from the president

Thanks for the Help!

Much of this past year has been spent addressing NAME's organizational and administrative issues: filling board vacancies, revising operating guidelines, developing a long-range plan, dealing with membership and finance issues, and revitalizing communication between and among the NAME Board and NAME members.

As we look back at the year in review I would like to take the opportunity to thank the many individuals who give their time and energy to make NAME a success. NAME is comprised of dedicated, hard-working individuals who give hours of volunteer labor to assist with the planning and implementing of regional and national workshops, regional and national conference sessions, and special events at AAM Annual Meeting. The programs, publications, and activities of NAME are the heart of our organization.

Thanks to the efforts of Leslie Cohen, 1st VP, Program Chair, NAME had a fine slate of sessions and programs at AAM-St. Louis. Over one hundred NAME members gathered together at the Issues Luncheon to hear Rich Farron, Executive Director, DuPage Children's Museum address the issue of "business as usual." Thank you Rich for giving us your time and providing us with food for thought. The NAME Marketplace of Ideas featured ideas from the Midwest. Thank you to our Midwest Regional Reps and State Reps for sharing your secrets about exhibits.

Michael Blakeslee did a commendable job of coordinating the 2001 Excellence in Exhibition Competition. Ingvild Horn has stepped forward to manage this year's competition. Thank you to Don Hughes, VP of Visitor Services, Monterey Bay Aquarium, for serving as the NAME judge for the 2001 Excellence in Exhibition Competition.

NAME, along with four other AAM Standing Professional Committees, participated in the Exemplary Interpretation Seminar, which was held on June 15th & 16th in Portland, Oregon. Details for a National NAME Workshop on lighting and conservation are being worked out by Leslie Cohen, Ed Mastro, and Teri Knoll (Director, California Association of Museums).

The fundraising auction, held at the NAME dinner at the AAM Annual Meeting-St. Louis, raised over $700 for NAME. Many thanks to the organizations and individuals who contributed to the auction (see the box on page 3). And, a special thank you to Jim Walther who served as our auctioneer.

The 2002 auction will be held on Sunday, May 12th, as part of the Evening at Southfork event. If you would like to donate to the upcoming auction, please contact me.

Thank you to Ed Mastro, Whitney Watson, and Harbor Sales for assisting with the design, fabrication and installation of graphics for the NAME booth. Dave Denney and the NAME members from Texas have taken the challenge to design a "better" NAME booth for AAM-Dallas. We will make sure to bring more candy to Dallas, as it appears that NAME members have a penchant for sweets! NAME members from Oregon who are willing to take up the challenge to design a "better" booth for AAM-Portland should contact me or Dave Denny.

I would like to thank Claudia Berg for her help in her capacity as Mountain Plains Regional Co-Rep. Unfortunately, she has submitted her resignation. I know the Board joins me in thanking
Claudia for the years of service that she has given to NAME. Individuals interested in filling the positions of Mountain Plains Regional Co-Reps can contact any member of the NAME Board or Monta Lee Dakin, Executive Director, Mountain-Plains Museum Association.

NAME welcomes aboard Christine O'Donnell as the new Southeastern Regional Co-Rep and Eugene Dillenburg as 2nd VP, Membership Officer. As many of you know, NAME has been without a Membership Officer for some time now; and many of the activities associated with the membership position have been in abeyance, specifically the members’ directory and the NAME newsletter. Gene and I will be resurrecting the NAME newsletter. Look for it in your e-mail or postal box sometime around Christmas. The 2002 NAME members’ directory is underway. If you have not sent in updated contact information, now is the time!

The upcoming year, 2002, is an election year. Many of the officers and board members of NAME will be continuing on for a second term. However, some individuals will be leaving their positions. NAME will need new leaders to fill these vacant positions. I encourage each of you to consider offering your skills and talents to benefit NAME. NAME needs individuals of diverse backgrounds passionate about exhibits and the profession and committed to the mission and vision of NAME. NAME needs individuals with experience in fundraising, marketing and public relations, and administration.

Elections will be held in early spring for officers and board members to serve NAME for the period of August 2002 to July 2004. The nominating committee is at work to recruit people with vision and commitment to NAME and the profession. The Chair of the Nominating Committee is Whitney Watson. Whitney’s contact information is listed on the inside back cover.

**CONTRIBUTORS TO THE 2001 NAME AUCTION**

- Arts Foundation of Cape Cod, Centerville, MA
- Greta Brunschwyler, Novato Historical Museum, Novato, CA
- Mary Ellen Conaway
- Kristine L. Hastreiter
- Dianne Hanau-Strain, Hanau-Strain Associates, Inc., Chicago, IL
- Oliver Hirsch, Hirsch & Associates, New York, NY
- Monterey Bay Aquarium, Monterey, CA
- Outagamie County Historical Society & Houdini Historical Center, Appleton, WI
- Amy Leidtke, Leidtke Design, Providence, RI
- Nancy Lynn, American Museum of Natural History, New York, NY
- Ed Mastro, Cabrillo Marine Aquarium, San Pedro, CA
- Palace Arts Foundation, Washington, DC
- Peaceable Kingdom Gallery, Providence, RI
- Jonathan Shay, Mystic Seaport, Mystic, CT
- Anne von Stuelpnagel
- Mary Beth Trautwein, Getty Museum, Los Angeles, CA
- Jim Walther, National Atomic Museum, Albuquerque, NM
- Wareham Historical Society, Wareham, MA
- Whitney Watson, Missouri Historical Society, St. Louis, MO
- Jennie Alwood Zehmer, WhorledPeas, Inc., Birmingham, Alabama
THE OBJECT IN VIEW: Rethinking the Relationship Between Conservation and Exhibition

This issue of Exhibitionist addresses the state of the art in the conservation of museum objects that are displayed in exhibitions. As the articles demonstrate, there have been significant advancements in technical mastery of the challenges implicit in displaying vulnerable artifacts. Furthermore, the references cited in the articles also indicate advancements in communicating these techniques more broadly within the museum community.

A prominent leader in this initiative has been the Division of Conservation of the National Park Service. DOC's wide-ranging efforts culminated in 1999 with publication of the CD-ROM Exhibit Conservation Guidelines: Incorporating Conservation into Exhibit Planning, Design and Fabrication. That disk offers 370 pages of searchable narrative, technical notes and illustrations, all adding up to an invaluable resource for exhibit development teams.

Toby Raphael, the NPS conservator who authored Exhibit Conservation Guidelines, graciously consented to act as Guest Editor for this issue of Exhibitionist. In the following pages he has assembled contributions from both conservators and designers, from both museum staff and for-profit specialty contractors. Taken together, the articles evidence impressive technical achievements, especially in design and fabrication of exhibit cases meeting the highest standards for protection of the most vulnerable objects. The articles also express systematic thinking about how the process of exhibit development must be designed to incorporate conservation issues from the very beginning. I think that all exhibit teams will find this issue a valuable resource, and want to express my gratitude to Toby Raphael for his leadership and hard work in bringing it to fruition.

As I read through the articles myself, I was struck by the way that advancements in conservation techniques and processes are embedded in the broader trends that are impacting American museums. The recent history of the museum field has sometimes been described as a shift in central focus from objects to audiences. Rather than existing primarily for the benefit of their collections, museums are increasingly understood as existing for the benefit of the communities that host and support them.

One feature of this "rethinking of the museum" has been insistence upon increasing the accessibility of collections to the general public, including development of exhibition techniques that reduce the sense of separation between visitors and objects. This program has exacerbated the long-standing tension that has been understood to exist between the goals of conservation and the goals of exhibition, since it threatens to place important objects in situations of increased risk and vulnerability. As a result, debates over the priorities of conservation vs. exhibition have often become the symbolic battlegrounds in which larger issues of changes in museums have been fought and dramatized.

These battles have served to sharpen our understanding of the underlying issues, but beyond that have not served the field well. We seem to have been trapped in an unproductive definition of the problem to be solved. That definition has assumed that the types of solutions we must seek in the process of developing exhibitions are necessarily compromises between two irreconcilable objectives: conservation and display. It is taken as a given that display is "bad" for objects, and that conservation unduly constrains display. Completed exhibits are therefore compromises that do the best possible job of balancing the competing criteria, but can never be fully satisfactory from either perspective.
This definition of the problem has long served as a conceptual block to more creative ways of understanding how conservation and exhibition can work together synergistically to serve our communities in more powerful and effective ways. At its extreme, framing the problem as reaching an acceptable compromise between antagonistic objectives turns the exhibition development process into a competition with winners and losers. It defines the “most successful” conservators as those who manage to make the fewest compromises in the process—who come the closest to placing every object in replications of those extraordinary cases that house the U.S. Constitution and Declaration of Independence. On the flip side, the “most successful” designers in this eternal battle can be defined as those who maximize present visitor access without regard for the long-term deterioration of the objects displayed. Rewarding such behavior is not in the best interest of any museum.

Few projects reach such extremes, of course. Most designers and conservators are very willing to acknowledge the validity of the other’s aims, and work in good faith to find good solutions. Nonetheless, if they view themselves (even unconsciously) as working toward an acceptable compromise between fundamentally irreconcilable goals, no amount of good will can fully overcome the dysfunctional nature of that problem definition. This is especially true when institutional reward structures reinforce the compromise model.

We are often unaware of how powerfully such habitual modes of thinking dominate the way we define the task at hand, and the types of solutions that we seek. The first step is to become aware of our own habits of thought, and of the possibility that there might be other alternatives. John Maynard Keynes said that the hard part in changing any enterprise lies not so much in getting new ideas as it does in getting rid of the old ones. Old ideas and problem definitions are hard to get rid of precisely because they seem so obvious and natural that to think any other way would be crazy. Perhaps conservation and exhibition really are fundamentally antagonistic—but we need to consider the possibility that they are not.

Our challenge is to define a new way of thinking about the relationship between conservation and exhibition that understands them as mutually-supportive aspects of a single enterprise, rather than as antagonistic opposites. I hope that the articles in this issue of Exhibitionist will help move us toward that new understanding.
Call for Submissions:

FORMALIZING THE EXHIBIT DEVELOPMENT PROCESS

Deadline for submissions:
February 1, 2002

In recent years many museums have moved toward greater formality in defining their exhibit development process. Some have produced elaborate handbooks and/or flowcharts on “how we develop exhibits at this museum.” Others have experimented with more rigorous definitions of exhibit teams, with use of project management software, or with greater efforts to fit exhibit development into more comprehensive, museum-wide strategic planning.

We seek submissions for the Spring 2002 issue of Exhibitionist that explore and assess any aspect of this trend. Articles may simply describe efforts at formalization at one or a number of museums, or they may offer analyses or opinions on the value of such efforts. In most cases article length should not exceed 3,100 words—but feel free to make your case for a longer article.

Authors are urged to contact the editor early to discuss your planned submission. Contact Jay Rounds at (314) 516-5473 or at rounds@umsl.edu.

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Jay Rounds, Director
Graduate Program in Museum Studies
University of Missouri St. Louis
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SHARING THE RESPONSIBILITY FOR PRESERVATION
A Call for Partnership Between Exhibition and Conservation Specialists

To exhibit planners, designers, and fabricators, the conservation requirements and techniques necessary to produce responsibly constructed exhibits can appear complex and even elusive. There has been no single resource where guidance can be found, and only a handful of sources where techniques or applications can be studied. The unavailability of such a body of knowledge has caused considerable frustration and has taken its toll on both professional working relationships and the final product—the museum exhibit itself.

It is equally true that the exhibition process itself, as practiced by most museums, is generally not conducive to collaboration;
• is generally not conducive to collaboration;
• rarely obtains appropriate, well-balanced conservation solutions;
• seldom achieves fully successful exhibits that take advantage of both the most current design possibilities and state-of-the-art preservation features.

The Dual Responsibilities of Exhibition
Beyond the fact that exhibit conservation is in its infancy there is a myriad of factors that has contributed to this situation. The issues between conservation and exhibit specialists are clearly rooted in the central debate over preservation versus use of our collections. The museum's dual obligation to preserve collections but also to use them, has created a perception that conservation and exhibition specialists have conflicting goals. The museum exhibit is where the respective interests of these professions ultimately collide.

Creating exhibits that preserve the artifacts is not rocket science. With the array of exhibit technology currently available and the practical know-how more commonly found in the field today, most vulnerable objects can safely be put on display. Successful and well-balanced exhibits can be inexpensively produced. Collections no longer have to be needlessly damaged through inappropriate exhibition techniques.

Collections on exhibit cannot be safeguarded by conservators alone.

Attitudes Reflect the Need for Collaboration
I have polled both conservators and exhibit specialists, and have found that several interesting, yet not surprising, attitudes prevail. Many conservators feel frustrated in working with designers because of what they perceive as designers' insensitivity to collections and disproportionate attention to their own interests. They also believe that:

• the exhibit process at their institutions does not adequately incorporate the preservation needs of the collections going on display;
• while they see the long-term picture, the exhibit specialists focus on the short-term use of the collections;
• the designers tend not to design around the object;
• the designers neglect to provide mock-ups or prototypes ahead of time, so that, in the end, conservators are asked to simply "trust" them.

Exhibit designers quickly point to a variety of difficulties with many conservation recommendations:

• the manner in which conservation is introduced often compromises exhibit design and effectiveness, and disregards its impact on a project's budget;
• it is difficult to gain consistent information from different conservators, and rarely can this information be found in a published source;
• preservation requirements are often vague, theoretical, or impractical for the particular circumstances at hand and frequently the information is offered too late in the exhibit process;
• recommendations often come off as requirements, not from a team member but from the "conservation police."

Underlying Causes of Our Predicament
Unfortunately, progress in the area of integrating conservation into the exhibit process has been slow. Additionally, the perceived conflict between conservation and exhibition has been perpetuated by several factors, including:

1. The lack of cross-training
Just as there is little focus on the exhibit process within conservation training programs, there is virtually no conservation training available for museum specialists such as exhibit designers. In fact, there is a dearth of museum training for designers altogether.

2. A tradition of poor "exhibit communication"
Collection staff members often lack the experience and technical understanding needed to communicate their needs in ways that designers and fabricators can comprehend. Conservators rarely are taught to read drawings or to use the design/fabrication language of "specifications."

3. The absence of a well-defined exhibit development process
An accepted method or approach for developing an exhibit involving museum objects does not exist. Commercial firms and institutions alike are left to define their own "critical path" for creating exhibits, often resulting in an ineffective process that adversely affects the end product. The exhibit development process must be more clearly defined so that conservation can be methodically incorporated into it.

4. Conservators' serving more as watchdogs rather than as facilitators
Conservation specialists are often preceded by a reputation for being difficult team players. Too frequently, conservators set high requirements that serve as barriers, and spend too little time searching for practical and economical solutions.

Guidelines Needed
Within the exhibits program of the National Park Service (NPS), it became increasingly clear that a systematic resource was needed to assist our museums and their exhibit contractors to successfully incorporate conservation into the exhibit process. Consequently, the NPS Department of Conservation at Harpers Ferry Center elected to take a first step, the development of a set of practical conservation guidelines for exhibits that would work to:

• integrate conservation early;
• share responsibility among team members;
• unify and consolidate preservation recommendations;
• promote practical and well-balanced conservation criteria;
• explain alternative strategies and options;
• encourage appropriate levels of conservation response;
• promote practical design that is both "buildable and maintainable";
• find solutions within the budget and timetable.

Short and Long-Term Solutions
The Department's preventive conservation project was designed to create a preservation framework and tool for both its own personnel and the exhibit specialists whose services the NPS procures. The short-term objective was to develop a set of practical exhibit guidelines that would methodically incorporate preservation criteria into the exhibition development process. The long-term goal was to create a program that would impact the practices
being used in the field and ensure more preservation-responsible exhibits by:

- organizing the current technical information and making it accessible;
- identifying the key conservation strategies and principal guidelines;
- encouraging the sharing of conservation responsibility among all exhibit team members;
- supporting innovation among design and fabrication firms to build an improved product.

The NPS guidelines project was recently completed and is titled *Exhibit Conservation Guidelines: Incorporating Conservation into Exhibit Planning, Design and Production*. Rather than creating a set of definitive standards, it presents a variety of principles and techniques illustrating how conservation criteria can be met successfully in exhibits. For ease of use, the *Guidelines* was produced as an electronic publication, presented in a CD-ROM format. The viewer can easily access previously difficult-to-find information in the narrative section and move directly through hyperlinks to pertinent technical references and illustrations.

The *Guidelines*’ recommendations focus on ten specific steps:

1. adopting a methodical exhibit process that introduces conservation early;
2. forming an appropriate exhibit team with access to qualified conservation expertise;
3. defining realistic conservation criteria for the exhibit objects;
4. establishing a multilevel design strategy to resolve conservation concerns;
5. selecting an appropriate display format for sensitive exhibit objects;
6. designing and fabricating conservation-grade case enclosures;
7. creating effective micro-climate control systems;
8. designing preservation-responsible exhibit mounts;
9. incorporating conservation-appropriate exhibit lighting;
10. overseeing a well-planned installation and providing an exhibit maintenance plan.

