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Saving Collections and the Planet

For creating a green, sustainable future, museum collections are part of the solution—and part of the problem.

By Elizabeth Wylie and Sarah S. Brophy

Saving Collections

How can museums mitigate the effects of climate change on our planet and on humanity?

We asked museum professionals and trustees, architects, engineers, environmental thinkers and futurists to imagine the state of living and nonliving collections care 100 years from now, specifically concerning availability and use of energy. We wanted to challenge museums to consider their larger role in educating and leading by example on climate change, while proactively safeguarding the collections they must preserve in perpetuity.

Several imperatives emerged from our discussions: Professional practice must adapt significantly, energy use and sources must change, and the power of the original will shift in weight and meaning. There was, however, one clear and consistent theme: What we do today affects tomorrow. We must adopt a long view when it comes to building and operating museum facilities.

"If we continue to act as is—that is, on a global level with our heads in the sand or waiting for another country to do something first—then our public gardens could very well be institutions where we are trying to keep alive the last remaining individuals of thousands of species on the brink of extinction," says Richard Piacentini, director of the Phipps Conservatory and Botanical Garden in Pittsburgh, which already has a super-efficient new conservatory and a welcome center that achieved LEED (Leadership in Energy and Environmental Design) Silver certification. The staff is now working on the design of a living building that will generate all of its own energy with renewable resources, capture and treat all of its water on site and operate efficiently—all while creating an exciting new interpretive exhibit for the public on sustainability.

Whether a museum maintains a living collection like the Phipps, or a nonliving one, it plays a vital role. As author (and environmentalist/entrepreneur) Paul Hawken explained to us recently, "Museums are keepers of truths. What plagues and troubles this world is a product of our mind. Transforming minds is what museums are about. If we are biologically illiterate, forests look like firewood. If we are socially illiterate, people look like problems. In a world where children can name hundreds of logos but only a handful of birds, museums offer us the possibility of discovering our true home here on Earth, and knowing where we are, we may more fully know who we are and can be."

As the effects of climate change grow, museums have an opportunity to transform minds and help shift behaviors toward resource conservation. They can lead by example as they retool their physical plants to ensure they have the resources necessary to sustain collections. To do this they will need to consider a variety of strategies that have their pros and cons.

For example, if environmental changes are so significant that a living thing or object cannot survive in its native land, saving it may require moving it—which could demand significant energy resources to create the warmer, cooler, dryer or more humid environments required for appropriate collections care. Zoos and gardens may begin to collect differently, shifting from the one-from-everywhere model to a focus on those species that thrive under changed local climates. That is, it takes less energy to keep a polar bear comfortable in a cool climate than it does in a warm climate. Similarly, "hot house" species will consume too much energy in cooler climates. Brian Holley, director of the Naples Botanical Garden in Florida, says facilities like large greenhouses with lapped single-pane glass and inefficient heating systems "will become relics or technically very difficult to support. We may abandon them in the North … if we don't have profound resolutions to the energy issue."

A similar challenge could arise for historic buildings. Creating artificial environments for in situ care of these structures after 100 more years of climate change could require huge amounts of energy. If hurricanes and tornadoes consistently threaten important sites, will we elect to dismantle buildings or monuments for reconstruction in a safer place or to care for them in climate-controlled domes or other permanently protective structures? How will we choose which ones to save through relocation? Or will collections of architectural fragments—like those of the National Park Service, Historic New England, Colonial Williamsburg and the Smithsonian Institution—become the chosen, efficient way of preserving portions of select structures? The loss of the original site is undoubtedly a painful cost of climate change, but if rising sea levels threaten to inundate every extant waterfront structure, will we elect to rescue them in some manner other than holographic depictions, detailed drawings and fragmented salvage? Can we afford to relocate or protect many—or even a few—historic structures?

Take Yin Yu Tang, a late Qing dynasty merchants' house that the Peabody Essex Museum relocated from China and reconstructed on its Salem, Mass., grounds. The building was relocated not as a last-ditch rescue effort but "as part of a cultural exchange that would help protect and promote Huizhou architecture." For visitors never expecting to travel to China, standing in the interior courtyard of Yin Yu Tang and peering into the families' rooms brings an understanding of another culture's lifestyle that cannot be explained by images or fragments. Relocating a building could become a more common collections-care practice—especially if alternative energy options are available. The energy expense of moving such a structure is substantial, but the result is potential rescue for the building. The museum, of course, must then house the structure and commit energy to maintaining conditions necessary for its preservation.

For many museums with nonliving collections, maintaining appropriate exhibition and storage conditions is an ongoing dance of adjusting HVAC systems to respond to the building (is it old and not originally designed for air conditioning?), to occupancy loads (is it a blockbuster opening night with lights blazing in packed galleries?) and to external environmental conditions. It takes plenty of energy to get the right balance of temperature and relative humidity while controlling light levels and keeping out pollutants. Museums use a lot of energy to heat and cool and filter air, and outside conditions can require fans and motors to circulate and vent air into or out of the building. In some climates, easily half or more of annual energy consumption can go towards dehumidification in summer.

