# ZSM Biofact Storage Guide **DRAFT ONLY**

# BioFact Storage

The goal of this document is to outline some basic principles improve stewardship of biofacts your institution uses to interpret the natural world and educate the public. It also recognizes that many institutions have very limited budgets and staff time, and every attempt is made to give suggestions of improvements and techniques at various price points and effort levels. Remember that while you can probably not do everything in this document to make storage “perfect”, anything you do to improve your storage will improve the lifespan and usability of your biofacts.

# Types of biofacts

### Bones/ Skulls/ Antlers

Skeletal materials are made of bone, which are made of protein, collagen, and minerals, largely calcium. Provided they are cleaned well (defleshedand degreased) they are largely stable if stored at consistent temperature and humidity. They are susceptible to acid damage- so any paper material that touches skeletal specimens should be acid free (see Materials section). Bones are relatively porous and

### Teeth/ Ivory

Comprised of dentin and enamel. Because of the nature of growth of teeth, ivory and teeth have layers that may delaminate or crack due to rapid changes in temperature or humidity.

### Horns

A keratin sheath that fits over a bony protrusion They are relatively porous, and (like most things on this list) are susceptible to damage from fluctuations in temperature and humidity.

### Pelts/ skins

Tanned animal skin. If prepared correctly, probably the least susceptible to temperature/ humidity damage. There is risk of mold and some risk of pest damage.

### Mounts

Skin stretched over a form (usually, but not always rigid foam). Because of the 3-D nature of the specimen, they are vulnerable to damage from knocks and bumps.

Dried Specimens
Insects and plants are typically preserved dry, but occasionally some smaller taxidermy pieces (small song birds, lizards, snakes) may be freeze-dried. While all specimens are vulnerable to pest damage, small freeze dried specimens are especially vulnerable (and not terribly durable) and should be avoided if possible.

### Wet Collections

Usually used for whole body preservation of specimens that don’t dry or taxidermy well (e.g. reptiles, amphibians,larger invertebrates) or body parts/ organs. May be preserved in a humectant (often a proprietary fluid like Nasco-Guard™ or CaroSafe™ ) ethyl alcohol (ethanol), or formaldehyde or formalin. It’s important to keep specimens in fluid from drying out (which will ruin them), and it’s very important to record what fluid they are stored in. Future you (and everyone who deals with your collection after you) will thank you.

# Environmental Considerations

The environment in which biofacts are stored is one of the biggest contributors to how long they last. Annoyingly, the environment is also the hardest part to control. Creating a microclimate ( a cabinet or a box) is the best way to manage the environment in cases where the whole space cannot be conditioned.

## Light

Light damage is cumulative and irreversible, and may contribute to bleaching, fading, or other damage. When possible, store biofacts (especially brightly colored ones, like bird mounts/ feathers) away from natural light.

## Relative humidity

The ideal relative humidity (water vapor in the air relative to the ambient temperature) for storing biofacts is between 30%-65% RH. Below 30% RH increases the risk of specimens becoming brittle (embrittlement), and above 65% increases the risk of mold growing on organic materials. However, maintaining a consistent RH in storage is maybe more important as storage within the target range- storage at a consistent 70% relative humidity (despite being out of the target range) is far better than storage where the RH fluctuates rapidly between 40%-60%. Large fluctuations increase the risk of tears/ rips in skins and taxidermy specimens and cracking on teeth, bones, and other osteological materials. Maintaining a constant RH is often much more achievable on a budget.

Inexpensive temperature/ RH monitors are available online or locally at hardware or big box stores. If possible, obtain a digital one that will record data and synthesize it in a graphical format to help you track temperature and humidity shifts (See Figure 1, below).

Figure 1. Relative humidity graphs. Despite being out of the desired RH range, the example on the right is far more consistent.

It’s ideal to have more than one temperature/ humidity monitor in a space- initially, you might want to take readings from the larger room and have data from whatever storage structure you are using (shelves, cabinets, etc). Once you have this data, you can determine what, if any, changes you need to make.