**In Conclusion**

Years of producing exhibits at the NPS have shown us that preservation-responsible exhibits require a close, collaborative working relationship between design and conservation specialists. A sense of shared responsibility for collection preservation and trust is an essential part of the equation. Only by incorporating conservation principles early and systemically throughout the exhibit process can a museum ensure responsible planning, design, and production.

Our objective for this issue of *Exhibitionist* is that the various authors will help to clarify key conservation and exhibition issues by viewing them from different perspectives and by describing their methodology for incorporating conservation into the exhibit process. By collaborating in this multidisciplinary issue, exhibit and conservation specialists are illustrating how we can work together to obtain our common goal for successful exhibits that also prolong the life of their contents.

For information on how to obtain the NPS Exhibit Conservation Guidelines, contact the Harpers Ferry Historical Association at (800) 821-5206.

No longer can a conservator simply call for “five foot-candles” or “50 percent relative humidity.”
Summary of Exhibit Conservation Guidelines
Harpers Ferry Center, National Park Service

A. Exhibit Planning

Integrating Conservation into the Exhibit Process
- Integrate conservation early in the exhibit planning phase.
- Provide adequate time and resources.
- Search for balanced conservation solutions.

The Exhibit Team
- Work cooperatively with the team.
- Hire supportive design staff.
- Demand high construction standards.

The Role of the Exhibit Conservator
- Include an exhibit conservator on the exhibit team.
- Involve the exhibit conservator in the earliest stages of the process.

Selecting Objects
- Select appropriate display objects. Avoid selecting too many objects.
- Consider the aesthetics of each object.
- Avoid permanent exhibit of objects.
- Allow enough time and resources to safely prepare, mount, install, or replicate exhibit objects.

Establishing Conservation Criteria
- Examine each object chosen for display.
- Establish necessary but realistic conservation criteria.
- Address the conservation criteria.

Collections Management
- Ensure safe handling of objects.
- Have a conservator document the object condition.
- Include the accession or catalogue number of each object.
- Protect objects during photography.

B. General Planning

Multi-level Conservation Response
- Design for environmental stability and protection.
- Consider both macro and micro approaches.
Exhibit Format and Layout
- Use enclosed display when possible.
- Allow sufficient room for traffic flow.
- Group similar objects.

Temperature and Relative Humidity
- Obtain baseline information about the temperature and relative humidity.
- Control the environment within the entire exhibit space.
- Locate sensitive objects in the most stable locations.
- Provide additional control for sensitive objects.

Particulate Contamination
- Enclose sensitive objects.
- Use high-efficiency filters in environmental systems.
- Use localized filtration equipment.

Chemical Pollutants
- Monitor pollutants.
- Incorporate chemical filters in environmental systems.
- Provide air circulation. Select stable construction materials.
- Aerate the exhibition space before object installation.
- Enclose sensitive collections.

Exhibit Lighting
- Develop a lighting plan that responds to conservation criteria.
- Limit total light exposure.
- Filter all sources of ultraviolet radiation.
- Control infrared radiation.
- Exclude sunlight.
- Construct lighting mockups.

Biological Infestation
- Examine objects for signs of infestation and active mold.
- Design exhibits to inhibit infestations.
- Enclose objects when the risk of infestation is high.
- Avoid introducing insects through props and unchecked exhibit materials.
- Control human behaviors that encourage infestation.

Physical Security
- Conduct a risk assessment.
- Provide the appropriate level of protection.
- Use tamper-resistant hardware.
- Facilitate authorized curatorial access to the objects.

Emergency Preparedness and Fire Protection
- Develop fire protection and emergency response plans.
- Perform a risk assessment and address potential problems.

C. Exhibit Case Design

Designing a Conservation-Grade Case
- Design cases as protective enclosures.
- Establish performance criteria.
- When possible, build and test a prototype case.
- Provide detailed, explicit drawings and specifications.
- Test the fully assembled case in its final location.

Case Stability, Security, and Access
- Construct a physically stable, structurally secure case.
- Provide appropriate security features.
- Provide for legitimate access.

Sealed Exhibit Cases
- Use sealed display cases when appropriate.
- Design well-sealed cases with tight joints and with gaskets.
- Use conservation-appropriate sealants.
- Test case performance.

D. Installation and Maintenance

Choosing Conservation-Appropriate Materials
- Select conservation-safe materials.
- Avoid adhesives within the object display area.
- Review the composition of commercial interior finishes.
- Allow sufficient curing time before installing objects.
- Isolate objects from painted or varnished surfaces.
- Select and attach decorative fabrics with care.

Using Less Stable Materials
- Use the least hazardous material available, and isolate objects from them.
- Aerate the case after applying coatings and sealants.
- Isolate objects from problematic surfaces.
- Incorporate a pollutant absorber or scavenger.

Design and Fabrication of Exhibit Mounts
- Design and fabricate mounts for object installation ahead of time.
- Support the entire object.
- Provide adequate support for flexible objects.
- Support all parts independently.
- Stabilize objects from vibration.
- Ensure the security of framed works.

Exhibit Production and Object Installation
- Avoid transporting objects into production areas.
- Inspect exhibit assemblages that affect objects.
- Complete construction before object installation.
- Evaluate the exhibit team's performance.

Exhibit Maintenance
- Provide a maintenance manual.
- Monitor exhibit conditions.
- Perform necessary maintenance.
- Keep the exhibit area clean.
- Plan ahead for the safe movement of objects.
Conflict or Collaboration
Redefining the Relationship Between Design and Conservation

by Daniel Quan

Daniel Quan is principal of Daniel Quan Design, an exhibition planning and design firm based in Oakland, CA. He has worked extensively with governmental agencies and private institutions on museums, visitor and interpretive centers, science centers, and parks throughout the United States. His career spans thirty years as a museum staff designer, commercial designer, and museum consultant. He can be reached at dq@earthlink.net.

Designers and conservators share common objectives that provide the basis for effective team collaboration.

It may not be the Hatfields and the McCoys, but sometimes the differences between designers and conservators can blow up into the feud of the century over the installation of an exhibition. It is fair to say that, from the perspective of most designers, issues of object conservation have traditionally ranked pretty low on the list of priorities. For many of them, the science of conservation—or any science, for that matter—falls into a black hole of mystery best left to conservators, curators, and technicians. After all, what do lumens, microrads, pH, and out-gassing have to do with the aesthetics of an exhibition? Designers deal with image, identity, and intangible properties such as the interweaving of ambience, storytelling, and visitor flow. Gut feelings and a sense of the dramatic are often the driving force behind an exhibition design. Conservators, on the other hand, have difficulty understanding, or little knowledge of, the process that planners and designers go through to develop an exhibit. Often, conservators feel that their work is not taken into account or that their issues are not adequately addressed. A great schism can develop within an institution because of such differences, and it can easily color an organization's culture for years. But does it always have to be like this? Is there a way for us to work together toward a common goal?

Attitudes Apart
Design is an introspective activity by nature, and designers often feel that no one else can truly understand their work or appreciate their work process. This feeling can lead to an attitude of “Why bother to tell anyone because they won't understand anyway, so I may as well just do the whole thing myself.” This attitude feeds on itself. As designers feel more alienated from others involved in an exhibition, they may become more single-minded in their mission. Eventually, the need to control every aspect of an exhibition design becomes increasingly important to the designer (or the conservator).

Conservators often feel that designers push the limits of the envelope, wreaking havoc with the system or even causing irreversible damage to a collection. Their perception is that designers do not understand the science of conservation and often ignore important safeguarding techniques that they recommend. The designers' perception of conservators' attitudes is that, if they were given their way, all collections would be locked in archival storage in perpetuity. With all objects of value out of reach—or out of view—of the public, conservators could rest assured that they would be preserved. Designers often perceive conservators as too theoretical and unbending in their quest for the perfect museum exhibition standard.

Are these attitudes real or perceived? Obviously the attitudes as presented are exaggerated, and the truth probably lies somewhere in the middle. However, if we stop to analyze some of these attitudinal issues, we may find that both camps actually share more in common than they think they do.

The days of the "one-stop shop of design" are long gone.
Objectives in Common
The traditional role of exhibit planners and designers in object-based exhibitions has been to:
- interpret the displayed objects and tell a story about them
- highlight valuable or culturally significant objects
- draw out the beauty, uniqueness, and aesthetic quality of objects
- give context and meaning to an exhibition
- engage the audience in an emotional experience.

With our present concerns for museum collections and with the increase in technical knowledge about conservation, exhibit planners and designers now have the added responsibility of:
- protecting and preserving objects in an effective way
- designing for conservation
- treating the objects with the highest respect.

These are worthy goals for designers to aspire toward, and the successful exhibition will incorporate methods of treating all of them. Curiously enough, if we look at the work of conservators, we find that their roles and responsibilities are actually very similar to those of planners and designers. Protection and preservation, highlighting and interpreting objects, providing context and meaning, and treating objects with the utmost respect are all part and parcel of the conservators’ domain as well. So with that much convergence and agreement on the roles and responsibilities of both parties, why are they so often still at odds? The answer may lie more with their failure to communicate and collaborate than with any major philosophical differences between them. With this as our premise, let us examine ways in which we can improve our working relationships.

Toward a New Approach
With the complexity of exhibitions today, it is apparent that the days of the “one-stop shop of design” are long gone. Besides everyday design decisions, we have issues of security, ownership, and insurance overlaid onto concerns for object preservation, climate control, and materials composition. Add to these issues the demands of marketing and considerations of financial viability, and you have one large exhibit headache. It takes a small army of diverse professionals to successfully create a quality exhibition today. Exhibit design needs to be handled with a coordinated, multidisciplinary team approach—one that involves a core group of planners, designers, conservators, curators, subject-matter experts, evaluators, educators, preparators, and installers. A larger umbrella of participants in the design process would also include technical consultants, marketing staff, and administrators. (For more on exhibits teams, see Exhibitionist, Spring 2000)

Theory Meets Application
The concept of a coordinated team approach to design makes great sense on paper, but can such a team actually work in practice? How and when do team members contribute in the most effective way? To answer these questions, we need to break down the design process and examine how decisions are made in each stage when the team approach is used.

Schematic Design Phase
In schematic design, the skeletal framework of an exhibition is defined programatically, and a conceptual design is generated to fulfill that program. Design elements are identified, and general design direction is formulated.

A coordinated approach at the schematic design phase is absolutely critical to the success of a project. An open dialogue among curators, conservators, evaluators, educators, and designers will help establish exhibit objectives and clearly state program requirements and concerns from each stakeholder. Prior to or at the beginning of this phase, a collections inventory and conditions assessment of potential exhibition objects is prepared and shared among team members. Armed with this information, the team can make an informed preliminary selection of objects. Selections would take into account each object’s condition, risk, importance, impact, and interpretive value. Additionally, the conservation assessments become an integral part of the resource material for all team members involved in the design.

A team effort at the schematic-design level allows exhibit planning and other program planning (such as outreach, tours, and marketing) to develop concurrently while using the same shared information. Other wide-ranging planning issues that can be discussed during this phase include climate control, space considerations, light sensitivity, the length of time objects can be displayed, and closed versus open displays. All these issues greatly influence how a design will develop and are best resolved at the front end of the design process. The team approach to these issues will ensure that they are discussed from every viewpoint and will be resolved in a fair and informed manner.
Design Development Phase
Design development takes the conceptual work accomplished in the schematic phase and progressively refines the elements of the design in greater and greater detail. Objects and images are selected, draft interpretive text is written, and concepts may be tested and evaluated. At the end of this phase, a final design is generated.

While a coordinated effort helps in formulating an exhibit concept, it is just as important in honing the design during the development phase. This is accomplished through a continuing dialogue among team members on design details and object display requirements. Specific mounting techniques can then be agreed upon. At the same time, shared resource material and information are used in the development of text and exhibit graphics, as curators, educators, designers, and writers develop these elements collaboratively. Additionally, the team can choose to evaluate the project through mock-ups, focus groups, or visitor surveys, and to make modifications in a timely manner at the appropriate stage in the design.

The team approach during design development ultimately saves time and reduces potential conflicts in later project phases. With final object selections made early, a cascading effect results, and moves the entire design process along quickly. This means that case designs and mounting methods can be determined. Lighting design can progress and environmental needs can be assessed because conservation data are available. Sharing this information allows environmental control systems design (passive versus active control) and materials selection to be done quickly, avoiding costly redesign due to lack of adequate information.

Construction Documents Phase
Construction documents constitute a set of legal instruments that contractually define an exhibition through a set of drawings and written specifications. This package is given to a builder, who follows these plans to fabricate all components of the exhibition.

Just as design development drawings tell us what is to be built, construction documents tell us how it is to be built and to what standard. Relative to conservation, this information includes performance of display case seals, UV inhibitors, lighting systems, compatibility of materials, humidity and temperature controls, object mounting techniques, and graphics and media work. In this phase, the collaboration between designers and conservators can be intensive and highly detail-oriented. It is incumbent upon conservators to interpret and translate standards and technical data into clear language and positive actions that designers can use. Conservators must learn how to read blueprints and design details in order to adequately review construction documents. Likewise, designers must learn conservation basics in order to understand how standards should be applied.

There are profound implications to a successful collaboration of the design team in the Construction Documents phase. From a design standpoint, it means that case designs are appropriate for the environmental requirements of the objects to be displayed. This result translates to lower risk and better protection for the objects. From an operational standpoint, it means ease of maintenance in cleaning, lighting changes, desiccant monitoring, mechanical ventilation service, and object rotation. The benefits are lower operating costs and the higher likelihood that conservation maintenance will be performed regularly.

Production and Fabrication Phase
Fabrication of exhibit components, production of graphics and media programs, purchasing of equipment, and preparation of the physical space are all executed during this project phase.

Having completed the design process does not mean the design team can rest on its laurels. Diligence in the oversight of the production and fabrication of an exhibit can make a significant difference in the quality of the final product. No matter how good the design is on paper and how high the performance standards have been set, it is all meaningless if exhibit cases are not built to perform to their original specifications. Traditionally the domain of the exhibit designer, project management of this production phase really should be collaborative as well. Inspection of work with conservators, curators, and designers present will ensure that all aspects of the construction documents are equally and rigorously addressed. Testing of case seals, lighting levels, and humidity and temperature, along with normal visual inspections of cases and other built components, can be performed prior to installation so that corrections and modifications can be made in the fabrication facility rather than on-site. This procedure will result in a much tighter adherence to the standards set by the design team and ensure an easier, trouble-free installation.

Installation Phase
The installation phase includes disassembly, packing and shipping the exhibit components to the site, and unpacking and installing the exhibit in the intended space. Final cleaning and maintenance and operations training are performed at the end of the installation.

The collaborative design team together will put the finishing touches on an exhibit installation. Conservators, preparators, installers, and designers should all participate in the installation. Proper handling of objects and the need for security necessitate the presence of curatorial personnel such as the registrar, curator, and conservator. Under their
direction, preparators and installers handle the actual mounting and placing of objects. The designer's role should be to coordinate the overall installation process, including some detail work such as final placement of objects and adjustment of lighting. The construction documents have brought us to this final point in the design process, but the intervention of the human hand is needed to render that final mark of distinction and personal feeling to the exhibition. Through hands-on participation during installation, team members are immersed in an eye-opening learning experience that leaves them better prepared for the next collaborative design effort.

Planning for the Future
The journey through the labyrinthine design process underscores the need for a coordinated, multidisciplinary approach to problem solving. The need for equal participation and communication, and for the attitude that everyone at the table is a knowledgeable professional, cannot be overemphasized. This approach takes a tremendous effort on the part of the team. The collective learning curve can be steep, as team members sort out their roles and learn to work together. Initial efforts will undoubtedly see a degree of frustration and longer completion times. However, this effect will be easily outweighed by the added long-term benefits of the collaboration. In the future, cross-disciplinary training can be made available to working professionals, while similar programs become integrated into museum studies curricula.

We have discovered that many of the roles and responsibilities we assume in our own disciplines are not unlike those of our colleagues—giving us more in common than not. In the end, we all share the responsibility for stewardship of our treasured objects and our common desire to preserve this legacy for future generations. By keeping this larger idea in sight, we give ourselves the power to overcome differences and to work with a united, single voice.

We all share the responsibility for stewardship of our treasured objects.
Conservation-Grade Exhibit Cases: A Standard Museum Option in the 21st Century

by Toby Raphael

Toby Raphael is an exhibit conservator at the Harpers Ferry Center, Department of Conservation, National Park Service. Working with the staff from the Department of Exhibits and two contractors, he recently produced the publication Exhibit Conservation Guidelines. Toby coordinates conservation activities for exhibits installed at NPS sites across the country.

A conservation-grade exhibit case is the most important and cost-effective tool for preserving vulnerable collections on exhibition.

Museums put their most significant objects onto display and, by doing so, place these collections at much greater risk than if they had remained in protective storage cabinetry. Although display in cases and vitrines is the norm for most museums' exhibits, the pitfalls and benefits of conventional display enclosures are only now being calculated, by conservation and exhibit specialists alike.

