillion bytes.

The most significant issues for immortalists regarding long-term storage (other than costs) are:

1. Will the storage company, organization, or individual storing information and materials be inclined and obligated to provide it, or even be in existence at the time of revival, and,
2. Will the media used (DVD's, CD's, flash drives, video tape, paper, etc.) be preserved and readable, including the question of whether there will be compatible devices to read them.

The bottom line is that there are no absolute assurances with any of these (not to mention whether bio-stasis and revival techniques will work), and I have arranged the chart with the rows in descending order of what I feel is the highest to lowest probability of retrievability. So, it starts with Alcor and the Cryonics Institute on top, since their mission is completely aligned with our objectives as cryonicists. Next is Terasem with the LifeNaut and CyBeRev options, since transhumanism is closely aligned with cryonics. (I was unable to determine that any other cryonics or transhumanist organization offer storage services.) These are followed by commercial services that have a purpose not connected to immortalism, although not necessarily in opposition. I've also included toward the top the Millenniata M-Disk, since it is a technology that can be used along with various physical storage options.

### Alcor Storage Box

As part of an Alcor full cryopreservation membership, Alcor members have the use of an 18"x15"x13" cardboard storage box that is stored in an environmentally maintained former salt mine in Hutchinson, Kansas. This is a service provided by Underground Storage Vaults, Inc. (undergroundvaults.com), which has been in business since 1959. Members can add to their boxes approximately every two years. Additional boxes cost $250. Beside digital media, a wide variety of objects can be stored such as books, albums, collectables, paintings, etc.

In addition to it being free to members, this alternative has the advantage of Alcor itself monitoring the company and Alcor's continued stewardship of the stored boxes (but not the material). With no management of the media in the boxes however, there is no control over deterioration

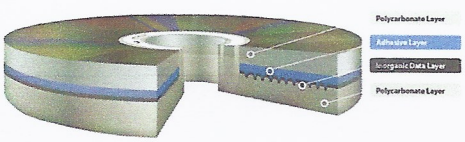
or maintenance of readability of the media. (Storing digital information in the cloud or with an organization focused on storing "information" rather that storing "boxes" implies that they would maintain compatibility with changing reading devices and software.) As with any commercial company however, Underground Vaults may revoke its commitments or go out of business, and Alcor would have to find another alternative or take on storage itself.

### Cryonics Institute Storage File Vault

Cryonics Institute provides the option to their suspension members of buying a drawer in a file cabinet at CI's facility in Michigan. The drawer has a one-time fee of $1,000. The cabinets are in an office environment, and other than being fireproof (i.e. fire resistant), there are no other environmental controls. This alternative has the same advantages as the Alcor storage box, except for the more strictly controlled environment and security of the salt mine. CI also specifies that only papers and digital media may be stored.

### Millenniata M-Disk

I discovered the Millenniata M-Disk while researching this article. It is a DVD with a data layer made out of stone-like metals and metalloids that ExtremeTech (www.extremetech.com), the provider, asserts will last and be readable for 1,000 years. It has been tested by the Naval Air Warfare Center under extreme conditions. (See http://www.mileniatta.com/m-disc/.) It can only be written-to by an LG DVD writer, but they are not expensive. I purchased the writer at Fry's for $34, and a 5-pack of disks for $20. Capacity of a disk is 4.7 GB. This is, allegedly, the most physically robust medium that I have identified for storing digital information.




### Mind Files

There are two projects within the Terasem Movement that allow storage of digital information in the cloud (i.e. over the Internet), LifeNaut and CyBeRev. Terasem is a 501c3 not-for-profit charity "endowed for the purpose of educating the public on the practicality and necessity of greatly extending human life... concentrating in particular on facilitating revivals from bio stasis. The Movement focuses on preserving, evoking, reviving and downloading human consciousness." (Quote from the Terasem Movement website at www.terasemcentral.org.) It is largely funded by Martine Rothblatt, a successful entrepreneur and promoter of futures technologies and acts as an umbrella organization over many projects, including LifeNaut and CyBeRev.

Both LifeNaut and CyBeRev are highly advantageous since they are both aligned with cryonics and immortalism, and many Alcor members are members of one or both. It was easy to sign-up for LifeNaut and uploading was straightforward. When I had questions about uploading files, a call to Bruce Duncan, Terasem Managing Director, was returned promptly. Bruce spent considerable time helping me with the LifeNaut uploading tools and answering questions about Terasem and LifeNaut. He said that the available LifeNaut on-line user manual is currently in need of update because of a recent major system revision. Bruce told me that LifeNaut's infrastructure includes three physically separate sites that replicate systems and data among themselves in "near-time", i.e. minutes or hours, allowing failover to another of two sites should one fail. I was also told that while the stated limit of storage per user is 7 GB, many members use more, and there is currently no need or plan to limit user storage.

