August 2011

Dear Colleague:

Attached here are sample narratives, schedules of completion, and summary budget forms from eleven successful applications to the FY2011 IMLS Conservation Project Support (CPS) grant program. These samples represent different types of conservation projects from both living and non-living collections. They emphasize the overall institutional conservation perspective, the involvement of conservation professionals in all phases of the project, and the importance assigned to projects being identified as one of the highest priorities for collections care for the applicant institution. Each of the samples was selected to illustrate a specific aspect of a competitive application in any category, as described below:

Survey projects

Oakland Museum of California: This application for a General Conservation Survey articulates the museum's concern with not only its collections but also its emphasis on the visitor experience and its mission to connect communities to California's cultural and environmental heritage. Its project design and the way in which the skills and expertise of museum staff are integrated with those of outside consultants are exemplary. The forward-thinking approach outlined in the narrative aims to give conservation a more public face through exhibitions and improved access, thereby encouraging new discourse with the public centered on our material culture.

Walters Art Museum: This application for support of a Detailed Conservation Survey addressing a new acquisition of works clearly outlines the project tasks and goals and makes a compelling case that resources will be deployed and managed efficiently and effectively. A "Conservation Window" will showcase work on these objects and give conservators a chance to discuss what they are doing and why with the public. Two visiting experts will help staff, interns, and fellows acquire specialized knowledge, which will build professional capacity for the future.

Mildred Lane Kemper Art Museum (Washington University): This modest survey project is well grounded in the museum's collections care planning efforts and exemplifies the museum's strong and robust commitment to conservation. A contract conservator working closely with experienced staff will complete a survey that will help staff identify those sculptures in most critical need of conservation and will provide a foundation for the long-range conservation and exhibition of the museum's sculpture collection.

Treatment Projects

American Museum of Natural History: This project demonstrates systematic strategic planning for collections care improvements and exemplary general curation of the most important at-risk specimens of a significant natural science collection. The project strategy and technical tactics relating to treatment have been well evaluated and tested, which adds

strength to the case for the project's potential for success. The training workshop that will be developed as a result of this project will benefit the conservation and natural science fields and will provide valuable experience to interns and volunteers who participate in it. Increased accessibility and new information about the conservation methods specific to this type of collection are among the impacts identified. Captioned photographs helped underscore the need for treatment of objects.

Henry Francis Du Pont Winterthur Museum: The application is exemplary for its level of detail, its clarity, its conciseness, and its well-written presentation. The project design not only addresses the practical side of conservation but also includes a valuable analytical component that will benefit the conservation and scholarly community.

Memorial Art Gallery (University of Rochester): This application focuses on an important, 16th-century fragile tapestry that is currently inaccessible for exhibition, education, or research. The project design, which includes specialized conservation services augmented by art historical research, publication-grade photography, and development of an interactive, multimedia, Web-based presentation on the tapestry's conservation and historical context, is intended to resolve that. The financial and research collaboration between the contract conservator and the museum staff are especially admirable.

Environmental Improvement Projects

Newark Museum Association: This proposal's project design is thorough with clear objectives and demonstrates the efficacy of having a quality ongoing association with a professionally trained conservator for both project planning and execution. The proposal documents the organization's strong commitment to collections care and to upgrading storage, qualifying this project as a logical next step in the long-range plan.

Hearst Museum of Anthropology (University of California Berkeley): This application is the result of a series of thoughtful collections and institutional self-evaluations and is well integrated into the museum's long-term institutional reorganization. It benefitted from consultation and collaboration with subject-matter experts both locally and further afield, and underscores the institution's strong commitment to collections care and preservation.

Memphis Zoo: This project addresses the zoo's highest priority conservation needs as identified both through internal review and through the AZA accreditation process. It demonstrates the zoo's commitment to evaluated animal health and behavior changes and to sharing the results with their professional community as well as their visitors. The goals and work plan are reasonable and cost effective.

State Botanical Garden of Georgia: This project addresses a top conservation priority identified through surveys and reflecting the institution's commitment to stewardship and restoring native plant diversity in the floodplain. The project activities are systemic, well-aligned, and appropriately sequenced, and the experience will be relevant for not only a

larger area of the garden's property but also those of regional landowners and land managers, thus extending the public value of the work.

Yale University (Peabody Museum of Natural History): This rehousing project is a well-justified next step in a solid plan to address all housing and storage needs for a vast collection of diverse materials. Its well-documented and well-planned project design for installing and filling new cabinets, shelves, and drawers addresses the fragility of the collection and belies the undertaking of a pilot project that provided data for accurately estimating the time required for the larger effort. The project will result in better documentation for the collection, which will be useful in future planning, processing, and research; and improved access for study and monitoring.

We hope that these sample narratives will be useful to you as models for structuring a proposal addressing your conservation needs. Please contact us if you have any questions. We would be happy to assist you and discuss any questions you have as you develop your proposal.