The display case, unfortunately, has been taken for granted as an effective means of mitigating damage while objects remain on exhibit. The truth is that, until recently, exhibit specialists have had little information on the impact of common exhibit cabinetry on vulnerable collections or the degree to which they actually provide protection. As we learn more about the traditional exhibit cabinet from scientists and researchers at conservation analytical laboratories, we have serious reason to be concerned. Research findings indicate that the exhibit case has an alarming potential for adding to the deterioration of its contents. On the other hand, an enclosure that is properly engineered has an equally surprising potential for protecting and preserving vulnerable collections. When objects on display are housed in well-designed and carefully fabricated cases, they can be effectively preserved at levels remarkably close to those provided in storage. Exhibit lighting makes the primary difference to an object between storage and display, yet even this threat can be minimized with current lighting equipment.

The technology is now available for museums to insist that their display enclosures balance the need to present and interpret objects aesthetically with the conservation characteristics necessary to protect them from needless loss. Conservation features can be specified as standard components if the clients are aware of what constitutes a conservation-quality case. In weighing the advantages of different exhibit enclosures when they are procuring new casework, museum staff must know which features can be specified and what level of performance can be required.

Several commercial firms now offer a line of standard museum cases that meet current conservation requirements, an advance that represents a substantial change in the marketplace and ushers in a new era for museums. These exhibit firms have shown that safe cabinetry can be produced at relatively little additional cost. Planning for most museum exhibits, however, still requires custom-designed and -produced casework. This article will discuss the key characteristics of these preservation-engineered cases.

Overall Recommendations
1. Design exhibit cases as protective enclosures. Take advantage of a case that is designed with the participation of a conservation specialist to control the threats to sensitive collections. A well-designed case is an efficient and cost-effective way to meet conservation criteria for an object.
2. Establish performance criteria. Methodically determine which conservation features will be built into each case, and clearly identify performance criteria for each feature. Design the case to provide these results.
3. When possible, build and test a prototype case to decide whether it meets design objectives. Modify the case until acceptable performance is achieved.
4. Provide detailed, explicit drawings and specifications. Inspect cases during assembly to ensure that the fabricators adhere to specifications and construction tolerances.  
5. Test the fully assembled case in its final location to ensure that conservation criteria have been met. Such testing should occur before object installation to allow for adjustments.

Adopting the New Generation of Exhibit Cases
Deciding When to Use Conservation-Grade Cases
Conservation criteria for exhibit objects can be fulfilled with a variety of design options, which should be examined and compared during exhibit planning. Preservation challenges can be met on either the macro level (the exhibit room or building) or the micro level (the exhibit case). Managing the environment throughout the building or exhibit space is ideal, because all exhibit elements and collections will be under controlled conditions. In many institutions, however, this approach proves unrealistic or not cost-effective.

A smaller-scale, more self-contained approach using specialized exhibit cases can economically satisfy most conservation requirements for individual objects. Conservation-grade cases will efficiently meet the goal of shielding vulnerable objects from sources of deterioration while controlling their immediate surroundings. Museum staff should weigh the benefits and costs of addressing conservation criteria throughout the exhibition against creating more localized solutions using well-designed exhibit cases.

What Are We Protecting Against?
If an exhibit case is to provide adequate protection, conservation concerns must be addressed early in the exhibit-planning phase. The level of protection desired for individual objects should drive case design. The aim is to create suitable enclosures to:
• reduce the damage caused by disasters, such as an earthquake or fire
• prevent object handling by visitors and incidental touching
• reduce the threat of theft and vandalism
• prevent accidental exposure to water
• block insect and rodent access
• reduce entry of dust and foreign pollutants
• buffer interior atmospheres from rapid changes and damaging levels of temperature and relative humidity
• reduce the effects of light radiation.

To Enclose or Not to Enclose?
The first question that must be addressed is whether to even enclose objects that are going onto exhibit. Given the inherent costs and problems of caring for museum collections, including preservation treatment and ongoing maintenance, open display is rarely an option for short- or long-term museum exhibits. The required special security arrangements and regularly scheduled maintenance procedures incur long-term, frequently ignored costs. Open displays are usually limited to temporary exhibits of no more than a few months, and generally they show reproductions, oversized artifacts such as vehicles or machinery, period settings within historic buildings, and special exhibits such as sculpture or painting in galleries.

The decision on whether to display objects within protective enclosures should consider the following factors:
• length of the proposed exhibit
• sensitivity and condition of the proposed objects
• environmental conditions of the exhibit space
• likelihood of visitor contact and handling of objects
• likelihood of vandalism and theft
• availability of security and curatorial maintenance resources.

What Makes a Case Conservation-Grade?
The new-generation exhibit cases are constructed with conservation-approved materials and are engineered to incorporate specialized characteristics such as environment-modifying agents (for example, absorbers for atmospheric pollutants, moisture responsive substances, oxygen scavengers). Conservation-grade cabinetry includes:
• overall design features that methodically prevent or reduce damage to exhibit objects
• safe and nondamaging construction materials
• appropriate door-access systems that facilitate object retrieval, inspection, and rotation
• control of ventilation and case seal to achieve a desired air-exchange rate
• optional control of interior environmental conditions
• regulation of light within the display chamber to safe levels.
Nonhazardous Case Construction
A tremendous range of materials is available for construction of exhibit cabinetry and for finishing case interiors. Only high-quality conservation-grade materials should be used for the display chamber, including its interior, and for exhibit furniture. Materials of unknown or questionable composition require research and testing. It is preferable to avoid problematic materials such as wood products inside the display chamber. If they are used, they must be isolated with a vapor-impermeable barrier because all wood products contain free acetic and formic acid, which is increasingly generated over time. Plywood and particle boards have additional problems with unsafe adhesives.

Fabricators of conservation-quality exhibit cabinetry:
• avoid materials that are known to out-gas or become acidic, or lose their physical or chemical stability
• avoid the use of adhesives within the display chamber when possible, or employ only conservation-approved products that are based on tested resins
• avoid the use of oil paint and carefully review the composition of all interior finishes such as those used on metals and wood
• use decorative fabrics with good dye stability and lightfastness. Before they are installed, fabrics are prewashed to preshrink and remove excess dye and finishes, then fastened in place mechanically.

The Degree of Exhibit Case Seal
The choice between sealed and ventilated cases depends on the circumstances of the particular exhibit, the ambient exhibit environment, and the sensitivity of the objects. Conservation-grade cases can be sealed or ventilated at one of four levels: unsealed, moderately sealed, well-sealed, or hermetically sealed.

Cases with internal climate control systems (either active or passive) should fall into the well-sealed category, having a complete air exchange rate every 72 hours or longer. Construction materials used in the display chamber of these cabinets should be impermeable to moisture vapor, or appropriate sealants such as specialized laminates and impermeable coatings should be applied.

Leaks that normally occur at joins and around doors must be sealed against airborne soil, insects, and rapid climatic change. Numerous methods are available to locate leaks and to determine the air exchange rates of a case. After being evaluated for airtightness, case designs can be modified as necessary or caulk and gaskets added to reduce leakage. In a well-sealed case, it is most important to avoid interior case contaminants emitted by unsafe construction and decorative materials because contaminants become concentrated in sealed enclosures.

Ventilated cases have the same interior temperature and relative humidity as the ambient exhibit space. They are appropriate applications in exhibit spaces with good climate- control and pollutant-control systems that function twenty-four hours a day. Ventilation is controlled by designing a well-sealed case and placing in it a number of vents or ports to provide for air circulation. Vents should be filtered to prevent pollutants and insects from being drawn into the case.

Local Microclimate Control
When tight climate control of the entire exhibit space is impractical for financial or technical reasons, or when only a few of the objects require a more stringent environment, a case with a microclimate is a very practical preservation device. The environment within the exhibit case can be manipulated and controlled to meet a wide range of conservation criteria. A separate environmental maintenance compartment is required. Because this approach usually is more complex than conventional display cases, longer design and construction time should be expected. Tight adherence to design specifications and strict exclusion of certain hazardous construction materials are also necessary. Climate-controlled microclimates are a common optional feature of conservation-grade casework.

Controlled Exhibit Lighting
Integrated (case-mounted) exhibit lighting is a particular preservation challenge. Case lighting must be carefully planned and implemented within exhibit cabinetry if it is to be successful. The principal concerns for control are visible light, ultraviolet radiation, and case heating. The well-engineered case balances the requirements of both the
Objects on exhibit and the visiting public. Safe, well-designed lighting systems:
• offer highly flexible and adjustable interior illumination levels
• allow for the use of light-modifying devices and visitor-driven occupancy sensors
• isolate lights from the display chamber—attics are sealed off to prevent the entry of insects, dust, and heat
• reduce heat gain and temperature cycling—attics are adequately ventilated
• produce high-quality color rendering using low-voltage, energy-efficient fixtures whenever possible.

Justifying Specialized Cases
Well-designed exhibit cases can be much more easily justified now as cost-effective tools for preserving a museum's precious resources from most forms of physical damage and deterioration. Their additional expense is usually quite reasonable (the average cost increase is 20–40 percent over conventional custom casework). Using these cases can result in major cost savings in other areas as well:
1. They can prevent the need to install central HVAC systems to control entire buildings or rooms to meet the stringent climate-control requirements of a few objects.
2. The need for future conservation treatment of exhibit collections is reduced, and the maintenance required to keep objects on display is considerably decreased.
3. Objects can be kept on display for longer periods (in many instances), thus reducing the laborious task of rotation with similar objects in storage and changes in label copy.
4. The cleaning and maintenance of exhibit case interiors is reduced by the filtration of atmospheric pollutants.

In the future, there will be little excuse for a museum to house its collections in inferior casework that allows or causes needless damage to vulnerable objects selected for display.

This subject and others are discussed in depth on the author's CD-ROM titled Exhibit Conservation Guidelines. For information on how to obtain the National Park Service publication, contact the Harpers Ferry Historical Association at (800) 821-5206.
Retrofitting Old Exhibit Cases: A Search for Economical and Safe Cabinetry

by Jenifer Bosworth

Jenifer Bosworth received a Masters in Object Conservation in 1998 from the University of Durham, England. She has held internships at the Royal Armouries Museum, England; Colonial Williamsburg; the Museo Stibbert, Italy; and recently finished a Getty Fellowship in Exhibit Conservation at the National Park Service. She will spend the coming year as a Mellon Fellow at the National Museum for the American Indian.

Rather than buy new exhibit cases, retrofit the old ones.

Small museums and historical societies have customarily adapted old cabinets or commercial display cases to house their exhibit collections. In most instances, these cabinets fail to meet museum standards for collection preservation and also fall short of museum exhibition needs. New cases with appropriate conservation features tend to be custom-made and expensive. Therefore, museums with few resources have to choose between raising large sums of money for new exhibits, continuing to use cabinetry that compromises their collection’s preservation, or figuring out how to rehabilitate their existing cases.

With this dilemma in mind, the National Park Service coordinated a research project to determine the feasibility and cost of rehabilitating old cases (Participants in the project include: Kevin Brookes, Exhibit Designer; Nash Brookes Associates; Cindy Cook and the Historic Shepherdstown Commission, Shepherdstown, WV; Steve Kaldes, Nature’s Waye Woodworking; Sue Nash, Paper Conservator in private practice; Toby Raphael, Exhibit Conservator, National Park Service; and the author. NPS Department of Conservation staff at Harpers Ferry contributed advice and assistance. Many thanks to all for their hard work!). Since the nature of an exhibit is to provide the best possible interpretation of objects, the project focused not only on techniques for improving case preservation features, but also on case exhibition features. This interdisciplinary approach was reflected in a project team that included an exhibit designer, conservators, and members of a local historical society.

The issues associated with retrofitting old cases are complex; however, we found that cabinetry can be effectively improved at a reasonable cost. Most retrofit work will need advice from a conservation specialist who is familiar with the museum’s collection and its exhibit area. This article will share the findings of the investigation and offer simple guidance for rehabilitating older cases. Solutions to retrofit problems in this article are based on techniques tried during the case retrofit project.

Do All Cases Need Retrofitting?
It is possible that preservation and exhibition needs can be met by a major retrofit of only one or a few cases in a museum and by minor alterations to others. Objects made of materials that are more sensitive to environmental pollutants, RH fluctuations, and light could be grouped together for display in cases that are completely retrofitted to provide a proper environment. Minimal changes may be made to other cases that house more robust materials, such as ceramics, iron, copper, and stable glass.

Which Cases Should Not Be Retrofitted?
Many styles of display cabinetry are in use at small museums, and not all are candidates for retrofitting. Any antiques such as china cabinets, desks, or bookcases converted for display use should not be structurally modified. Other cases may not be worth modifying because they do not provide an adequate display volume. Even if they are not well suited to rehabilitation, these cases may still benefit from the application of some of the techniques described below.
What Features Need Retrofitting?

Most older cases are unable to meet basic preservation and exhibit criteria. Each case needs to be inspected for shortcomings before a retrofit plan can be devised. The problems of any individual case may be defined by checking the case against the following list of common deficiencies:

**DOES THE CASE HAVE ANY OF THE FOLLOWING DEFICIENCIES?**

### PRESERVATION FUNCTION

**Case Construction Materials**

- Harmful construction materials—unsealed wood products (e.g., plywood, chip board), oil-based paints
- Unstable interior decorative fabric/materials—acidic paper, wool fabric, cork, cardboard

**Amount of Case Seal**

- Large gaps in cases allow for ingress of dust and pollutants, fail to buffer objects from harmful RH fluctuations, fail to protect objects from water and smoke in case of flooding/building system failures

**Lighting**

- Interior lamps generate heat, create excessive light levels, are difficult to access for maintenance
- Light not filtered for UV radiation

**Security**

- Locks and closure devices absent or inadequate
- Construction does not utilize tamper-resistant material (tamper-proof locks/screws)
- Non-safety glass makes it a hazard for objects and the public

**Access to Objects**

- Rear doors: awkward for installation of objects, object inspections and rotation, routine interior case maintenance

### EXHIBIT FUNCTION

**Case Design**

- Fixed shelving: makes it difficult to mount objects at different levels, inefficient use of space
- Limited locations for graphics and text panels
- Inability to change backgrounds and backboards
- Uncomfortable viewing height

**Exhibit Lighting**

- Interior lighting fixtures are visible and produce visitor glare
- Lighting is uneven with upper regions overlit
- Shadows are cast over lower objects and label copy
- Lighting is diffuse without highlighting and point sources

### Retrofit Techniques

Once the deficiencies of a case are identified, a retrofit plan can be devised using a combination of solutions. Techniques range from the simple to the complex, and most can be performed with materials bought in local hardware, home improvement chain stores or from preservation supply catalogs (The suitability of all materials used was researched by contacting manufacturers and other conservators). A list of materials, suppliers and costs can be found at the end of this article.

**PRESERVATION FUNCTION**

**Case Construction Materials**

Most older cases are made with construction materials that accelerate object deterioration by giving off harmful volatile pollutants. Only conservation-grade materials should be used inside a case exhibit chamber, especially if the case is to be well sealed.

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**Figure 1:** Case before retrofitting. **Figure 2:** (right) Applying a Marvelseal vapor barrier.

**Solutions:** Structural components can be sealed by applying vapor barriers such as Marvelseal 360 (an aluminum/polyethylene film) or several coats of a water-borne polyurethane liquid sealant. New exhibit panels, decks, and risers can be made of stable materials, such as safe aluminum products or composites such as Ultrad board, a rigid polystyrene board.

All unstable decorative elements inside the display chamber should be replaced with appropriate materials. Exhibit surfaces can be covered with washed fabrics such as polyester, acrylic, cotton, or linen held in place by stainless steel staples. Acid-free paper and matboard can be used for text and graphics. If harmful exhibit surfaces cannot be removed or sealed, Mylar placed under the objects at least prevents direct contact with these problematic materials.

**Degree of Case Seal**

Ventilated cases can be suitable for use in exhibit spaces with well-controlled environments. However, it is important for small institutions which have no form of environmental control to provide a sound micro-environment for vulnerable objects by turning some cases into well-sealed enclosures.

**Solutions:** Case doors with large gaps, such as sliding doors, should be replaced. New plywood doors with inlaid gaskets can be made to fit into the old frame. The inner side of the new doors must be covered with a vapor barrier.
Compression locks hold the doors in place and ensure a good seal. Gaps between walls and frame should be sealed with silicone caulk. If it is too difficult or inappropriate to build new doors onto a case, a “box within a box” may be used for especially sensitive objects. A Plexiglas cube with a gasketed access door could be made or ordered from an exhibit fabricator. Small containers of silica gel placed inside or behind risers will regulate RH inside a case.

**Lighting**

Interior light fixtures expose objects to high temperatures and excessive light and reaching past objects to change a lamp increases the chance of accidents.