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| --- | --- | --- |
|  | Possible Fix | Notes |
| Humidity Too high (above 70%) | Dehumidifier |  Introduces water to storage environment- may need to be emptied by hand. |
| Humidity fluctuates | Move open shelving into cabinets  | Monitor cabinets to see how RH changes inside |
| Humidity Fluctuates | Shroud open cabinets | See below for details. Monitor after shrouding to see RH changes. |
| Humidity Fluctuates | Move specimens to boxes | Monitor inside of boxes to see how environment differs against ambient. See “storage materials” for more details on boxes |

### Shrouding open cabinets

Adding a plastic cover to an open cabinet is an easy and economical way to build a microclimate that is more suitable for storage than the ambient environment.

Get plastic construction film made of polyethylene (sometimes referred to as Visqueen™- but any sheeting make of polyethelyne will do). Do not use PVC sheeting. The material comes in a variety of thicknesses, measured in mils- 4mils will make a durable barrier.

Attach the sheeting to the shelving unit, covering the sides (if open), and the front. For wooden shelving, you can staple the sheeting directly to the shelving. For metal shelves, use magnets to attach the sheeting to the shelving- you can use a hair straightener to make little magnet pouches to make the front flap (the door) easier to open without loosing all the magnets.

In addition to mitigating humidity swings, the sheeting has the added advantage of preventing water penetration.

[Insert images here]

### Boxes

For small objects (especially ones that are fragile or susceptible to fluctuations in the environment), a simple solution is to store the specimen in a box. You can use pre-made boxes (see storage materials sections) with or without gaskets, or make one from chloroplast. See Boxmaking section

## Temperature

Ideal biofact storage temperature is between 55-59F for maximum longevity. However, in most situations, this is unpractical from both an HVAC and a human comfort perspective. A higher temperature range (65-70F) is well within the bounds of what the specimens can tolerate. As with RH, consistency in temperature is important- it’s far better to be 80F year-round than bounce between 60-70F daily or 65-90F seasonally. Creating a microclimate by using a box or cabinet will help mitigate temperature swings.

# Storage materials

A great reference is

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| --- |
| Best |
| Plastics | Polyethylene expanded bubble sheets (aka Bubblewrap™); ethafoam sheets/ planks, Plastazote™, Volara™, packing peanuts  | Polyester, polyethylene, polypropylene are inert, acid free materials and should be your first choice. many of the products listed are brand names and off brand versions are available- just enquire to make sure it’s one of the plastics above. |
| Fabrics  | Undyed muslin, cotton, linen | Used for making covers for specimens or wrapping skins/ pelts.  |
| Papers | Tissue, paper for labeleing | Tissue (used for wrapping/ padding) should be acid free; papers (labels, etc) should be acid free and ideally 25% rag content (if they are going to touch a specimen/ be a permanent label) |

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| If you have to |
| Packing peanuts (polystyrene) | Not the first choice of plastics |  |  |
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| --- |
| Never |
| Biodegradable packing peanuts | These are expanded cornstarch/ wheat and can harbor/ feed pests that want to eat your biofacts.  |  |  |
| Newspaper |  |  |  |
|  |  |  |  |

# Labeling

[Rationale]

What gets put on the label is individual to an organization and its needs, but could include:

* Species/ common name
* Name of animal (if from a zoo)
* Can it be handled by the public?
* Arsenic test status
* Date acquired
* Inventory number

DropTags

Any acid free stock can be made into a drop tag [Insert Image]; use either an archival pen or marker or run it through the printer to make a label. They can be attached specimens with string (look for cotton string that is undyed/ uncolored), spaghetti tag (in the case of pelts), or sewn on pelts or skins if the biofact is robust enough. The lable should be durable enough to last handling, and big enough to contain data but not so big it’s in the way. A label that’s annoying is a label that gets removed/ lost.

Permanent labels

Sometimes it is useful to label a specimen directly (usually for pelts, bones, horns, teeth) with marker.

Fluid labels

## References/ Further Reading

Many of these references are very technical and written for a museum setting where the goal is preservation of specimens rather than use for interpretation. However, they provide a more indepth rationale behind many of the recommendations in this guide.

Conserve-O-Gram 11/3 Storage Concerns for Fluid-Preserved Specimens, National Park Service

https://www.nps.gov/museum/publications/conserveogram/11-03.pdf