The application deadline for the 2012 Conservation Project Support grant program is October 3, 2011. Applications for CPS are available from the grants.gov Web site (www.grants.gov). We look forward to receiving your application.

Sincerely,

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IMLS Conservation Project Support Narrative
The Oakland Museum of California Foundation

Statement of Need

The Oakland Museum of California (OMCA) requests support to conduct a second General Conservation Survey of the Museum's facilities and collections. The first General Conservation Survey was completed in 1989 and established a 20-year strategic plan for collections care. The results from this proposed re-survey will identify the Museum's most pressing conservation needs, and will be used to plan and prioritize the next long-range plan for collections care and facilities improvements.
The permanent collections of the Oakland Museum of California (OMCA) contain more than 1.9 million items, including works of art, historical artifacts, ethnographic materials, natural specimens, and photographs of astonishing scope and diversity – representing the material legacy of California and its people. No other institution has assembled such a full and distinguished, multi-disciplinary, California collection, which makes it particularly relevant to the local and statewide community.

The Oakland Museum of California collections include Art, History and Natural Sciences collections. These each date back to the collections of three founding institutions founded in the early 1900s that came together in the 1960s to form the Oakland Museum of California. This merger of the Oakland Public Museum (founded 1910), Oakland Art Gallery (founded 1916), and Snow Museum of Natural History (founded 1922) created what OMCA is today. While OMCA's collections contain some elements of these "legacy" collections, they all share a focus on California, as well as its relationship with the rest of the country and the world. Each of the Museum's three collecting departments has a large permanent gallery where portions of the collections are always on view for visitors and researchers to enjoy and study. Interpretation is provided by object and thematic labels, audiovisual presentations, interactive computer and video terminals, self-guiding brochures, docent-guided tours, and educational programs.

The Oakland Museum of California is a department of the City of Oakland, under the governance of the City Administrator, Mayor and Oakland City Council. The City of Oakland holds title to the Museum's collections. The Museum acknowledges that collections care is a fundamental responsibility, and commits to providing the optimal conditions for the preservation of all specimens, artifacts, and works of art in its care, including both permanent collections and loans, in order to preserve their scientific and cultural worth. To this end, every effort is made to incorporate professionally accepted conservation principles into routine Museum practice. Recognizing that the Museum's statutory responsibility toward the preservation of its collections justifies necessary expenses for supplies, equipment, and staff, the Museum endeavors to provide these funds in balance with its other programs. Artifacts are not accepted into the collections unless there are sufficient funds or facilities for their care and conservation. In all matters regarding the acquisition and use of objects or specimens, we consider that the care and conservation of the collections is paramount. The Museum maintains a collections care plan that sets priorities for the care of the collections as a whole and for the care and treatment of individual specimens, artifacts, and works of art.

In 1989, the IMLS supported OMCA to conduct its first General Conservation Survey of

collections and environmental conditions. At that time, eight consulting conservators spent a total of 29 days on-site and examined the Art, History, and Natural Science collections as well as overall facility and operational conditions. Their individual reports were consolidated into a comprehensive overview, which further led to a prioritized long range conservation plan, incorporated into the institutional strategic goals. The long range conservation plan identified 18 separate areas needing attention. The following year, the Museum conservation department began addressing these needs with yearly grant-supported projects that incrementally resolved these issues in priority order, a process that led to 18 major projects in the past 20 years, along with numerous related activities (see Attachment OMCA Conservation Department Accomplishments). Just last year, with partial support from the IMLS, the Museum completed the sole remaining project on the long-range plan developed in 1989 (Costume and Textile Collection Storage Improvement Project). The initial 1989 IMLS General Survey was unquestionably the critical event that made much of the ensuing progress possible.

OMCA conservation staff and the senior curatorial team recognize that the resolution of all the major issues identified in the 1989 survey demand a new assessment of needs and priorities so that we can respond proactively and strategically to collections care over time. OMCA needs a progressive long-term strategy that balances long-term Museum collections care issues with institution-wide issues over the long term.

In addition to needing a new strategic plan for conservation that maintains the momentum set 20 years ago, there have been other significant advances in the Museum's recent past that changed the institution to a degree unimaginable 20 years ago. For example, in June 2006, OMCA completed the construction of a new off-site collections facility – the California Collections and Research Center (CCRC) – that now houses about 90% of the Museum's fine art, cultural history, ethnography, photography and science specimen collections (the remaining collections are in the Museum). Structural improvements to the 62,400 sq. ft., warehouse included earthquake bracing, a new seven-layer insulated roof, walls that were waterproofed and insulated, and epoxy floor treatments. A new HVAC system was installed and tested to achieve strict standards of temperature, humidity, and pollution filtration. Fire suppression, security systems, and communication systems are in place and have been tested. With support from the City of Oakland, National Endowment for the Humanities, and the IMLS, high-density, mobile storage equipment was purchased and installed.