**Solutions:** Light fixtures must be removed from inside of cases. If ambient light is not enough for display, a light attic can be built to sit on a glass-topped case (Kevin Brooke’s light attic design was based on work presented by Stefan Michalski at a seminar hosted by NPS and WCG, *Museum Exhibit Lighting - Beyond Edison: Lighting for the Next Century*, March 6-8, 1996). A range of illumination can be created by using dimmable compact fluorescent bulbs and a conventional dimmer switch. White paint inside the light attic reflects light so that fewer bulbs are needed. Small vents should be used to let heat out. A hinged top and stopper chain will allow easy access inside the light attic. UV-filtering Mylar laid over the glass case top will block harmful radiation.

If a light attic is not possible and fluorescent lighting is within the case, a sleeve of UV filtering film can be placed over the interior lamp, and the electronic ballast must be relocated outside the display chamber. A light filter of polyester door screening or shaded window film can be fitted over the lamp fixture to bring light to appropriate levels for the objects being displayed.

**Security**

None of the other preservation features is necessary if your object is stolen or damaged while on display. If a docent cannot be in the room when visitors are present, other steps must be taken to protect objects.

**Solutions:** Locks and tamper-resistant screws can be installed to discourage theft. The compression locks described above provide a secure locking mechanism and enable easy opening and closing of the doors with a unique key system. More simply, doors may be fastened with security screws, but this solution can make curatorial access cumbersome.

Breakable glass can be replaced with safety glass or covered with a safety film. Safety film applied outside the case can be quickly scratched and marked up, but applying it inside the case can be a difficult procedure!

**Access to Objects**

Curators must have easy access to objects for exhibit installation and maintenance. Moving a heavy case to gain access to back doors endangers objects and staff.

**Solutions:** Casters can be added to the base to allow for smooth, easy movement of the case. Threaded leveling feet installed at the base corners can be raised when the case must be moved to access the doors, and lowered to stabilize the case.

**EXHIBIT FUNCTION**

**Case Design**

The design of many older cases makes it difficult to interpret objects engagingly. Rows of shelved objects can be an inefficient use of space. The lack of internal text/graphics panels and unchangeable background colors can also detract from interpretive goals.

![Exhibit design diagram](image)
Solutions: New exhibit panels, described above in Case Construction Materials, can be inserted into frames made of the same board and held in place with sash locks or Velcro. A simpler solution is to construct a display "wedge" that can be placed on the exhibit chamber floor.

Graphics, text labels, and small objects can be mounted on the exhibit panels using pushpins or screws held in T-nuts. Fabrics coverings can be changed for new exhibits.

The location of the display area of an old case can be moved to a more comfortable viewing height by building a new base (Smithsonian Guidelines for Accessible Exhibition Design, webISi.edu/opa/accessibility/exdesign/start.htm). The base may be a simple table-top construction with a raised lip to hold the exhibit chamber in place. Another alternative is to build a base cabinet with a sealed, conservation-grade interior that could be used for the storage of artifacts.

Exhibit Lighting
Poor lighting seems to be inherent in most older cases, but can be modified with some simple additions to the light attic described above.

Solutions: Pivoting concave shaving mirrors installed in the light attic can be used to eliminate shadows and provide minor spotlighting. "Egg-crate" louvers placed inside the attic on top of the exhibit case allow light to come through and hide the lamps and mirrors from view.

What Resources Are Needed to Retrofit Old Cases?
The cost of retrofitting depends on the size of the case, what its deficiencies are and to what extent modifications are made.

For example, structural alterations require a carpenter's skill and are more expensive. Unskilled work, such as applying vapor barriers, making risers, and installing fabric, lamps, and mirrors, can often be done by staff or volunteers. A carefully executed case retrofit can produce a case that will significantly extend the life of objects for a fraction of the cost of an equivalent new case. Here is a cost comparison using the cost for the test case that was fully rehabilitated during our investigation:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost Range</th>
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</thead>
<tbody>
<tr>
<td>Test case retrofit</td>
<td>$1,523</td>
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<tr>
<td>New case custom built by an exhibit fabricator</td>
<td>$4,000 and up</td>
</tr>
<tr>
<td>New case in current museum catalogs</td>
<td>$1,200-2,000</td>
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</table>

The most expensive structural modifications of the test case were to improve case exhibit features, e.g. building a cabinet base. If retrofitting to improve preservation features had been the only work done, the final cost would have been under $1000.

Consultation with a conservation specialist before proceeding is strongly suggested. A conservator can save a museum time and money by reviewing an entire exhibit area, highlighting overall problems, and helping to select good candidate cases for rehabilitation.

Resources other than money that are needed for successfully retrofitting old cases include staff with motivation, attention to detail, patience, and imagination. Although retrofitting a case may be less expensive than purchasing a new one, it is by no means an easier solution. Unexpected difficulties can
## MATERIALS & EXPENSE LIST – CASE RETROFIT PROJECT – NATIONAL PARK SERVICE

<table>
<thead>
<tr>
<th>Contractor Cost for Retrofit*</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhibit Chamber</td>
<td>$300</td>
</tr>
<tr>
<td>Base</td>
<td>$600</td>
</tr>
<tr>
<td>Light Attic</td>
<td>$390</td>
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</table>

* The contractor supplied plywood and basic fabrication materials for the base and light attic.

### Additional Materials for Retrofit

<table>
<thead>
<tr>
<th>Material</th>
<th>Supplier</th>
<th>Quantity</th>
<th>Unit Cost</th>
<th>Total Cost</th>
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<tbody>
<tr>
<td>Ultraboard - 4' x 8'</td>
<td>Commercial Plastics Baltimore, MD</td>
<td>1</td>
<td>$45.40</td>
<td>$45.40</td>
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<td>Interior panels</td>
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<td>T-Nuts</td>
<td>Lowe's</td>
<td>3 pkgs.</td>
<td>$0.70</td>
<td>$2.10</td>
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<tr>
<td>Hold screws in Ultraboard</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Compression Locks, E3-55-75</td>
<td>South Co.</td>
<td>8</td>
<td>$14.00</td>
<td>$112.00*</td>
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<tr>
<td>Glass seal &amp; security</td>
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<td>Dennis Premium self-adhesive weather strip - EPDM rubber</td>
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<td>Gasket</td>
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<td>Stanley Classic Colours Narrow Lock, 81-9173, CD 7069</td>
<td>Home Depot</td>
<td>2</td>
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<td>$8.94</td>
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<td>Hold inner door panels in place</td>
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<td>Philips Earth Light 23 W Dimmable compact fluorescent lamps</td>
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<td>Light fixtures</td>
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<td>Lutron Toggler Switch &amp; Dimmer Adj sent illumination levels</td>
<td>Lowe's</td>
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<tr>
<td>Exhibit lighting</td>
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<td>Goody Products, Inc. 2-sided shaving mirrors</td>
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<td>Midget Louvers, 3'' round</td>
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<td>Light attic ventilation</td>
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<tr>
<td>UV Filtering Mylar</td>
<td>University Products</td>
<td>1 roll</td>
<td>$90.50</td>
<td>$90.50**</td>
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<td>Filters UV from light attic</td>
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<td>Plaskolite, Inc. white egg-crate louvres</td>
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<tr>
<td>Hide lamps from view of exhibit chamber</td>
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* Donated by the company ** In stock at museum

### Summary

**Contractor Cost** | $1290.00
---|---
**Additional Material Cost** | $233.48
---|---
**Total Cost of Retrofit Work** | $1523.48

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arise, such as finding a carpenter who is willing to adapt old structures instead of building new ones or having to redo work because it did not come out as planned. It is important to remember, however, that retrofitting is a viable option that can help a museum fulfill its mission of preserving and interpreting its collections for current and future visitors.

### REFERENCES CITED:

**Hatchfield, Pamela**

**Raphael, Toby**

**Tétreault, Jean**
An Interview with an Exhibit Case Designer/Fabricator

Interview with Van Wood

Van Wood is president of Smallcorp, a manufacturing company specializing in exhibit products for museums. Wood has worked with the National Gallery of Art, the Metropolitan Museum of Art, the National Archives and Records Administration and other institutions. He can be reached at (415) 772-0889 or at www.smallcorp.com.

Question What do you feel is your role in ensuring preservation of the collections you put on exhibit?

We are somewhat unusual in that we are not exhibit fabricators but exhibit case fabricators. We specialize in building the cases that actually hold the artifacts. Because of this limited focus, we have been able to develop some real expertise in this somewhat technical area.

The science of conservation has reached the point where we all have a pretty good understanding of what qualities an exhibit case must have in order to protect the displayed objects. A good case provides mechanical protection and support, a stable microclimate or filtered ventilation, protection from ultraviolet radiation, and protection from both external and internal air contamination. As exhibit case fabricators, our primary role is to provide such a case while meeting the design criteria of the exhibit designer.

In general, we have found that curators, exhibit fabricators, and exhibit designers are not experts in the requirements for conservation-quality exhibit cases, and often they are not aware of the range of materials and techniques that are now available for case construction. Over the last thirty years, the same design and conservation requirements have come up time and again.

Building conservation-quality exhibit cases is not overly complicated, but there are many elements involved. You have to consider the off-gassing potential of the materials in the exhibit cavity; the ability of the case to maintain a stable relative humidity; the amount of damaging light, especially UV, entering the case; physical security; and a host of other concerns. There is general consensus within the conservation community about what materials are safe to use in cases, and as fabricators we should limit ourselves to those materials. There really is no longer any excuse for building cases that compromise the conservation of the objects displayed.

Often we have heard clients say that the object designated for a given case is not particularly sensitive or is not going to be on display for very long and therefore does not require conservation-quality case. Our experience is that objects are often on display much longer than initially anticipated and that cases are usually recycled for new exhibits or objects. We have a client who likes to point out that a case becomes cost-effective the second time you use it. This viewpoint argues very strongly for building every case with conservation firmly in mind.

A good case provides mechanical protection and support, a stable microclimate or filtered ventilation, protection from ultraviolet radiation, and protection from both external and internal air contamination.
Exhibit cases should not compromise the conservation of the object in any way. About ten years ago, we decided that we had to get wood products completely out of the exhibit cavity, since wood can be a major source of air contamination in a case. I disagree with those who feel that wood is OK as long as it is sealed properly. Not only is meaningful sealing very difficult to achieve, but also sooner or later someone is going to put a screw or pin into the wood and break the seal. It is also very difficult to monitor the quality of the seal over time. It makes much more sense not to put that contaminant in the case at all. Wood, however, is an extremely versatile material, and replacing it with more benign materials is difficult. It has taken a combination of aluminum extrusions, sheet metal, Dibond (an aluminum/polyethylene sandwich material), aluminum honeycomb, polyethylene foam, and powder coats, but we have achieved the total elimination of wood products from our cases. Powder coating represents a great advance in the application of decorative coatings to metals. In this process, the “paint” is a dry polyester or epoxy powder that is applied to the metal in an electrostatically charged cloud. The powder that adheres to the part is then baked at about 400°F until it fuses and cures to an extremely durable finish, with zero off-gassing potential. Although, unlike with paints, custom colors are very expensive, there is now a very large selection of standard colors available.

The increasing requirement in recent years for cases that provide microclimates prompted us to develop new techniques for sealing cases. We conjectured that, once a case is really well sealed, the primary agent for creating an air exchange inside is changes in relative air pressure between the inside of the case and the outside. Changes in temperature inside or outside the case and changes in barometric pressure can cause pressure differentials that no flexible seals can withstand. To counteract this effect, we developed a bladder, made of Marveseal, a polyethylene/aluminum/nylon film lamination, which we could connect to the exhibit cavity via a small polyethylene tube. If the air in the exhibit cavity expands, it flows into the bladder instead of exerting pressure on the seals and leaking. When the air in the exhibit cavity contracts again, the air is drawn back in from the bladder. In order to quantify the effectiveness of this technique, we developed an air-exchange testing protocol that involves filling the case with argon or nitrogen and, using an oxygen concentration monitor, observing the rate at which the oxygen concentration in the case increases. This method is described in the National Park Service Tech Notes (see www.nps.gov/hfci/conservation/exhibit). Using this technique, we are able to show that we can produce exhibits cases with air exchange rates of .05 per day. This result allows for the use of relatively small amounts of RH-conditioning media in the case.

Another problem we had to overcome was how to lock a case—for example, a vitrine to a pedestal—and still maintain an air seal. We developed a system using pneumati
cylinders that could be placed inside the case and locked into
the vitrine without breaching the envelope of the case.

Light, especially ultraviolet light, is a well-known factor in the
deterioration of many materials. Overall light levels are the
responsibility of the conservator and exhibit designer, but
acrylic sheet (Acrylite, Plexiglas, Lucite, Polycast) is uniquely
capable of essentially eliminating ultraviolet from an exhibit
case. Standard acrylic sheet eliminates all light of wavelengths
shorter than 370-380 nanometers, depending on the brand.
As a UV filter, glass, even laminated so-called ultraviolet-

When building a sealed case, the simpler the concept, the better.

filtering glass, is no better than and usually not as good as
standard acrylic. UV-filtering grades of acrylic (UF96, OP2,
UF3, etc.) have a UV cutoff at about 400 nanometers, filtering
out essentially all wavelengths shorter than the human eye
can see. A 400-nanometer cutoff gives the artifact the most
protection without affecting its apparent color. The newest
UV-filtering material is Polycast UP96, which has the sharpest
cutoff at 400 nanometers. We collaborated with Polycast in
the development of this material.

When designing exhibit cases, we have found it useful to
think of the case as a five-sided box with a removable sixth
side. For a vitrine, the five-sided box is transparent and the
sixth side is opaque. In a wall case, the five-sided box is
opaque and the sixth side is transparent. In both instances,
the five-sided box is a completely sealed unit. Thus, the
seal between the box and the sixth side can be a simple
continuous gasket on a single plane. When building a sealed
case, the simpler the concept, the better.

Question What important improvements do you
think are needed in the relationship
between conservation and exhibits, such
as future directions or training, better
products, technology?

It would be useful for exhibit case fabrication to develop as
an independent discipline. There are many exhibit fabricators
building exhibit cases who really don’t understand the
principles involved. Likewise there are many exhibit designers
who would be better off collaborating with a competent
exhibit case fabricator in the detailing of their cases. Many
times exhibit designers have given us plans for cases that
were either overly complex (and therefore expensive) or
just not state-of-the-art technically. Often we are brought
into a project when it is too late to change even the smallest
details that would make the product better. I guess I am
really arguing for a team approach, where the exhibit case
fabricator is part of the exhibit team from the beginning,
not just a tradesman who is given fully developed plans
at the last minute.

My advice to those who would specialize in exhibit case
fabrication is to start by joining a professional conservation
organization, such as the American Institute for Conservation
(AIC)* or a regional conservation guild,
such as the Washington Conservation
Guild (WOG). Another resource is
Conservation Online (CoOL), a library
of conservation information, sources, and
This is the best way to keep up with
current thinking about case requirements
and materials. My advice to exhibit

fabricators is, where conservation is important, to
subcontract the fabrication of cases to firms that specialize
in conservation-quality exhibit cases. My advice to exhibit
designers and others responsible for specifying cases is to
find an exhibit case fabricator you can rely on and
collaborate on the design of cases at the earliest possible
point in the design process.

NOTE:
*The American Institute for Conservation of Historic and
Artistic Works is at 1717 K Street, NW, Washington, DC
20006; phone (202) 452-9545; e-mail info@aic-faic.org;
An Interview with a Technical Exhibit Detailer

Kevin Brookes is a partner with NashBrookes Associates based in Frederick, MD. He has worked as a designer and cabinet maker in New York, and as an exhibit detailer for Explus Inc., where he provided technical design for the Top Treasures Case at the Library of Congress. Brookes recently designed the case for the Declaration of Independence at Independence Hall and illustrated the Exhibit Conservation Guidelines for the NPS. He can be reached at 301 662-3630 or kevin@nashbrookes.com.

Question: What do you feel is your role in ensuring preservation of the collections you put onto exhibit?

The idea of “conservation” in exhibits can be very abstract and intimidating for many designers and fabricators. One reason is that the concept remains somewhat intangible and ambiguous, lacking clear definition and specifications that can readily be applied to the design and production of exhibition structures, such as cases for the display of objects. As the design of each museum exhibition is almost always custom in nature, there are few “off the shelf” conservation-friendly solutions that can be specified by the designer and screwed in place by the fabricator.

After working on countless exhibit projects, doing everything from design to installation, I have found it is far easier to implement conservation requirements by designing the exhibit around the needs of the object or collection than to try to force requirements onto an exhibit later. When I approach the design of an exhibit case, for example, I begin with the object and work outward, using what you might call an “object-centric” approach.

It is very important to have a dialogue early in the design phase with the collection staff about the conservation factors that will affect exhibit case design, lighting, construction material, access, and other features. As the collection staff members are responsible for the objects, it is critical that they be involved in those initial decisions.