It took ten days after requesting participation on CyBeRev's website to become a participant. Uploading after signing-up was easy and straightforward. I was told in an email from Mike Clancy, General Manager, Terasem, that "In addition to off-site (local) and off-site (out of state) storage, mindfiles are stored on two waterproof fireproof drives on site"; and that "The database is also on a fault-tolerant raid array." In my opinion, CyBeRev's technical infrastructure compares satisfactorily with LifeNaut's, with the difference being that LifeNaut would probably recover from a major system failure in minutes or hours, while it may take CyBeRev a day or more.

Regarding both LifeNaut and CyBeRev, there is always a question of whether something free from a charitable organization will remain so over the long-term, or whether the organization will remain in existence. That is also a concern regarding commercial organizations. A case in point is an entity called Swiss DNA Bank that, apparently, was set up as a commercial enterprise for immortalists to store DNA information and digital files in a Swiss mountain for a fee. There are references to and articles about it on the Web, however the website is not operating, and one must assume they are out of business. The concern about sustainability would also apply to cryonics or other immortalist organizations, however, I believe that alignment of goals and cross-participation of members makes immortalist organizations the best available option for long-term storage of digital information.

### Commercial cloud archival and backup services

These services focus on business users with the need to retain archival copies of important data and materials relevant to their business, and to have backup copies of these available in case active copies are corrupted or lost. Such backup is required of publicly traded companies under Sarbanes-Oxley legislation and by regulations in certain industries such as banking, insurance, and healthcare. Many companies offer this service, including well-known companies such as IBM and Google, and others such as GlobalDataVault, Seagate, Iron Mountain's LiveVault, etc.

These services offer some distinct advantages in that they are tightly managed by large, strong companies with a vital stake in the integrity and readability of data, including conversion to new technologies. While they offer some assurance of longevity, very-long term stability is not assured. Arrangements with these services also requires continuous renewal of

contracts (every year or every few years), and continuous payments. Also, because they focus on data, storage of large video files can get very expensive, and storage of objects is not available.

Overall, because the focus of these services is not aligned with immortalist objectives, and because of the need for continual renewal of contracts and payments, these services are not recommended.

### Commercial cloud sharing and storage services

There are numerous commercial cloud sharing and storage services available today, including the popular and highly publicized Apple iCloud, Google, Dropbox, Amazon Cloud Drive, and Windows Live SkyDrive, as well as Google's YouTube. They vary from 5 to 18 GB free, and you can purchase a TB or more, depending on the service. They vary in the details of what is available, but the most important point for immortalists is the short-term focus of these services. They focus on the general retail user, and their purpose is to provide a file sharing platform and backup for currently used files, music, video, etc., not archival preservation for the long-term. As such, there is no intention or awareness of any of these long-term immortalist objectives, and these services are also not recommended.


Another related service which deserves mention is one that converts photos, slide and move film, and analog media such as audio and video tapes, to a digital format. This, of course, then allows you to store these on digital media such as the M-Disk or with a cloud storage service. You can purchase your own equipment for this conversion, retailers like Walmart and Costco provide the service, and there are numerous such services available through the Internet. At least one of the online services which does conversion, PeggyBank (peggybank.com), also provides cloud storage for archival and sharing purposes, and does it for free for the media that you've paid to have them convert. The same caution would apply to the storage aspects of this service as to other commercial cloud storage services, namely that it is not aligned with immortalist objectives of very long-term storage, so it is problematic how long files would be maintained.

### Other physical storage service providers

There are also companies besides Underground Vaults that focus on the long-term archival storage of physical business documents and materials. The leader and best known is Iron Mountain, which stores materials in caves in Iron Mountain, Colorado, and other locations. Some will also store materials, such as the archival film libraries that Underground Vaults stores for the movie industry.

I see no reason why an Alcor member would choose this option from an organization other than Underground Vaults since it's free and overseen by Alcor. Other immortalists may wish to compare other services.

## RECOMMENDATIONS

My recommendations are simple, and are based on the "belt and suspenders" approach: Use more than one of the viable alternatives simultaneously for the best possible assurance that you will see your selected personal material in your next life. I see the viable alternatives as those with objectives that align with mine, i.e. revival in the very long-term future. So I am using the Alcor box to store materials, and digital information written to M disks, and I am in the process of deciding between LifeNaut and CyBeRev to also store information through the cloud on their servers. I may decide to use both, although I like the freer access by would-be participants that LifeNaut appears to provide, and their service that offers cryostorage of DNA.

Commercial archival and backup services may be another viable alternative because of their robust infrastructure and the strong companies that provide them. However, I don't consider their costs as worthwhile, and the need for constant contract renewal and payment seems infeasible over immortalist timeframes. I don't recommend commercial sharing and storage services such as iCloud, Dropbox, or YouTube because their focus is so short-term and constantly changing to meet market preferences (and whims).