Traditionally, facilities managers tinkered with a patchwork of systems and sweated it out largely unnoticed as long as the hygrothermograph readings were satisfactory. Now CFOs are asking questions as they consider staggering utility bills, and many museums are "going green" with new buildings. Yet, as National Trust for Historic Preservation President Richard Moe said at the 2009 U.S. Green Building Council's annual conference, "We can't build our way out of the climate crisis. We need to conserve our way out." That means museums should look for ways to conserve energy now and not wait while imagining a new green building or addition funded by the long-awaited capital campaign.

There are many energy conservation measures museums can adopt today that require little or no investment and are no different than what any other business or homeowner is doing to reduce their energy loads. The U.S. Department of Energy website and dozens of other sites have easy tips on energy conservation, and professionals in the field can learn from each other. Colonial Williamsburg (CW) in Virginia installed lighting controls in a recently renovated building in an effort to save energy. Motion detection turns the lights on when visitors are in the galleries and turns them off when people leave. In addition, Preventive Conservator Patty Silence asked engineers to install a clock to measure how long the lights were actually on. This small investment allowed staff to see that the lights in those spaces were only needed 43 percent of the time the museum was occupied whereas previously they were illuminated all the time. With this quantifiable measure the museum can track the light exposure of the objects, can readily see the reduction in energy use and now has a replicable model for application elsewhere.

CW is the most attended museum in Virginia. Imagine the savings (both in energy and light exposure time for the objects) for a museum with less visitation. Measurement is a critical part of energy conservation; base-line audits are important so you can measure savings. Load reduction is the next step. Lighting—both in front and back of the house—is a huge energy suck. According to the U.S. Environmental Protection Agency artificial lighting uses about 18 percent of the electricity generated in the U.S., and another 4 to 5 percent goes to remove the waste heat generated by those lights. Vampire loads from all those chargers and office machines also add up and can be mitigated by use of powerstrips. If you don't know where to start, call your local utility company. Many offer audits and advice, and who knows? Maybe you can turn it into a public relations story and grow it into corporate support.

As for conditioned spaces for collections care, professional practice must adapt to energy scarcity or find alternative forms. Museums are already rethinking the traditional system set points (50 percent RH and 70° F with minimal fluctuation) once established as best practice and learned by every museum studies graduate. The Smithsonian Institution decided several years ago to adjust the conditions parameters for nonliving collections. Staff at the Canadian Conservation Institute in Ottawa no longer recommend a single, simple standard but suggest decisions be made as part of a larger risk assessment. Understanding how various materials respond to different conditions can clarify decisions about climate control; much energy efficiency can be achieved by rethinking storage and considering microclimates for different materials.

Future collections facilities will store similar materials together, muses Carrie van Horn, collections manager of American decorative arts at the Peabody Essex Museum. “Objects that might need less rigorous temperature and humidity controls could be stored in spaces with lower HVAC control and needs,” she says. Struggling under the costs of climate control, some museums add more heating and cooling zones to allow greater flexibility in making exhibit-related decisions. Others are developing high-performance storage that takes advantage of intrinsic energy efficiencies. For instance, the Field Museum’s collections resource center is under the museum’s east and southeast terraces, and the Morgan Library’s underground storage is carved out of Manhattan bedrock. Both use their subterranean locations to reduce energy demand. The world’s largest document storage facility, Iron Mountain, developed 146 acres of secure and climate-controlled space in a former mine where underground water maintains climate conditions in the vaults through a geothermal system. This green alternative is considered one of the most energy-efficient, environmentally clean and cost-effective systems for temperature control.

Conservation concerns could shift the ethic from collecting and saving the original to creating a facsimile that functions as a record and resource. A three-dimensional object requiring premium resources like space and energy might become a hologram. Gianfranco Pocobene, head of conservation at Boston’s Isabella Stewart Gardner Museum, describes the role of facsimiles in a setting where everything must remain as it was arranged by the museum founder: “Who are we responsible to, Mrs. Gardner’s display or the Sargent watercolor?” The museum is replacing some vulnerable textiles and works on paper with facsimiles to ensure their long-term preservation while addressing the historiographic aesthetic of the display. Creating facsimiles of works on paper that are indistinguishable to the untrained eye is possible today with reprographic techniques that are easily accessible. There are also 3D printers that make reproductions, but widespread adoption of that technology is a ways off. Can we imagine a future in which the panel and application of paint in Leonardo’s Mona Lisa can be satisfactorily reproduced? What about a facsimile of a Roman sarcophagus, Gothic wood carving or ancient Chinese lacquer?

When Mrs. Gardner opened her palace to the public, she received 1,000 visitors a year; now the building is bursting with 200,000 visitors annually. Gardner Museum Objects Conservator Valentine Talland points out that 100 years ago museum professionals knew about light and fading but didn’t “anticipate the burden of access and its role as a variable in deterioration.” Maintaining climate conditions in storage (a controlled environment) is one thing; maintaining conditions in the galleries is another, with variables like heat-producing artificial lights and lots of breathing, moving people skewing conditions so systems must work harder.