Occasionally I work on projects that have no conservator and find myself looking at a final design with no guidelines or criteria for the display environment or enclosures. In these instances, I end up asking the designer a lot of questions, and the further into design development the project gets, the more awkward the situation if the case is lacking in conservation solutions. It is even more disheartening, however, when pointing out deficiencies falls on deaf ears.

It can be a daunting experience, with costly consequences, to revisit an extensive exhibit design package involving many cases that require alteration of their access systems for the installation and maintenance of objects, their environmental chambers to meet performance criteria, and their lighting attics to give reasonable access and prevent overheating. No wonder designers are unwilling to entertain the idea of a redesign and decide to push it off on the fabricator, who is next in line.
Can these issues be properly revisited or corrected during the exhibit’s fabrication phase? If the design phase gives no clear indications of what conservation features need to be included in the exhibit, it is unlikely the fabricator will have this information. The costs of finding acceptable solutions that late in the game will not be covered in the original pricing. My experience is that, if it happens at all, it will be an expensive add-on, and the redesign will be hurried along to meet a fast-approaching exhibit-opening deadline.

Without a clear delineation of which measures are required to protect the objects, it is difficult to develop targeted design solutions. In this situation, I try at a minimum, to ensure system flexibility where there is a capacity for adjustment, and in general to err on the side of conservatism. For instance, I plan for:
- the exclusion of contaminants by limiting the presence of hostile materials within the display and climate chamber and by using barrier coatings and laminates
- the adjustment of the amount of light striking an object, through the addition of films, louver screens, or different types of acrylic filters and diffusers
- the ability to create and maintain a climate-controlled environment within display cases.

As the purpose of a case is to display objects for the exhibition, my function is in the nature of a balancing act: to ensure both that the exhibit criteria have been effectively met and that the objects are displayed safely, with the collection staff aware of what conservation solutions have been implemented.

**Question** What special skills, techniques, or steps have you developed, resulting in improvements in conservation?

Exhibit cases pose a unique problem to the exhibit designer: They need to satisfy standards of both appearance and function. As exhibit designers, we are quite capable of managing how a case appears within an exhibit. The real challenge is integrating appearance with how the case is meant to perform—as a place to display precious and vulnerable objects. When designing cases, we should remember that considerable time and expense have been devoted to collecting the objects, treating them, and preparing them to look their best for display. It seems irresponsible, then, not to consider the environment into which they are to be placed.

As exhibit cases are more akin to product design than exhibit design, a different approach is needed if we want a more efficient path through fabrication. Three-dimensional modeling software can be used extensively throughout the design and engineering process. This technique enables designers to communicate ideas clearly and efficiently to clients, without their needing to interpret artistic sketches or complex plans and sections.

We can walk through the exhibit space, picking out areas or details, and then look at them in isolation. As the design progresses and greater levels of detail are added to the model, we can demonstrate exhibit case access methods, show exactly where the hardware and the lighting fixtures are to be located, and, depending on the extent of the project, even represent the objects within the case. For some projects, we have produced both animated walkthroughs and still renderings, all based on a 3D computer model, showing what a particular feature looks like at eye level. This gives the exhibit team a wealth of visual information, enabling them to make educated decisions about the design as seen directly, without having to interpret several plans and elevations.

New computer-aided technology such as this is especially useful in exhibit case design, as we can layer in the material thicknesses, realistic hardware, lighting products, and the objects. We can then peel away the outer layers of a case’s structure to expose the key components of the case: the lighting and the display and environmental chambers. Color-coding can illustrate where conservation-grade materials must be located within the display and environmental chambers and where the exterior of the case begins.

I would recommend contracting with a fabricator or renting shop space to build prototypes. Get access to a detailer or someone with fabrication experience to provide technical advice during the design development phase.

For an exhibit case at Independence National Historic Park in Philadelphia recently, we built a full-size mock-up of the cabinet, complete with alternative lighting scenarios, so our client would understand the scale of the case and the challenge of lighting its contents. The prototype, developed early in exhibit development, enabled us to try several scenarios for features such as lighting and door systems for object access and rotation. Our team review strongly influenced the case interior’s final design. Which lighting system was chosen, even how objects were to be held. I cannot overemphasize the importance of communicating design issues back to the collection staff, involving them in the process and allowing them to raise issues we had not anticipated.

We often collaborate with other specialists to establish the display criteria early in a project because we know how challenging it can be to meet performance standards for exhibit cases. For example, Scott Fitch of Landmark Facilities Group was instrumental in determining the precise design of the walls of an enclosure to resist exterior changes in temperature and relative humidity. If we had failed to
engineer the enclosure properly, condensation would have formed on the case interior, with catastrophic results.

After we have selected material, lighting, access methods, and other elements to match the case requirements, we begin the final design process. Still working in 3D, we break down the case into greater detail, making sure our details work and do not conflict with other parts of the design. The next stage is to pull our model apart and create the fabrication documentation, complete with the 3D exploded views, traditional plans and sections, product specifications, vendors, and lighting, everything needed to enable a fabricator to accurately bid on the project.

At this stage, the display criteria for the object have been translated into notes, specifications, and material selections agreed on by the design team. Through prototypes and review of the material specs, we have actively demonstrated that the solutions we are using meet the criteria.

The usual approach is to issue design documents and then have the fabricator provide shop drawings. I personally found this to be a stressful and imperfect way to work. The shop drawings are being produced during the fabrication phase, and there is little time or inclination to redesign problematic cases. Consequently, the designer is often unwilling to accept any changes in design, so what follows is a series of compromises. It is far better to have a separate phase for producing fabrication drawings, when consideration and time are given for review and comment.

**Question** What important improvements do you think are needed in the relationship between conservation and exhibits, such as future directions or training, better products, technology?

I have found attending conservation seminars and workshops to be invaluable. Most designers and fabricators are missing out on a wealth of information that is being presented in these meetings. This year, for instance, I participated with two conservators in an exhibit workshop at the annual meeting for the American Institute for Conservation. I brought away reams of extremely practical information that I could put to use immediately.

The museum field needs to demystify the realm of conservation as it applies to exhibitions, and a number of professionals in the conservation field appear to be moving in that direction. I was asked to collaborate on *Exhibit Conservation Guidelines*, recently published by the National Park Service, and I understand that conservator Pamela Hatchfield is publishing a book on exhibit fabrication materials. Both of these publications come from conservators trying to facilitate a collaboration with exhibit specialists.

I do not believe fabricators or designers will ever be in a position to provide any extensive science and analysis of the materials they use in exhibits. This job will always be left to conservation specialists. However, with more publications like those mentioned above, the design field will become familiar with more appropriate materials to use around collections, the reasons we should use them, and where we should use them.

We need to take the guesswork out of exhibiting objects by requiring that better planning documentation be provided to the designer. If there is any estimating in sizing a case, for instance, you can be sure there will be problems later on. The documentation of objects going onto display is a critical factor in case size and proportion, for example. Care should be taken even to indicate how the object should be physically displayed and supported. Objects should be photographed from above, the front, and side, exactly as they are to appear on exhibit.

Conservators should be available to serve as contract consultants with exhibit detailers and fabricators to review design drawings. Drawing and plan reviews prior to fabrication give the chance to ensure that preservation criteria are being met. Casework should be evaluated for access design, air seal and sealing surfaces, lighting and environmental control, and quality of construction material within the display chamber. Ask for spec sheets on any problematic material.

Standards for the exhibition field need to be established and published. The federal government has standards for the restoration of buildings and for the display of text and graphics. We should also have accepted standards and examples for the display of cultural objects, removing the difficulty of interpreting complex display criteria.
Key Issues Involving Object Mounts and Installations

I was asked to consider the topic of new techniques and materials in exhibit object supports, but after some thought, I realized that recently there has not been much that is new. Rather, the same old things are just as important as they ever were: safe materials, careful fit, and stable conditions within the exhibit case. However, since the late 1970s there have been some apparent changes worth discussing. Some of the changes are improvements, and some are steps backward.

Some Steps Forward, Some Back

Current practice in designing mounts usually includes efforts to both safely support the object and remain unobtrusive while doing so. One obvious improvement in museums all across the country is the increasing use of common kits of acceptable materials and safer mounting techniques. These days, mounts are usually made of brass, Plexiglas, or painted or stainless steel. The padding choices now available permit appropriate and subtle solutions to various problem conditions. I no longer see fabric- or tinfoil-covered bricks supporting or holding down objects, as once was so common. Object mounts are almost universally padded. These developments signify improvement and growth.

Most of the new materials used in exhibit mounting are for padding. Over twenty years ago, when I first began making mounts, all we had that was considered safe for padding was heat-shrink tubing and nalgene or felt, the latter two adhered by brushing on contact cement. That was it.

There are now many more padding materials to choose from. The main reason is the widespread use of the Oddy test (an accelerated aging test that determines whether a material is safe to use in proximity to collection objects), which has allowed approval of many new materials for exhibit use. Although the Oddy is not a complete or perfect test, it is easily accessible and offers reasonable reliability at relatively minimal expense. Plastics and foams, felts and suedes with acrylic adhesive backings, fabrics used in exhibit cases, paints, adhesives—all are routinely put to the Oddy test to determine suitability for use.

Available coatings have changed as well. Krylon acrylic spray is now commonly used to coat pins, providing a barrier between the pins and metal objects. It is efficient, effective, and inexpensive, especially when compared with the heat-shrink tubing we so laboriously applied to pins twenty years ago.

What has not changed much are the reasons behind the need for mountmaking. The first reason is to facilitate the display of the object, to make it look better or to offer a better view of a particular aspect. Second, but of equal importance, is to hold the object safely, so that no harm comes to it either immediately or in the long term. Immediate danger might include the object’s being scratched, crushed, or otherwise damaged by a badly designed mount or a blow to its case. Long-term dangers could come from adverse reactions to the materials or structures used to hold the object up or from inappropriate support (for example, copper chargers standing on edge for years until the rims are crushed under the weight of the platter).
Here is what I see going on as I work around the country, dropping into ten to fifteen institutions each year for several weeks at a time:

- Museums seem to be making more effort to properly care for objects, or at least their staff members appear to be trying.
- The work of designers, however, is not always so reassuring, since some designers fail to make consistent efforts to protect the artifact on display. This is the step backward I mentioned above, but their lapses can be addressed.

In the case of museums, the evidence of collections care is seen everywhere. Standardized, safe art-handling techniques are now commonly in use. Padded carts, air-filled tires, painting pads in the galleries, padded work surfaces and storage shelves, removal of doorway thresholds, smooth panels laid over the diamond-plate floors in freight elevators—all of these commonsense ideas to keep objects safe from shocks are well known and used more than ever before. Improved handling procedures, the use of gloves, and specified procedures to minimize handling reflect a system actively concerned with object safety.

**Mounting Design**

All the above techniques involve either selecting safe materials or using helpful tools appropriately. After resolving issues of collections safety, the most important issue involved in an object mount is the appropriateness of the mount design while taking care to fabricate a mount that is well fitted to the object. In fact, a bad mount design or a poorly fitted mount can damage an object much more quickly and surely than would a poorly selected padding material.

Those two attributes, good design and careful fit, cannot be obtained from an off-the-shelf, prefabricated mount. They come only from using a trained crafts-person, and being given a reasonable amount of time to do the job. A basic, safe, well-fitted mount is not the result of any magic, nor does its creation require a highly skilled specialist. It takes only reasonable craft skills, a certain amount of training, some knowledge of parameters, and care and close attention. (It unerringly requires, however, sufficient time in which to do the task.) I learned my exhibit mounting skills through a casual apprenticeship, all that was available to me in 1977. Now, several different seminars on mountmaking are available offered at various times.

The designer's brief is usually a complex one. There are huge restraints on space, time, and only so much money to make an exhibit that will satisfy everyone: curator, conservator, security staff, collections care manager, trustees, directors, important donors, critics, and the public. Happily, and to their credit, most designers usually succeed.

Unfortunately, in the effort to please all or most of the above masters and to facilitate the design concept, basic standards of museum object care are sometimes left unsatisfied. Imbalanced solutions that are decided upon to enable a design concept or design conceit frequently result in imposing ongoing maintenance problems on the museum staff and budget. These problems (such as unnecessary exposure to dust, vibration, and light) and their annual cost often last for years, well after the glowing review is no longer a source of pride to those involved. Scarce monies are wasted.

I have noticed recently a decrease in the use of many long-understood solutions to recurring exhibition problems. Most often the root cause is that an exhibit designer has not worked on staff at a museum. The staff experience inculcates an awareness that object safety and preservation are an ongoing concern that must be addressed. Objects are in the museum because of a consensus that they have value; there is a mutual understanding that these items should be preserved to maintain that value for the future.

Exhibit cases should be designed to facilitate entry for object mounting and de-installation.

To that end, museums try to protect these objects, in the long or short term, by handling them as little as possible. When dust settles on objects, it necessitates time-consuming cleaning, which for many collection objects is not simple and can cause their degradation. Vibration can result in burningish of the object surface or failure of joints. Over time, light can fade colors and degrade surfaces. Some objects are more susceptible to these damaging agents than others. Ethnographic objects are more fragile, while metal and ceramic objects are usually more durable.

These concerns present serious undertakings, and to achieve them often requires spending significant amounts of money from limited budgets. So when I work on exhibitions where it is apparent that the exhibit's design will necessitate frequent cleaning of the artifacts because they are unprotected from dust and dirt, I am forced to wonder why. In recent years, I have been wondering why more frequently than before.
Basic Exhibit Case Design

I recently reviewed exhibit plans to display more than 1,000 objects behind unsealed glass panels that prevent visitors from touching them but with no other protection. Dust carried up by convection will gently fall onto the uncovered artifacts. As hundreds of viewers a day shuffle through the gallery, their shoes will raise a constant thin cloud of dust that will settle gently on everything in the room, including the artifacts. Not even the best HVAC system will remove all that dust from the air. How many times a year must the objects be removed from their mounts for cleaning? One? Two? Three times? Can this problem be avoided during the exhibit design process? Where is the protective vitrine?

Vitrines have a well-established purpose—to cover objects. Objects should usually be covered. There are reasons and times to break the rule, but usually it should be enforced. Planners who choose not to use vitrines incur an obligation to find other satisfactory ways to protect against dust and ensure the security of the object.

Vibration is disturbing to see in a museum display case; it certainly is not good for the display object. Fortunately, the ways of prevention are clear. The vibration we are talking about is best dampened by mass. A heavy case transmits less vibration than a flimsy one. If the exhibit case is thin or unsteady, it easily transmits vibration to the mount, and nothing the mountmaker does can prevent it from transferring to the object. How could this vibration be prevented? Not by putting mass into the mount to dampen the vibration. This dilemma has one well-established, commonsense design solution: heavy exhibit cases.

Unfortunately, these days, lightweight or poorly supported artifact cases are increasingly common. Sometimes they are held up by a single tube, and sometimes they are cantilevered from the top bar of a railing. In these instances, damaging vibration (certain to come through the railing as viewers lean on it) will likely affect the objects in the case. The potential for damage to the display material has been designed into the exhibit, and the mountmaker can do little that will affect or dampen the vibration to any noticeable degree. Employing a rigid, dense case support would prevent this problem.

The value of involving the mountmaker early in the design process should not be overlooked. Useful suggestions regarding material choices, case access, successful display possibilities, and object placement are generated from a mountmaker’s review of preliminary designs. For example, exhibit cases should be designed to facilitate entry for object mounting and de-installation. That usually means access from the front. Front-access cases require only one person to install, unlike rear-access cases, which require two installers every time, one of whom only looks from the front and gives directions.

In sum, as a standard element in their design brief, exhibit designers should include the concept of protecting collections by requiring only minimal maintenance of the objects. Designers should be actively concerned with not imposing any unnecessary, repetitive tasks. It is clear from the otherwise fine shows they create that this would just be another condition of their brief, like story, budget, and deadline.

One place where the demands of long-term care seem to be well satisfied is the National Gallery of Art, which has managed over the years to consistently produce beautiful exhibitions that engage visitors on all levels and repeatedly win awards. Anyone who has been attentive to their exhibits over a period of time will realize that, in terms of materials and case design, a standard selection of elements and minimalist details is used over and over again. These features are used to produce great effects in shows that always look fresh, while satisfying concerns about object preservation.

We do not need to reinvent the wheel each time we try to make an exhibit attractive and compelling. Basic, long-term, useful solutions that are proven to work should not be readily rejected. In theory, it is the objects, the facts, and the story that convey the truth to be told, not the flashy materials or eye-catching graphics. While these are wonderful elements and can compel attention, they should not be allowed to drive the exhibit bus, ...sometimes right over the safety of the objects.
An Interview with an Exhibit Mountmaker/Installer

Question: What do you feel is your role in ensuring preservation of the collections you put on exhibit?

The role of the exhibit mountmaker/installer includes caring for the artifact from the time it is taken from its storage place until it is mounted and installed in the exhibit. This period of exposure is a very dangerous time for collections going onto display. The mountmaker will normally be the last person to touch an artifact, since the display cabinetry might well remain closed for the duration of the exhibit.