Finally, in addition to recommending that immortalists provide for this kind of very long-term storage in some way to assure higher quality future lives for themselves, I also recommend making this material available to friends and loved ones, either now or after bio-stasis. Tell them where it is stored and communicate your very long-term storage arrangements so they may continue to experience you in a way that may make them more inclined to continue to support efforts to revive you.

One other recommendation: Create an "Ethical Will" and store it with your other long-term material as well as where friends and loved ones can have access. Briefly, this is a statement of your basic values, beliefs, and what made you who you are as a person, and messages you would like to pass on to future generations. CyBeRev focuses on providing a framework for this kind of information; however I'm inclined to think that a simple video of you communicating your message would be just as effective. I think this may be the most valuable content I can pass on to my children and have upon my revival. ■

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# Long-Term Storage Alternatives

| PRODUCT | COMPANY / PROVIDER | MEDIA / METHOD | LONGEVITY REPRESENTATION | COST | ADVANTAGES | DISADVANTAGES |
|---|---|---|---|---|---|---|
| **Alcor storage box** | Underground Vaults and Storage, Inc.(undergroundvaults .com) | 18"x15"x13" cardboard box stored in environmentally controlled prior salt mine 650 feet underground in Hutchinson, Kansas | Underground Vaults logo says "Security Forever"; has been in business since 1959; 99 year lease on salt mine; no contractual representation. | One box free with Alcor membership; additional boxes $250 ea. | No cost for one box; can store various media and other objects; security, low temperature and humidity controls; Alcor oversight | No very long-term assurance/ representation by vendor; no media management |
| **Cryonics Institute storage file vault** | Cryonics Institute | File cabinet-sized storage drawer housed at CI in Michigan | As a cryonics organization, CI is implicitly committed to storage until revival | $1,000 one-time fee with CI membership | CI stewardship in connection with suspension membership | No environmental management or controls (office); digital and paper media only (no objects) |
| **Milleniata M-Disk** "DVD made out of stone that lasts 1,000 years" | ExtremeTech http://www.mileniatta .com/m-disc/ | 4.7 GB DVD with a data layer made out of stone-like metals and metalloids | Co. claims data layer lasts for 10,000 yrs., polycarbon layer for 1,000 yrs. | Fry's - 5 pack $20, 10 pack $30; to write must also have LG R/W drive $34. | User control; store anywhere including Alcor box or CI, no on-going costs | Uncertain future readability, small capacity for video (4.7 GB per disk) |
| **MindFiles** | LifeNaut (www.lifenaut.com); part of Terasem movement (www.terasemcentral. org) | Free cloud storage of digital info up to 7 GB+ for registering; can create your own interactive avatar and freeze and store DNA for a fee | Assertion of unlimited timeframe for revival and/or uploading to future avatars and other transhuman technologies | Digital storage free with registration; DNA storage free with $99 shipping costs in U.S., $399 from outside U.S.; donations requested | Free digital storage; committed to idea of cryonics and transhuman immortalism; on-line control and easy use | "Free" can also mean freely withdrawn. No contractual commitments regarding retention. Supported by private philanthropy. |
| **MindFiles** | CyBeRev (www.cyberev.org); Part of Terasem movement | Storage of up to 10GB digital information, including questionnaire/person ality profile; personal avatar | Similar to LifeNaut; more emphasis on personality and psychological profile (i.e. "bemes" - units of personality) | Free, however limited to pre-existing accounts; new accounts by invitation only | Free digital storage; committed to idea of cryonics and transhuman immortalism; on-line control and easy use | Controlled membership; terms of service seem to imply that Terasem owns your information |
| **Commercial Cloud Archival & Backup Services** | Examples: IBM, Seagate, Google, Sungard | Cloud backup/storage of 50 GB+ digital files | Various assertions; no very long-term representation | $4 / month and up | High capacity; tightly managed storage infrastructure; on-going business may assure readability and some long-term viability | No very long-term assurance; focus on data and documents; continuous monthly/yearly contracts and cost. |
| **Commercial Cloud Sharing & Storage Services** | Examples: iCloud, Dropbox, Amazon Cloud Drive, YouTube | Cloud backup of flies, music & media; up to 1 TB; 5 to 18 GB free | No long-term representation or contractual assurance | Free up to 18GB+, depending on service | Easy to use with popular tools (Windows, Apple and Android devices). Robust commercial backing | Focus on short-term backup and sharing; no focus on immortalist objectives |
| **Other physical storage service providers** | Examples: Iron Mountain, Gaylord, GRM | Physical storage of paper documents and materials | Generally no contractual assurances or representations | Varies by volume and services provided | Actively managed secure venues; commercial viability | Paper materials only with some exceptions; no commitment or focus on very long-term |