

Why conserving Video-game Heritage is (almost) impossible II: Why is it sticky?

As disclosed in my [previous entry](#), we know for a fact that most of the video-game heritage is based upon unstable materials; many of them accelerating the degradation of one another at alarming rates. These degradation processes mean that many of the “future cultural artifacts” that we care for today (may it be as archival experts, conservators, curators, or just plain video-game enthusiasts) will be unusable and unstudyable for future generations.

Most of the items encompassed in the video-game heritage commonly suffer processes of oxidation, hydrolysis and general physio-chemical wearing. As previously discussed, these are aggravated by the environmental presence of IR/UV radiation and changes in temperature and environmental humidity.

If we also add-in the human factor to all these difficulties, the deterioration of these items only aggravates and accelerates exponentially. In some cases, and formats, the minor mishandling of many of these items can result in the loss of readability of (more or less) replaceable commercial games; but is specially object of concern when the object of misuse are unique artifacts, such as unreleased games dead in the preproduction phase, or development documents and files crucial to understanding the inner workings of the final products.



Figure 1. Damages on the informative label of a Super Game Boy Adapter for SNES

The common “wear and tear” is a physical alteration mostly caused by continuous manipulation or use, and/or the removal of informational and protective labels or markings. This is especially commonplace in the piezoelectric membranes loss of conductivity of game controllers’, which reduces the usability of the peripherals and controllers and hindering the user input into the software. The recent practices of “refurbishing” video-game consoles by replacing internal parts or changing their original shells can alter the stability of many components if the replacements are subpar, or just have minimal different chemical composition.

Although many of these damages are unavoidable (you just cannot play that *Party* game without hindering the usable life of some controllers), many are preventable. The use of cotton gloves and table protectors when handling most plastic-coated items is enough to deaccelerate their deterioration when handling. The use of high quality and tested replacements for internal repairs can on the long run allow the continued use of the hardware for many years. However, the necessary analysis and tests are often costly and difficult to submit by the average user.

The damages produced by IR and UV radiation are physiochemical alterations which can alter not only the outer casing and internal parts of the hardware and their mechanical properties, but also

the loss of the analogue media-based software, the documentation contained in paper or digital software stored in UV sensitive erasable programmable read-only memory, to cite a few.

The storage, use and manipulation of most video-game related plastics in conditions of, medium to high, levels of these radiations can and will ease the migration of the plasticizers to the exterior of the plastics, being the most common cause of the yellowing of ABS plastics rich in bromine (1).

One of the most dangerous chemical alterations, especially in archives and museums, are the hydrolysis processes in plastics, such as polyethylene or polystyrene. When in contact with moderate to high levels of humidity, this eases the release of acetic acid (2) during the plastic items natural degradation processes, which alters the PH levels of any and all other close items. Is for this reason that we need to have in mind the enclosures in which we display many collections, because the proximity or condition of certain items can accelerate the degradation of the entire lot. Thus, creating a chain loop in which the degradation of one single piece can doom the whole collection.



Figure 2. Difference in the ageing process of two Dreamcast Controllers and VMUs (PAL). Left has sustained heavy use since its release in 1999 and shows signs of yellowing in the casings and cables, and wear of the overall surface (specially visible on the stick); right has seen significantly less manipulation and exposure to UV radiation, retaining most of the original coloring.

The plasticizers chemical alterations are eased in by the hydrolysis processes, can also rapidly hasten when we touch plastics with the bare hands. The infiltration of human body oils accelerates the yellowing and corrosion of the materials; becoming brittle and unstable, which makes it one of the most dangerous processes for controllers and peripherals **(3)**.

The loss of magnetism is one of, if not the worst, physiochemical alterations of the floppy and cassette games. It can be caused by multitude of factors: The wearing of the tape rolls, decohesion and “powderiness” of the pads, drastic temperature fluctuations, magnetic agglutinant hydrolysis or demagnetization by exposure to electromagnetic radiation, etc. Also depending on the environment in which they are stored, there’s also risk of fungal and microorganism growings, which are dangerous not only to the items, but to the one who manipulates them. **(4)** Many of the commonly used glues and agglomerants in labels of media released until the mid-90’s are, in some way or form, of animal source. These are great vehicles for fungal spores and other microorganisms, which can lay latent until some change in humidity and/or temperature triggers a chain reaction that causes the loss of precious media.

Finally, equally destructive is the process known as “Disc Rot” or “Disc bronzing” **(5)**. It entails the incremental loss of readability of any optical disc-based information **(6)**. This occurs, as mentioned before, due to the degradation of the disc’s plastic polymers and adhesives, resulting in the subsequent oxidation of the metallic layer. The resulting loss of information depends on the media storage: the “rot” of CD/DVD media results in the complete loss of readability of the data contained in them due to the way it is stored in them in a digital format.



Figure 3. Effects of Disc Bronzing by accelerated ageing on a DVD. Danielteolijr, The Daniel D. Teoli Jr. Archive. 2020. [Archive.org](https://archive.org).

As demonstrated by the thousands of cases of lost media, the labour to conserve the video-game heritage, so generations to come can experience it as we did, is proving to be a difficult and tiresome. Sadly, the time for some of these items is running out and given the recent surge in demand for rare and pristine artifacts for their addition into private collections paints a dim future to preserve the heritage of video-games.

The [recent](#) declarations of Phil Spencer shed a little hope on our way, but I believe that it will be necessary the collaboration and cooperation of the developers (or rights holders) and the safeguarding institutions to allow the past of video-games to step into the future.

Álvaro V.Guisado
Conservator-Restorer of Cultural Heritage
[LinkedIn](#) [Twitter](#)

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