The mountmaker/installer’s role in preserving exhibit collections is critical. Essentially it is to:

- minimize or eliminate damage and stress on the individual artifact while it is being prepared for exhibition;
- ensure that the design and conditions at the point of contact between the exhibit and the artifact are optimum;
- maintain the artifact in a mechanically and chemically secure situation for the duration of its period on display.

Responsibilities of a Mountmaker/Installer

Because of their intimate involvement with artifacts going onto exhibit, it is essential that installation specialists be familiar with the fundamentals of conservation. In many instances, the mountmaker/installer must act as the artifact’s advocate and problem solver in dialogue with exhibit designers and curators. More often than not, a museum’s staff and exhibit team does not include a conservator, so the mountmaker/installer will directly affect the proper display of highly vulnerable objects. In these instances, the curator and the designer will come to agreement on the presentation of an object, and it is the job of the mountmaker to make sure that presentation accommodates the artifact mechanically and stylistically.

There is no easy answer for situations when a conservator is not available for exhibit projects. In these instances, the mountmaker/installer is required to make decisions on how to support the artifact in situ and protect it from vibration, abrasion, light, visitor abuse, and other elements that will endanger it. If there are conservation questions that our staff cannot resolve, we will ask the museum to provide a contract conservator. If a conservation issue still cannot be resolved, it is our place as advocates for the artifacts to request that the artifact not be displayed until proper conditions are met. The intrinsic and historical value of the artifact in question has a heavy bearing on how these situations are handled.
If objects are lost or misplaced during the exhibit process, the appropriateness or conservation design of the display mount becomes moot. A well-defined accountability procedure is essential to ensuring the safety and care of the artifacts entrusted to the installer or firm. In large exhibits with hundreds of items to be displayed, extreme care must be taken with regard to information processing and retrieval.

There are numerous key steps involved in the process of mounting objects for an exhibit:

1. Artifact registration
2. Artifact condition recording
3. Artifact photography, measurement, and patterning
4. Artifact mount design
5. Artifact mount fabrication
6. Artifact fitting and padding
7. Installation

The task of installation is initiated far in advance of the exhibit's opening. It should begin months earlier with a careful study of the artifact, including its geometry and internal physics. This analysis is the basis for developing a fully functioning support that will not distract the viewer. Our task is also to make the mount invisible by hiding it, integrating it into the surroundings, or making it as elegant as the object or exhibit itself.

**Question What special skills, techniques, or steps have you developed, resulting in improvements in conservation?**

**In Artifact Registration**

One of the most important processes involved in bringing an artifact-rich exhibit to completion is artifact registration and data organization. In a typical installation, the data provided by the museum or the exhibit designer is often in a form that is useful in tracking artifacts through the mounting and installation process.

We integrate the data from all sources into a single computerized register, which is subsequently used throughout the mountmaking and installation phases of the exhibit to maintain a continuous fix on the status of all artifacts and their mounts. In this procedure, the data provided by the exhibit designer and the museum are collated and annotated to provide the basis for a thorough analysis of the artifacts' condition, treatment, and dispensation. Each artifact is discussed with the museum staff, digitally photographed, measured, and patterned. Our patterns, notes, and digital photographs follow the artifact through the entire exhibit-installation procedure, and are constantly referred to and updated.

**In Mountmaking**

A practitioner of the art of mountmaking must combine a panoply of crafting skills with an understanding of artifact conservation, and apply these skills and knowledge to the special circumstances inherent in an exhibit situation. For efficiency, we have built two multimedia shops—a base shop and a traveling shop—designed and tooled to adapt to the special needs of mounting artifacts. The base shop is organized in modules, so that different skill and tool combinations can be assembled on-site to match the requirements of a particular exhibit. These modules are: steel fabrication module, rigging and raising module, brass fabrication shop, wood and acrylic fabrication shop, book and paper mounting studio, textile fabrication studio, and painting and fauxing studio.

**In Research and Development**

There are many similarities both among the requirements of artifacts and among exhibits. We have found that the mount attachment that connects directly to the artifact is the only unique aspect that requires custom design and fabrication. Everything behind the mount/artifact attachment can be subject to systemization, modularization, and development.

Many in the exhibit industry have begun development of modular systems on the large scale, including a museum's trusses, surface treatments, and architectural elements, down to the exhibit cases. In an industrial sense, the development of this type of hardware is well under way and will be an important new approach to exhibit installations.

**Question What important improvements do you think are needed in the relationship between conservation and exhibits, such as future directions or training, better products, technology?**

One of the most difficult situations mountmaker/installers face is being brought into an exhibit late in the project or being overlooked altogether. Planning artifact mounts and their installation should be part of the initial exhibit planning and design process. In our experience, consideration of this important aspect of collections care has been neglected or delayed until nearly the end of the exhibit's development.

Instead, the process should begin with an analysis of the artifacts soon after they are selected for exhibit and move outward from there, to include the placement and geometry of each item going on display.

A delay in considering the needs of artifacts (such as installation-mounting requirements) is sometimes understandable because the field of museum exhibit is still young and exhibit conservators are not routinely assigned to
exhibit teams. However, we see the interface of the exhibit design and the collection—the place where the exhibit meets the artifact—as the crux of the whole process and deserving the utmost attention. In our opinion, all the elements and considerations that affect the artifact should be brought to the table first and resolved as a design issue early. To my knowledge, the exhibit industry rarely consults specialty firms such as fabricators and installers for their mechanical and physical knowledge during the early planning and development of exhibits.

Unfortunately, there are few information resources available for exhibit designers and detailers. There are few schools where museum exhibitry is taught. The training opportunities for developing the multimedia skills necessary to become a master mountmaker are even rarer. Museum studies programs should be strongly encouraged to add these important specialties to their curriculum.

Given the present state of the exhibits field, most information exchange will necessarily occur around existing projects, with real-time problems to solve. I feel that it is the responsibility of the firms and individuals who plan, design, and build exhibits to spend time and resources exploring the issues involving conservation and how best to protect collections while on display. It is best to begin this process in the developmental stages of an exhibit or museum. A more holistic team approach to planning an exhibit could also focus the attention of the many practitioners on the artifact, which is the single, irreplaceable item of the entire project.

One approach to resolving some of the issues raised here is to conduct a conservation/installation survey of the collection to be exhibited. This survey involves a brief inspection of each artifact by a conservator and an installation specialist, followed by a preliminary report detailing the special preparation that certain artifacts might require. By identifying and flagging these special items early, the designer eliminates many potential problems during construction of the exhibit. A few of the more experienced design firms have incorporated such pre-exhibit surveys into their design process, and as a result have realized a great savings for their client.

One of the most difficult situations mountmaker/installers face is being brought into an exhibit late in the project or being overlooked altogether.
Microenclosures for Framed Collections

by Hugh Phibbs

Hugh Phibbs is coordinator of preservation services at the National Gallery of Art in Washington, D.C. He routinely gives workshops at all the conservation graduate programs and speaks at colloquia and conferences nationwide. He writes "Preservation Practices" for Picture Framing Magazine, and has authored a number of their preservation supplements.

Unobtrusive microenclosures can protect artworks displayed in buildings with less-than-adequate environmental conditions.

Since the environmental conditions in museums may not always conform to the highest standards, delicate artifacts and works of art can be protected while on display if they are in sealed, properly conditioned enclosures. Work at the National Park Service and the J. Paul Getty Museum has shown how this purpose can be accomplished by using sealed exhibition cases. The same benefit can be provided by smaller sealed packages made to fit inside traditional frames. These packages have been developed over the last ten years by the Department of Exhibitions and Loans at the National Gallery of Art to accommodate both paintings and works of art on paper.

Materials, such as paintings on wooden panels and photographs are highly susceptible to climatic change. Requests for loan of such materials from the National Gallery led to development of packages made of rigid plastics to protect the pieces from change. The bulk of these packages made them difficult to fit into frames, and their rigidity caused them to perform poorly when exposed to changes in pressure during air transit. More recently the use of flexible metal/plastic films and laminates allowed the creation of packages with thin sides that fit well in frames and can flex in response to changes in outside air pressure.

These packages are also able to ameliorate the threat of accidental wetting. Sprinkler systems are increasingly common in museums, and if leaks develop in such systems, the works in their vicinity could become dampened or soaked. As the packages were developed, pressure-sensitive adhesives to hold the laminate to the glazing were replaced with hot melt adhesives that provide much better water resistance.

The packages consist of the glazing material on the front of the art, to which vapor-barrier laminate film is bonded with heat-activated adhesive, forming the flexible, pressure-compensating sides and back of the package. Examining the creation of these packages can illustrate both the steps involved in their manufacture and how a desired idea can become a practical reality without undue labor or expense.

The specific materials used have a profound impact on the level of environmental sequestration that the package can provide. The most critical choice is the glazing material. Plastics such as acrylic and polycarbonate sheet have the advantage of being shatter-resistant and readily available with ultraviolet absorbers incorporated into them. The fact that some water vapor can pass through them makes them unsuitable for long-term protection from damaging climactic conditions. If these materials are used to make highly sealed packages that are exposed to dry exterior conditions, the outer surface of the plastic will lose mass as it becomes desiccated and will warp inward toward the art. Glass is an effective vapor barrier and can maintain the interior conditions of a sealed package for long periods, and it will not warp. But the fragility of glass requires that the art be protected against the possibility that it will break. Lamination of the glass is the simplest
The **most critical choice** is the glazing material.

strategy, but the fact that most domestic flat glass is strengthened with iron, giving it a greenish tint, means that doubling the glazing in a laminate will yield an aesthetically unacceptable color. Weaker, low-iron, 2 mm glass is harder to find, but it can be used as a laminate that is virtually colorless. If protection from ultraviolet radiation is required, it can be specified as an absorber placed in the laminating resin (polyvinyl butyrate) between the layers of glass.

Low-iron laminated glass has often been made with antireflective coatings on its surface. Control of reflections on the surface of glazing materials is accomplished either by scattering the reflected light or changing it so that its phase is opposite to the incoming light and thus is canceled. The scattering option is found in acid-etched, nonglare glass and in nonglare acrylic sheet. The scattering of the light creates a blurred image of the art, which becomes worse as the glazing is spaced farther away, making it unacceptable for use with fine art. Antireflective coatings do not diminish the clarity of the glazing, and their only drawback is their expense. Whether these coatings are applied through a series of dipping and baking steps or with an ionic sputter coater, the fact that usually half the glass is rejected as flawed drives up the cost of the final product. Budget will be one determining factor in the choice of glazing; the role that the package is to play will be the other.

The type of adhesive used will also affect the performance of the package. Acrylic can be used if the package must resist only accidental wetting and not a hostile climate; otherwise, glass is required. If the package is designed only to resist changes in exterior climate, pressure-sensitive tape can be used on the front and sides of the glazing for heat-bonding to the aluminum/plastic laminate film. If the package must be waterproof, electrical-grade hot-melt glue should be used to bond the laminate to the glazing. This can be accomplished if the glue is first extruded onto the front edges of the glazing, allowed to cool, then later heated with a tacking iron through the laminate so that it melts and holds the laminate to the glazing. The laminate film used should have four layers: an innermost layer of heat-bondable polyethylene, an aluminum vapor-barrier layer, then another layer of polyethylene, which will bond the aluminum to the outer puncture-resistant skin. This combination can be procured with an outer layer of polypropylene (Marvelseal 470), nylon (Marvelseal 360), or polyester (Mitsubishi PE/AL/PE/PET). Any of these laminates should perform well as a vapor barrier, but each must be reinforced with an extra layer of the same material heat-bonded to it, to gain puncture resistance. These laminates are highly formable when heated, so they can be compressed and shaped into structures that will provide durable seams and corners thin enough to fit inside most frames with little alteration.

Package designs are determined by the need to keep the heat used to seal the package away from the art or artifact within. A properly designed window mat package should be constructed so that its outside edges are one inch beyond the edges of the paper the mat houses. This means that heat can be applied to the glazing that rests on top of that unoccupied portion of the mat without heating the matted paper. This package can be made from a sheet of glazing that has been cleaned and fitted to the front of the matted work, with the adhesive applied to the glazing's front edges. A sheet of laminate that is larger than the outer edges of the mat by roughly one inch in each direction can be placed beneath the glazing/mat combination. The film is then drawn over the edges of the glazing and adhered with heat from a tacking iron that has been set at three-quarters maximum heat. As the laminate bonds to the adhesive, it should change from smooth to wrinkled, indicating the achievement of a thorough bond. The corners are the most difficult portion of the package to manage. The fact that the laminate will be folded creates the possibility of gapping where those folds rest on the surface of the glazing. This problem can be addressed by pulling the laminate into a number of small folds that can be flattened onto the surface of the glazing as it is heated.
Once the seal has been completed, the excess laminate should be trimmed with a blade so that what remains can be hidden under the rabbet width or lip of the frame. A backing board placed behind the sealed package will hold it securely in the frame and will decrease the possibility of accidental puncture. The sides of the rabbet space in the frame may need to be enlarged to accommodate the bulk of the package. The mass of the cellulose in the mat should be large enough in relation to the quantity of air in the package that it will be able to act as a buffer between the air and the art. Thus, if the temperature in the package drops, moisture will leave the air and enter the mat. The reverse will happen if the temperature in the package rises, so the relative humidity in the package will remain in a beneficial range.

A package that houses a painting must be designed differently. In this process, strips of laminate are adhered to the glazing to create the sides of the package. These strips will extend onto the back of the frame, where they can be bonded with heat to another sheet of laminate that forms the back of the package, without transferring the heat to the painting. Experience has shown that two layers of laminate are needed to make each side puncture-resistant, and they will work best if one is bonded to the front of the glazing and the other to the back. This means that the hot-melt adhesive should be applied to both the front and the back of the glazing first and then allowed to cool. The outer strips should be three to four inches wide and longer than the side of the glazing by twice their width. They are heat-bonded to the glazing and then to the ends of their neighboring strips, where they overlap along a line that bisects the corner of the glazing. The inner strips should be roughly two inches wide and as long as the side of the glazing to which they will be bonded. They will be attached with heat to the hot-melt adhesive on the glazing and to the polyethylene surface of the outer strip. When that step has been completed, the final bonding of the outer strips at the corners can be achieved with more heat that makes their joint perpendicular to the plane of the glazing. Now the package can be fitted into the frame, and a spacer of painted balsa wood can be glued into the edges of the package with hot-melt adhesive.

The glazing is then given a final cleaning, and the painting is fitted into the package. A sheet of well-conditioned paper impregnated with silica gel can be included behind the painting to increase its buffering capability.

Glass is an effective vapor barrier and can maintain the interior conditions of a sealed package for long periods.
capacity. A single sheet of laminate is laid across the back of the package and bonded to the polyethylene surfaces exposed on the back of the frame. To ensure that none of the folded laminate at the corners has any gaps left open, extra heating will be needed to flatten the layers of laminate in those areas. After the package is closed, the painting can be secured with brass mending plates that have been screwed to the back of the frame, through the ironed portion of the package. A sheet of backing board can be screwed to the back of the frame through that portion of the package that has been bonded with heat.

Highly sealed packages that fit into frames have already served to protect some of the most vulnerable materials, such as paintings on wooden panels, photographic emulsions, and works on vellum. These packages have ensured that works traveling to venues that have pressurized-water fire-suppression systems would be safe in case of accidental wetting. The design and assembly of these packages requires practice and coordination between those charged with framing art and frame conservators, since the package must be designed with the frame in mind, and the frame may require alteration. The constantly expanding traffic in loans among museums with the challenges of travel and differing institutional conditions makes this type of packaging an important adjunct to highly sealed cases and well-controlled exhibition spaces.
Alternative Technologies for Exhibit Lighting

by Larry V. Bowers

Larry V. Bowers is a conservator in the wooden artifacts lab at the National Park Service Conservation Laboratories in Harpers Ferry, WV. In addition to artifact treatment, he specializes in museum exhibit lighting, and evaluates and tests products for use in NPS exhibits. Most recently, he designed and oversaw the artifact lighting in the West Wing, Independence Hall National Historic Park, Philadelphia, PA.

Exhibit objects can be lighted without compromising conservation standards

The quality and direction of light define all that we experience visually. In our museum exhibits, lighting gives shape to objects and fine art, promotes interest in collections, and enhances the visitor experience. Secondly, museum lighting has to fulfill the requirements of accessibility, visitor circulation, security, and maintenance. Advances in lighting technology over the past decade have helped make all these tasks a bit easier. Additionally, there are products in development that may offer greater help for object lighting while at the same time meeting preservation criteria. As advocates for the artifact, it is incumbent upon us to keep abreast of technological developments that impact exhibit decisions.

Anyonw who has attended a lighting show recently knows that an enormous number of companies are offering products useful to the museum professional. The lighting industry is extremely competitive, and conventional lighting manufacturers now produce a wide variety of lamps and luminaires that fulfill many museum-lighting requirements. However, traditional museum lighting is not always capable of easily meeting today’s most stringent conservation standards. Filling that need are an increasing number of companies that have begun developing fixtures and lighting products specifically for a museum clientele.