For now, museums are actively digitizing collections to reduce burden and increase access to an object. Such databases can limit environmental exposure while greatly enabling research and information sharing. “Technology will increasingly make a collection in one institution more accessible to distant users, reducing the need for loans and the necessity for other museums to collect the same type of objects,” says Lea Foster, an independent collections professional working with the Museum of the Rockies in Bozeman, Mont. Foster believes collections care will increasingly include management and stewardship of electronic data, images and replicas.

This trend, however, comes with a cost. Technology may expedite access and collaboration and help manage large and dynamic volumes of data, but it requires energy. Increasingly all this data resides not on desktop computers but in vast optical networks spread across thousands of servers in large remote data centers. Experts have calculated that the total electricity consumed annually by the data centers of the three major search engines would power the entire Las Vegas area on the hottest day of the year. There are troubling issues about energy and access as we rely increasingly on computer storage for information, knowledge, art, images and more.

What does this mean for collection policies? Charles Venable, director of the Speed Art Museum in Louisville, Ky., asks, “Do we just endlessly continue to build and store? Do collections grow forever? How do we justify stockpiling endless amounts of art we don’t use efficiently?” He points out that art museums typically show only 3 to 5 percent of their collections and suggests that future practices will favor acquiring singular works that truly energize galleries and encourage sharing among institutions. He also predicts that the days of the huge loan exhibition are numbered (primarily due to concerns about their cost and perhaps their carbon footprint) and believes this shift will force museums to dig deeper into their own collections, researching them more and understanding them better.

With the energy demands of traditional storage, museums might reduce their collections. But Steve Sullivan, curator of urban ecology at Chicago’s Peggy Notebaert Nature Museum, says that institutions deaccessioning their collections are “short-sighted and ignorant.” To the field, the loss of objects means a loss of the historic record museums are charged with protecting. What if an institution has run out of space or can no longer pay its energy bills? The ideal solution is a shift to highly energy-efficient physical plants—fueled by alternative, affordable, clean energy sources—housing thoughtful collections. One increasingly popular model is super-efficient collections storage facilities shared by multiple institutions. Designed for high-performance, these facilities are not hindered by the challenge of retrofitting, for example, a Beaux Arts museum building for optimum efficiency. Typically located away from prime real-estate in urban centers, these no-frills structures are purpose-built; real or perceived security concerns usually keep them out of the public eye. Curators have managed just fine without their entire collection on-site, and insurance companies are adjusting to the model. On-site, museums can and must continue to upgrade for efficiency in every area. Think entrepreneurially about alternative energy sources. Can your campus accommodate a wind turbine or a solar array? Can local utilities pay for the installation and sell the power back to you at a reduced rate?

Creating and maintaining thoughtful collections is an ongoing challenge and source of debate. Few museum collections demand more space than a natural history museum, yet only 1 percent of their collections are typically on view. Sullivan places the unrivaled experience of the original in context. “As a biologist, it takes my breath away to hold the remains of a passenger pigeon, to handle the original. Once they were the most numerous vertebrate outside of the ocean. Now they’re gone,” he says. “A specimen, whether extinct or dirt common, is like a book. No copy anyone can make is so accurate that you can read everything from it.” He believes maintaining specimens as a source of knowledge is critical, helping us understand the past, interpret the present and predict the future.

Predicting the future is nearly impossible when it comes to collection policies that are necessarily rooted in time and available technology and resources. The materials society produces may change, and that may mean there could be little to collect as a result. If everything is biodegradable, repurposed or upcycled, will there be anything to collect? For example, if books biodegrade and furniture is reformed into other furniture or other objects, and artists shift to ephemeral formats, there may be very little captured for our cultural and artistic record, thus adding value and mystique to the unique original. Paul Saffo, a technology forecaster, rightly points out there is a very complex set of emotions around the original thing. “One hundred years from now the power of the original will be even greater. The more we duplicate things the more [people] will want to see the real thing,” he says. “Take the Mona Lisa. . . . What makes people stand in line for hours to see it? It’s like the Lascaux Cave writ large. How do you ration the view of the scarce original?”

Such objects found in museums give us the long record and thereby connect us to our deepest humanity. We care about saving beautiful and meaningful places, plants, creatures and things because we are spiritual and cultural. To save them we must value the systems that preserve them. “We really need to take a much stronger leadership role in inspiring the public to make changes in the way they live and operate,” says Piacentini of the Phipps. “If we’re concerned about saving biodiversity and saving the planet, we can’t be islands. People come to our facilities for inspiration and learning; they are ready for us to lead by example.”

How should museums balance conservation and environmental concerns with the need to display the powerful original? Smarter physical plants, micro-climates in exhibit areas and purpose-built collections facilities can help reduce museum energy loads. You can leverage the power of the original for support to pay your energy bills. Educating visitors about the steps the museum is taking to be environmentally responsible and sharing how visitors can adopt similar measures at home and work can foster collective action on climate change. Injecting transparency into what it really means to collect and preserve “in perpetuity” can engage visitors in rich and deep experiences that enhance our humanity.

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