Fiber Optics

Fiber optics have been in use in museums in one form or another for almost twenty years, and museum professionals are becoming increasingly comfortable with complex fiber-optic installations. As with any technology, though, fiber optics are not without pitfalls, and a little study can go a long way toward successful application.

Fiber optics works through a process known as total internal reflection, by which a reflective surface is created within the fiber, allowing the light to be transmitted longitudinally rather than escaping out the sides. The process is not perfect, and there is some loss, known as attenuation. Fiber efficiency will depend on constituent materials, the quality of the bond between core and cladding, hardware connectors, and end polishing.

A fiber-optic system comprises three component parts: the light source, referred to as an illuminator; the fiber that conducts the light; and an output device, such as a lens, light bar, or light strip. The variety and complexity of the individual components can vary enormously.

Illuminators fall into two basic types: halogen and metal halide. Both are available in a variety of configurations with single or multiple ports, mechanical or electronic dimming mechanisms, light-filtering screens, etc. Halogen lamps are generally preferable for museums due to their color temperature and their excellent color-rendering...
capacity. Metal halide lamps are more efficient and produce more light, having a much higher lumen-per-watt ratio, but they have a substantially lower CRI (color rendering index). Metal halide illuminators are best suited for architecture or sculpture, or in applications where precise color rendering is not a factor.

In application, the illuminators can be located in the bottom or top of the exhibit case, in an adjacent room or closet, or in the basement or ceiling if need be, allowing the light source to be separate from the exhibit environment. If the location is in the exhibit case, remember that the exhibit space must be insulated from heat generated by the illuminator. The space must also be ventilated to the manufacturer's specifications to avoid lamp damage. A case-top location is ideal, as it gives easy access for maintenance, allows easy ventilation, and requires short cable runs, maximizing light output. Light spill from the illuminator may be a concern but can be dealt with. This location also facilitates using one illuminator for multiple lighting tasks (figure 3).

Glass and acrylic (PMMA polymethyl methacrylate) are the optical fibers most commonly used for museum applications. Each type of fiber has advantages and disadvantages, and the fiber choice will depend on case design, exhibit complexity, performance demands, and system compatibility. Both types of cable give excellent light transmission. Glass has excellent flexibility relative to solid core acrylic fiber, and the bend radius is smaller, an important consideration in applications where space is tight. Glass must be finished by the manufacturer, arriving cut to length, sheathed, in a harness, and polished with ferrules attached to the output end. Acrylic, on the other hand, can be cut to length and polished by the installer, allowing a degree of adaptability and design flexibility that could prove useful in a complex exhibit that may require modifications on-site.

Lenses and output devices can be simple or complex. Most manufacturers produce some kind of single-element lens to focus light on the exhibit; several manufacturers produce complex lens systems for those desiring a higher level of lighting design. NoUVlR Research has designed and produced an excellent series of lenses for use with the 3 mm Mitsubishi PMMA cable.

Light bars are manufactured by several fiber optic companies and offer perhaps the easiest way to get fiber optics into your exhibit case. Schott fiber optics, distributed in the United States by Lighting Services Inc., (figure 4) produces an easy-to-use glass system utilizing light bars with individual light points that can be aimed, providing the opportunity to create a wash of light as well as focused, individual spots. The light bar is screwed into position in the exhibit case, the cable is routed to the exterior of the case, the common end is plugged into the illuminator, and the switch is turned on.

Conditioned exhibit cases will require that you adequately seal the entry port for the fiber bundle. Several possible methods include the use of neoprene gaskets or silicone caulk or, as shown in Figure 5, a glass harness for a light bar, a combination of gasketing and Plexi support.

Fiber choice depends on case design, exhibit complexity, performance demands, and system compatibility.

In special circumstances, manufacturers are willing to develop a product that meets specific design requirements, as we recently experienced in the new exhibit of the copy of the Declaration of Independence at Independence Hall in Philadelphia (figure 6). The three documents in this exhibit case are extremely valuable and required a special preservation effort, including a sealed case with dedicated environmental systems, heightened security, and exhibit lighting that would provide illumination with the least possible photodegradation. Schott Fostec LLC was able to fabricate light bars having multiple sets of light points, set at two different angles that could light the documents evenly, at appropriate footcandle levels.

One word of caution about fiber optics: I've learned not to rely on the photometric output data given by manufacturers,
as these figures are often derived under optimum conditions. I would strongly advise that a mock-up be made for any fiber-optic installation, especially if the light levels are critical, if there are budgetary concerns, or if performance is at all in doubt. A few hours spent with Fome-cor and a hot glue gun can mean the difference between success and failure. Also, if a lighting designer is involved in the exhibit, I would suggest that you choose someone experienced in using alternative lighting sources.

**Subminiature Fluorescent**

A relatively conventional but new lighting tool is the T-2 subminiature fluorescent lamp now being made by Osram-Sylvania. These lamps are 1/4 in. diameter, put out lots of light for their size, come in two color temperatures, and last 10,000 hours. Recently we used these lamps to light a series of long gun cases at Chickamauga/Chattanooga National Military Park (figure 7). Due to the space limitations and accessibility requirements, the cases had to be only 7 1/2 in. deep. Fiber optics had originally been specified but caused an enormous problem with shadowing. We were able to successfully light the weapons with the T-2 lamps directly from the top of the case and with bounced light from the bottom, using insulated light attics to maintain the conditioned interior object environment.

**LED**

Light emitting diodes (LED) are solid-state lamps that produce light when a low-voltage current is applied to a doped crystal. Until recently, they were considered unacceptable for anything other than utilitarian lighting, such as dashboards or signage. However, recent advances in LED technology by Asian manufacturers have overcome the stumbling block to producing white light, which is now a possibility. Although not perfect at this juncture in lighting history, white-light LEDs offer future hope for the lighting field in general and have already been successfully used in museum applications. They use very little energy, can be easily dimmed, and have a life expectancy that may exceed 100,000 hours. On the negative side, a single LED produces relatively little light and must be clustered (figures 8 and 9) to achieve even very modest results. Several manufacturers have begun producing fairly inexpensive LED clusters in various sizes and configurations as well as conventionally shaped lamps using LED technology.

**Cold Cathode**

Cold cathode is increasingly finding use in signage, architectural applications, and decorative and specialty lighting. The lamps are economical and long-lived, and triphosphor coatings have improved efficacy and allowed fairly good color-rendering characteristics. Unfortunately, the lamps being produced either are for interior lighting to replace fluorescent lamps or are small specialty lighting products for the after-market auto or boat industry.

**Summary**

Fiber optics was once considered an interesting, though not particularly practical, lighting tool. That viewpoint has changed enormously over the past decade as manufacturers have developed sophisticated systems useful for exhibit lighting. White-light LED and cold cathode lighting may prove just as useful in the future as manufacturers strive for technological advancement.

**Selected manufacturers**

(all can be accessed on the Web):

**Fiber Optics**

NalIVIR Research
RR Box 748
Highway 13 and Loop 532
Seaford, DE 19973
(302) 629-9933

Lighting Services Inc.
Industrial Park Route 9W
Stone Point, NY 10980-1996
(914) 942-2800

Lightolier
631 Airport Rd.
Fall River, MA 02720
(877) 99FIBRE ([877-993-4273])

Fiberstars
2883 Bayview Dr.
Fremont, CA 94538
(800) 327-7877

**LED**

The LED Light
1629 Tumbleweed Rd.
Fallon, NV 89406
(775) 423-7388

Ledtronics Inc
23105 Kashiwa Ct.
Corona, CA 92880
(800) 579-4875

**Cold Cathode**

SLI Miniature Lighting Ltd.
Beechtor Way
Bury St. Edmonds, England
+44 (0) 1284 762411
Safe Exhibit Construction Materials

The decisions made in choosing materials for proximity to artifacts can dramatically extend their preservation and well-being, or may inadvertently hasten their deterioration. In addition to the aesthetic, structural and performance characteristics considered when preparing new exhibitions or renewing displays, designers must consider potentially harmful interactions between construction materials and the sensitive materials they are exhibiting. Designers, often working closely with conservators, can make wise choices that will help to preserve artifacts on display.

The Material Safety Data Sheet (MSDS) provides a source of helpful information about construction materials, coatings, fabrics and finishes. Created to address human health concerns in industrial applications, the MSDS lists information about volatile organic compounds (VOCs) and chemical interactions, and may even describe the types of chemical compounds used in the product. After a general review of product literature and the MSDS, certain materials may be discounted because of the presence of undesirable components. Others may require further testing to determine whether they may give off acidic, alkaline, sulfurous or other harmful compounds. For example, oil based paints and varnishes are known to evolve acids even after they are fully cured. Sulfur capable of tarnishing metals and interacting with other artifact components may be present in wool fabrics, some fabric dyes, paints or gaskets. Materials containing these substances should never be used inside storage or exhibition enclosures.

Wood Products

It is ironic that one of the materials most commonly used in construction — wood — poses some of the greatest dangers to artifacts in enclosed spaces. Over the years, designers, fabricators and conservators have developed creative solutions to the problem of minimizing the presence of wood products in exhibit construction. This material has significant potential to damage artifacts by releasing acids, aldehydes and other volatile compounds. Certain woods such as oak release much greater amounts of acid than others, such as poplar or lauan. Birch and fir are of moderate acidity and should be encapsulated if used within the vitrine area. Plywoods may be chosen with exterior adhesives which contain more stable adhesives with lower offgassing properties than related products intended for indoor use. In general, particleboards have greater wood surface area and contain more adhesive than plywood, but some are marketed as “formaldehyde-free.” While they may reduce potential dangers from formaldehyde, they still release significant amounts of acids harmful to artifacts. Medium and high density overlay (MDO, HDO) are exterior plywoods with a paper surface that is easily covered with laminates or paint. These are made with exterior-type adhesive (usually phenol-formaldehyde) and are frequently used in the construction of exhibition cases. Construction materials made from wood products will evolve acids over time which can harm artifacts, so it is important to restrict their use where they will be in close contact with artifacts, or limit their ability to release acids by the use of physical barriers.

Wood products should be minimized as much as possible in the enclosed vitrine area of the exhibition case. Wood products can be replaced by other structural materials for the deck, risers and supports, such as Ethafoam 900®, aluminum, or aluminum/polyethylene laminates such...
as Alucobond®, Dibond®, Alpolic® or Alumalite®. Wood products can also be encapsulated in aluminum sheet products, or aluminum-based laminates such as Marvelseal®, which can be ironed on to plywood or other supports.

**Coatings and Paints**

Most coatings and paints applied over wood will not significantly reduce the release of acids and other harmful substances from wood products over the long term. Especially for case interiors, minimize the use of paint where possible, because many volatile substances are released from most paints during the initial phases of drying. Oil or alkyd resin paints or coatings should not be considered for use in exhibition cases. Acrylic latex paints are safer choices, but some latex paints contain sulfur, formaldehyde, or polyvinyl chloride, which can harm artifacts. Some environmentally-conscious paints (called low- or zero-VOC) have proven to be safe to use, but manufacturers may change product formulations without notice, so procuring up-to-date specifications and using testing procedures are important aspects of choosing products. Conservators and conservation scientists can provide suggestions, recent test results or testing methods. Some testing protocols require three to four weeks, so suggestions for materials must be made early enough to accommodate sufficient time for testing.

Similarly, appropriate curing time for glues, paints and coatings must be factored into the project schedule, especially for case interiors. Depending on the paint, coating or adhesive used, three or four weeks may be necessary to reduce the release of compounds such as ammonia and formaldehyde. This drying time is somewhat less crucial for areas where ventilation is good, such as open gallery spaces; however, in any circumstances incompletely cured materials may prove problematic in areas of platform contact with objects or in the hollowed interiors of bases.

**Fabrics**

Where fabrics will be used in case interiors, natural cottons or linens are often good choices, although fabric finishes may contain formaldehyde and dyed fabrics may contain sulfur or acidic components. Fire retardants sometimes

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**STABILITY OF MATERIALS COMMONLY USED IN MUSEUM CONSTRUCTION**

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<thead>
<tr>
<th>Most Stable</th>
<th>Less Stable</th>
<th>Unsuitable</th>
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<tbody>
<tr>
<td><strong>STRUCTURAL MATERIALS</strong></td>
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<td>Glass</td>
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<td>Metals including anodized aluminum, stainless steel, (although some can catalyze reactions with pollutants)</td>
<td>Baked enamel metals</td>
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<td>High pressure laminates such as Formica®</td>
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<td>Powder-coated metals</td>
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<td>Poplar or Lauan</td>
<td>Some woods and wood products including HDO and MDO</td>
<td>Some woods and wood products (variable, see details in &quot;Wood Products&quot;)</td>
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<td>Polyethylene (ester better than ether, but both unsuitable for long-term proximity)</td>
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<td>Polypropylene</td>
<td>Polyethylene (ester better than ether, but both unsuitable for long-term proximity)</td>
<td>Polyethylene (ester better than ether, but both unsuitable for long-term proximity)</td>
</tr>
<tr>
<td>Polyethylene teraphthalate</td>
<td>Cellulose nitrate</td>
<td>Cellulose nitrate</td>
</tr>
<tr>
<td>Acrylics</td>
<td>Polyvinyl chloride (PVC)</td>
<td>Polyvinyl chloride (PVC)</td>
</tr>
<tr>
<td>Polysyrene (not a vapor-barrier)</td>
<td>Acrylics</td>
<td>Acrylics</td>
</tr>
<tr>
<td>Nylon</td>
<td>Sulfur vulcanized rubber</td>
<td>Sulfur vulcanized rubber</td>
</tr>
<tr>
<td><strong>ADHESIVES</strong></td>
<td>Pressure-sensitive adhesives (contact)</td>
<td>Pressure-sensitive adhesives (contact)</td>
</tr>
<tr>
<td>Acrylic adhesives (pressure-sensitive not in direct contact)</td>
<td>Pressure-sensitive adhesives (contact)</td>
<td>Pressure-sensitive adhesives (contact)</td>
</tr>
<tr>
<td>Pressure-sensitive adhesives (contact)</td>
<td>Animal glue (sulfur)</td>
<td>Animal glue (sulfur)</td>
</tr>
<tr>
<td>PVA emulsion adhesive</td>
<td>Unaf-formaldehyde</td>
<td>Unaf-formaldehyde</td>
</tr>
<tr>
<td>Rubber cement</td>
<td>Rubber cement</td>
<td>Rubber cement</td>
</tr>
<tr>
<td><strong>GASKETS, CAULKING</strong></td>
<td>EPDM (some)</td>
<td>EPDM (some)</td>
</tr>
<tr>
<td>Neutral cure silicone caulk</td>
<td>Silicone containing rubber</td>
<td>Silicone containing rubber</td>
</tr>
<tr>
<td>Polyethylene foam</td>
<td>Polyethylene foam</td>
<td>Polyethylene foam</td>
</tr>
<tr>
<td>Polyethylene-based caulk</td>
<td>Polyvinyl chloride (PVC)</td>
<td>Polyvinyl chloride (PVC)</td>
</tr>
<tr>
<td>Silicone foam</td>
<td>Oil-based glazing compounds</td>
<td>Oil-based glazing compounds</td>
</tr>
<tr>
<td>PFTE</td>
<td>EPDM (some)</td>
<td>EPDM (some)</td>
</tr>
<tr>
<td>Acrylic caulk</td>
<td>EPDM (some)</td>
<td>EPDM (some)</td>
</tr>
<tr>
<td><strong>PAINTS AND COATINGS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acrylic paints</td>
<td>Shellac (prolonged solvent retention)</td>
<td>Oil-based or alkyd resin paints and coatings</td>
</tr>
<tr>
<td>Some water borne polyurethanes</td>
<td>Some polyurethane resins</td>
<td>Polyvinyl acetate emulsion paints</td>
</tr>
<tr>
<td><strong>FABRICS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unbleached cotton or linen fabrics (after washing)</td>
<td>Wool</td>
<td>Wool</td>
</tr>
<tr>
<td>Some polyesters</td>
<td>Fabrics containing sulfur-based dyes</td>
<td>Fabrics containing sulfur-based dyes</td>
</tr>
<tr>
<td><strong>PAPER PRODUCTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acid-free (neutral pH) paper products</td>
<td>Glossine</td>
<td>Glossine</td>
</tr>
<tr>
<td>Aluminum laminate vapor-barrier sheeting</td>
<td>Fire retardants (contact)</td>
<td>Fire retardants (contact)</td>
</tr>
</tbody>
</table>
added to fabrics can be extremely corrosive in direct contact with objects. Conservators often recommend prevashing fabrics in hot water, without soap, to remove surface finishes, but this process can complicate the fabrication process because fabric characteristics may be altered in the process, or they may require extensive ironing or other treatments afterwards. Wool and other animal protein-based fibers are a source of reduced sulfur, in addition to a potential food source for insects, and should not be used. Although silk contains sulfur, it is not as readily available as the sulfur found in wool. Fabrics must be tested before use to ensure they will not damage artifacts.

Gaskets
Gaskets made of rubbery materials are widely used in construction to seal joints between metal, glass, plastic or other materials. The term "rubber" once referred only to products made from the exudate of some tropical trees and plants, or natural rubber. Today this term denotes any substance with flexible, resilient, or "rubbery" properties. Many rubbery compounds are vulcanized with sulfur and should be avoided. Others made from silicone, polyethylene, polypropylene or Teflon® are often suitable replacements.

Mount Padding and Tubing
Tubings used to reduce abrasion of artifacts from contact with mounts may be made of similar rubbery materials, taking care to avoid unstable materials such as polyvinyl chloride or polyurethane. Various types of tubing can release sulfur, acids or other harmful substances. Some polyester felts with acrylic self-adhesive backings are safe to use as paddings. Modeling clays, kneadable putties and sticky or gummy substances used to adhere posters to walls should not be used in contact with artifacts as they can cause staining and become difficult to remove. Polyurethane or polyester/polyether foams are not suitable for prolonged contact with artifacts, but adhesive-free polyester batting and polyethylene or polypropylene foams are often good choices.

Adhesives, Sealants and Caulking
Adhesives are often used in attaching fabrics to decks and risers, or in the construction of structural components. Rubber-based adhesives and animal glues should generally be avoided, but acrylic-based adhesives are often good choices. Polyvinyl acetate emulsions (white glue) may be high in acetic acid. Some hot-melt adhesives are safe to use, particularly those comprising polyethylene and polypropylene, as are some self-stick tapes with acrylic adhesives. These can be effective for upholstering decks or assembling risers. Sealants and caulking should be neutral-cure silicone, to avoid the presence of acetic acid. Some acrylic sealants are safe to use, but should be tested before use. These materials should be allowed to cure and air thoroughly before installing artifacts.

In recent years, industry has turned to the production of products with lower environmental impact because of health and pollution concerns. Developing an understanding of the stability of different construction materials and choosing inert or non-reactive ones in exhibit preparation helps to ensure the long-term preservation of artifacts on display.

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Incorporating Conservation into Historic House Displays

by Nancy Davis

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Period installations use an open display format, with objects arranged in a room setting rather than inside exhibit cases. Thus, historical objects are vulnerable to physical damage from unauthorized handling and through physical jarring. A historic building often presents a harsh environment for objects, with constant dust accumulation, high levels of sunlight, and extremes in temperature and relative humidity. These hazards combine over the years to result in irreparable deterioration of sensitive museum collections.

Like any museum exhibit, a successful historic room installation begins with careful planning. A furnishings plan establishes how a room will be interpreted and identifies the objects, textiles, and finishes needed to create that interpretation. When developing the plan, try to use a combination of historical housekeeping practices and modern conservation techniques to preserve collection objects displayed in a historic room setting.

Using Traditional Housewifery Practices

Cookbooks have been in print since at least 1655, and the authors quickly began including advice on how to care for household furnishings (Anonymous 1655). Both the women who cleaned their own homes and those who were in charge of servants used these housewifery manuals to follow daily, weekly, monthly, seasonal, and even yearly schedules of maintenance. Several housewifery manuals were published each decade throughout the 1800s into the 1900s, leaving us with instructions that make it possible to incorporate period-appropriate practices into the interpretive plan for almost any American historic room display. This information can be used to supplement an inventory list or photograph of a room, and will prove invaluable when little is known about the original furnishings.

For example, historical practices can be used to prevent scratches to furniture. Although a piece of polyester felt or polyester film can always be used to keep an object from scratching a wood finish, more period-appropriate methods found in housewifery manuals include using a cloth for table settings (The most common exception is the dessert course, when the sweets and fruits would be arranged in dishes set on the bare table). “Table mats, of straw, or of oil-cloth lined with baize, are important, to save either waxed or varnished tables from the effects of hot dishes” (Beecher 1841: 351). Similarly, a “table rug” or “crumb-cloth” beneath a table was used to protect the carpet and floor, at least from the mid-1700s through the 1800s.
It should be noted that these manuals contain much advice that should never be followed, including cleaning and repair methods and ways to control infestations. Never use recipes from the manuals on collection objects, or the historic building fabric, without discussing the technique with a conservator or historic architect, as appropriate.

Two similar collection items can be rotated to limit the total exposure of each. The curator must determine whether it is preferable to sacrifice one object to the effects of long-term display or to have several objects undergo less damage. Always consider the substitution of an object of lesser value, or a modern reproduction, for an original collection object that will be damaged by long-term display.

Photocopies or photographic reproductions of original documents can be very convincing, especially when framed. Whenever possible, original photographs should be reproduced for display, with the originals and copy negatives stored archivally. If an original is displayed, frame the image using mats and backing boards that are acid-free, sulfur-free, and waterproof. When it is desirable to retain an original acidic mat for interpretive reasons, isolate the acidic mat with a smaller mat of archival board or with polyester film.

Installation of objects in a historic house museum must anticipate cumulative damage. Floors may need repair to correct spring, which translates into vibration, for example, of glass prisms on lamps. Always use a carpenter’s level and wooden wedges to level furniture, and make sure that objects sit securely on the furniture. Avoid placing any environmentally sensitive material, such as oil paintings or inlaid furniture, in the direct air flow from a vent. Either move the object or use air diffusers to direct the flow away from the object.

Displaying Environmentally Sensitive Objects

One or more exhibit cases can always be incorporated into a historic room display. A case designed in sympathy with the period furnishings can be used to display or highlight valuable or environmentally sensitive collection objects. Historical precedent for this technique includes the cabinets of curiosities developed by men of interest and means throughout the eighteenth and nineteenth centuries. Many historic house museums have traditionally used a room to display documentary evidence of the house and its residents, or to mount displays not directly associated with the house.

Displaying objects inside a conservation-grade exhibit case provides the highest level of protection from theft and vandalism and from environmental extremes. For security, either the case itself must have enough weight and bulk to be stable, or it must be attached to a larger object, wall, or feature. If the case is intended to provide a specific environment, it must be designed and built to conservation specifications. Usually, the case will need to be well sealed and have a maintenance chamber to hold a humidity-adjusting substance or a pollutant scavenger.

Reframing a print, drawing, or textile in a sealed package can stabilize the relative humidity inside and protect the image from water leaks. Creating a sealed-frame package
involves replacing or isolating all nonarchival materials, ensuring that excess moisture is not trapped in the paper substrate, and using gaskets and a moisture-barrier backing to form a tight seal. Ask about these techniques when choosing a skilled framer, or have the service performed at a paper conservation lab. Likewise, a backing board on an oil painting can help protect the canvas and stabilize the paint.

Security and Emergency Preparedness in Historic Structures

A monitored security system will help prevent unauthorized entry into the building. Motion-activated outdoor lighting and bars, grates, or special locks on basement windows are additional recommended security measures. At sites where a guided tour is not the norm, museums rely on a physical barrier, such as braided fabric ropes between stanchion posts or solid acrylic panels, to keep visitors from handling collections. Locating objects at arm’s length is a prudent precaution. Make small objects more difficult to pocket by attaching them to one another, or to a larger item, with monofilament. Consider the ramifications of this technique, however, if picking up one item will disrupt others, causing damage to metal, china or glass objects. Stabilizing small objects with conservation-grade wax is another option, when the materials are nonporous and will not be damaged or stained by the wax. Magnetic contact sensors or microswitches, weight sensors, pressure sensors, and built-in wire circuits can detect removal of valuable objects.

Fire is a threat for any institution, and an electronically monitored smoke detector is recommended for any historic house. Newer air-sampling systems can be almost invisible and so will not detract from a historic structure. An emergency preparedness plan is required, and in geographical areas susceptible to particular kinds of natural disasters, such as earthquakes or hurricanes, museum staff will need to develop special precautions. Exits from a historical installation can be especially confusing. Exit routes must be clearly marked, known by staff, and kept clear of obstructions. Pathways must be at least 36 inches wide to comply with the Americans with Disabilities Act, with a 60 inch diameter available at turns. Position objects to allow easy egress, and secure any object that could be bumped, such as framed items.

Lit candles create a serious fire risk, especially in a period setting cluttered with fabrics, furniture, and objects, and they can never be recommended from a preservation viewpoint. Instead, use electric fixtures with bulbs that imitate candles. Talk to a conservator before electrifying any collection object. When candles are insisted upon, never leave the flame exposed. If there is not an original glass globe for the piece, use a hurricane glass, even if inappropriate for the period represented. Use glass rings to catch dripping wax, and put out the flame with a candle snuffer to prevent splattering wax onto nearby surfaces and to limit the amount of soot produced.

Managing Light in Historic Settings

Recommended light levels are the same as those for any museum installation, a maximum of five foot-candles for very light-sensitive materials, including textiles and papers. Because a historic house installation is long-term, limiting the length of exposure is important. A lighting plan is critical. Use a light meter to measure levels in various parts of the room, at different times of the day, and during different seasons and weather conditions. Using this information, identify objects at risk and develop protective measures. Relocate light-sensitive objects to areas receiving less light. Practical methods of controlling light that have been used for centuries include window treatments such as lace or muslin panels, pulling window shades on a schedule following the sun, angling blinds to direct sunlight away from furnishings, and covering upholstery with two slipcovers.

More modern technologies to limit light exposure include installing low-voltage or fiber-optic lighting systems and using timers, switches, and rheostats to keep lights off or dimmed unless a tour is in progress. Avoid using collection lamps, especially if they have fabric shades. If these lamps are to be used, consider substituting a shade, and turn the lamp on only during dark periods, imitating its actual use. Connect the lamp to a remote switch so it is not jostled when
Train staff in housekeeping techniques appropriate for historic house museums.

being turned on and off, and use the lowest-wattage bulb available. Filter sunlight of ultraviolet radiation, using either a rigid plastic panel or a film. Choose a film that will also reduce the amount of infrared and visible radiation. Talk with a conservator about options. Any fluorescent light source and many tungsten-halogen lamps must be filtered of ultraviolet radiation.

**Care of Collections Through Seasonal Interpretation**

A site-specific housekeeping manual should be developed with a conservator about options. Any fluorescent light source and many tungsten-halogen lamps must be filtered appropriate for historic house museums, such as weekly for individual houses, outlining schedules and explaining cleaning practices. Train staff in housekeeping techniques appropriate for historic house museums, such as weekly dusting with brushes and magnetic-fabric cloths, vacuuming with a small nozzle on a hepa vacuum unit, and the more occasional wet-cleaning of ceramics and glass. Pattern some portions of heavier, annual cleaning on housewifery manuals, which, for example, recommend covering furniture with sheets and the dusting of ornamental plaster work once a year.

Seasonal interpretations offer a convenient time to rotate objects. Adequate work space and time must be allowed for new installations to be accomplished safely. Traditional seasonal practices can be modified to become part of the preservation plan for collections. For example, in the summer during the mid-1800s, carpets were often removed, cleaned, and stored, and strips of straw matting were placed over the floor. Muslin covers were slipped over upholstery. Conversely, in winter, mosquito netting around beds was replaced with curtains to protect from drafts. Today, these practices can be imitated to prolong the life of historic carpets and textiles.

Older taxidermy specimens are usually contaminated with insecticidal arsenic, and thus mandate special handling and display precautions. If it was preserved by freeze-drying, a specimen must be monitored for signs of rehydration. Even when a freeze-dried mount has been freshly prepared, its inherent oils and fats can migrate, so it is always necessary to isolate the mount from collection objects.

Imitation foods for table settings and kitchen displays can be hand-made using plaster or silicone that is tinted, foamed, or molded. When cost dictates, commercially available plastic and wax food can be used, but place a barrier such as a glass or polypropylene liner or a sheet of polyester film between the imitation food and any collection object.

At historic sites and houses where period cooking is demonstrated, thorough clean-up is essential. Storing food supplies in tightly sealed plastic containers reduces the likelihood of infestation.

Using live plants, flowers, and Christmas greenery introduces the threat of insect activity, damage from pollen, sap, or damp leaves, and moisture migration through a ceramic vase. The best safeguard is the use of silk flowers, or dried flowers and greenery. When real flowers are important to the interpretive plan—for example, when displaying flowers from the house gardens—inspect the flowers for insects. Purchase new vases for the arrangements. If historic containers must be used, line them with glass or plastic inserts. Remove the vase from the furniture before adding water, and protect furniture by covering an area the size of the arrangement with polyester film.

**Where to Go for Help**

Several excellent resources aimed specifically at the care and management of historic house museums have been written in the past few years. When developing your interpretive plan, talk with a conservator experienced in the care and conservation of historic objects. Select site-appropriate options from period housewifery manuals, and then discuss any concerns with the conservator.

**REFERENCES CITED**

Anonymous
1655 The Queen’s Closet Opened: Incomparable Secrets in Physick, Chirurgery, Preserving, Candying and Cookery.

Beecher, Catharine E.
1841 A Treatise on Domestic Economy, for the Use of Young Ladies at Home, and at School. Boston: Marsh, Capen, Lyon, and Webb.

**OTHER USEFUL RESOURCES**

Butcher-Younghans, Sherry

Heaver, Melissa M.

Raphael, Toby, with contributions from Nancy Davis

Sandwith, Hermione, and Sheila Stainton, compilers

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The 14th annual Exhibition Competition is the joint project of the following AAM Standing Professional Committees (SPCs): Curator's Committee (CURCOM), the Committee on Audience Research and Evaluation (CARE), and the National Association for Museum Exhibition (NAME). The competition recognizes outstanding achievement in the exhibition format from all types of museums, zoos, aquariums and botanical gardens.

Judging is based on the document Standards for Museum Exhibitions and Indicators of Excellence available from the SPCs. Judges can award one first place and one or more honorable mentions in each category. Competing institutions are divided according to budget: those with project budgets up to $50,000 and those with project budgets over $50,000 (both excluding staff salaries and benefits).

Eligibility

Any noncommercial institution offering exhibitions to the public may participate. Entrants need not be members of AAM. The exhibition must have opened to the public during 2001.

Entry Fees

A $50.00 fee is required for each exhibit entered. Make checks payable to the AAM Curators Committee. For multiple entries submit one check for the entire amount.

Notification and Presentation of Awards

Only winners will be notified. Each winning exhibition will be featured in a program at the 2002 AAM Annual Meeting in Dallas and will receive national recognition in the AAM publication Museum News. Staff from winning institutions will be expected to present overviews of their exhibitions at the AAM annual meeting.

Competition Policies

The SPC sponsors are not responsible for lost or damaged entries. All entry materials become the property of the Curators Committee and cannot be returned. Entrants agree to allow AAM and the SPC sponsors to use photographs of winning exhibitions, at no charge, in AAM publications. Entrants warrant that they have the right to allow such use. Institutions will be credited in any published reference to winning entries.

The exhibit will be judged based on the Standards for Museum Exhibitions and Indicators of Excellence, available from the competition coordinator or from the coordinators of the sponsoring SPCs.

To Enter

1. Complete the entry form.
2. Attach your check to the form. Make checks payable to the AAM Curators Committee.
3. Include 4 copies of each of the following materials to be used in judging:
   - Set of slides (not more than 20) depicting a walk-through of the exhibition. The purpose is to give a sense of the exhibition as a whole and not to highlight individual objects. Videos that supplement the exhibit may be submitted as a fulfillment of the optional materials category. Each slide should be labeled with the institution's name.
   - Narrative (not to exceed 10 double-spaced pages) of the exhibition that addresses the appropriate points in the Standards for Museum Exhibitions and Indicators of Excellence, which cites the criteria for judging entries.
   - Label text to include the whole text, if brief; otherwise, submit major concept labels and samples of subordinate labels.
Fourteenth Annual Exhibition Competition

ENTRY FORM

Exhibition Title

Name of Your Institution

Address

City/State/Zip

Phone/Fax

Contact Person

AAM Region

Amount of Check enclosed $  

BUDGET CATEGORY:

☐ less than $50,000  ☐ over $50,000

EXHIBITION CATEGORY

☐ Anthropology  ☐ Art

☐ Children’s  ☐ Physical Sciences

☐ Natural Sciences  ☐ History

☐ Other (describe)

Please separate the entry materials into four collated sets. Send entries to:

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ENTRY DEADLINE IS JANUARY 7, 2002

• Brief description of associated educational programs and publications.

• One-page exhibit budget with total cash costs and major subcategories. Do not include staff time.

• Single sheet floor plan of the installation.

• Evaluation materials. What methods were used to gauge the exhibition’s effectiveness in presentation of concepts to the intended audience? Include results. This may be incorporated within the ten-page narrative.

Optional Materials: (include four copies whenever possible):

• Exhibition reviews from media.

• Publications, such as catalogues, visitor guides, educational materials, promotional brochure(s), exhibit-related programs, and videos, not to exceed five items. Please label each item with the museum’s name and the exhibition title.

Entry deadline is January 7, 2002
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  - Student*: $35
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- Develops and conducts exhibit-related workshops and seminars.
- Provides products and services resources.
- Represents professional interests on a national level.

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