Secondly, a $63M major renovation of the Museum building (fundraising complete, construction two-thirds complete) has resulted in major gallery reinstallations which include: upgraded environmental improvements; a 75% decrease in ambient light, and new low-voltage lighting systems that together achieve Museum-standard illumination; an Oddy-testing protocol for all exhibit materials, along with universal microclimate case construction; improved earthquake mitigation measures; new collections-rotation policies; and a comprehensive disaster preparedness and response plan. Lastly conservation staffing has been increased and more fully integrated with our overall collections management activities, and new facility management and IT resources have been added to the team.

Finally, there has also been considerable expansion of the Museum's collections since 1989. At that time, the Museum was 20 years old, and the vast majority of the collections were from the 19th and early to mid-20th Century. Since that time, collections representing the later 20th

Century have grown significantly. During the past three years, the Museum has accessioned approximately 471 activity groups of objects from specific sources. These include approximately 200 activity groups in Art (including paintings, sculpture, craft objects, photographs, and artist memorabilia), 167 activity groups in History (including artifacts and photographs), and 3 activity groups in Natural Sciences (including a fabricated model of a mastodon and three models of northern elephant seals for future use in the collections gallery, photographs for exhibition use, and a collection of cured otter pelts).
Some single acquisitioned collections contain thousands of images. In 1995, the Oakland Tribune newspaper, founded in 1874, donated its collection of news negatives and photographs, also known as its photo "morgue." The collection contains about 3,000 negatives and a million photographs, all of which have been catalogued and rehoused. In 2007, the Museum received 275 works of contemporary California art from Ted and Ruth Nash, a gift that strengthened OMCA's already robust collection of California ceramics. Additional acquisitions include time-based media and installations by artists such as Tom Marrioni, David Irelend, John Baldesari, Bill Viola, and others.

The dramatic improvements in conservation of the collections over the past two decades, the significant facility, exhibition and storage improvements, and the major expansion in scale and scope of our collections, taken together create an ideal and unique opportunity for the Museum to re-survey its collections care activities, facilities, and operations.

Project Design

The goal of this project is to complete a General Conservation Survey with the long term objective of establishing a new long-range plan for conservation that will serve OMCA for the next decade and beyond. This survey will be conducted by consultants with the highest level of expertise in all collection areas including: operations and facilities, paper, ethnographic and natural science collections, objects, photography, time-based media, paintings, costumes and textiles. The survey will also take into consideration institutional priorities, especially related to OMCA's emphasis on the visitor experience and transparency in our mission to connect communities to the cultural and environmental heritage of California.

A second collections survey is the Museum's top conservation priority at this time because it is the most effective way to bring all institutional constituents into agreement on future collections priorities, and speeds the path to their achievement. The inclusion of outside specialists gives OMCA the benefit of fresh perspective, and serves to unite the varied departments of the Museum behind a common set of goals.

The proposed survey project will be based on the same model successfully employed in 1989: a team of 8 consulting specialists will survey various areas of the Museum collections and operations and submit reports detailing their findings and recommendations. Conservation staff will consolidate these separate reports into a comprehensive overview, with the combined recommendations organized into broad categories (collections, facility, operations, etc). The leadership team will develop and ratify a prioritized plan to establish the direction for conservation activities moving forward.

The 1989 survey was OMCA's first general conservation survey of the Museum collections ever. Out of necessity, it concentrated on a multiplicity of remedial collection and operational

details. In contrast, the proposed survey has the advantage of numerous changes in conservation and collection management in the past decades and can therefore focus increasingly on more holistic strategic opportunities, rather than individual object examinations. For this reason, we have decreased the number of days onsite for each consultant and concomitantly raised the staff contribution. With a collection of nearly 2 million objects, OMCA expects and welcomes remedial recommendations, but also looks forward to a broad holistic review of universal problems and collective institutional issues, including the less traditional areas of open-access, new media, and audience interaction that may impact our collections care activities.

This current survey will differ slightly from the last due to an increasing attention to the combination of conservation and education/curatorial activities that occurs in a 21st century Museum. In its effort to put the visitor experience as primary, the Museum aims to increase transparency and merge the more traditional back-of-house activities with ongoing educational and programmatic initiatives. OMCA is actively engaged in research to explore this potential with specifically funded multi-year initiatives. Such innovative strategies are certain to impact our conservation programs and methodologies. Incorporating conservation into exhibition programs can reveal the under-structure of Museum activity, and also encourage dialogue around the interpretations of tradition and meaning arising from material culture in the digital age. The pressure for increasing open-storage accessibility, and improved research opportunities, such as digital availability of collections information, as well as the expanded technological capacity needed for constituent discussion and feedback (social media) all question the balance between authoritative and public. These pressures both directly and indirectly impact the Museum's collections care policies and programs. Furthermore, time-based media, digital media, and other non-traditional collections also influence collections care policies and conservation planning. To ensure we have the best thinking in this regard, we have chosen experienced conservators who, beyond their well-regarded traditional subject experience, also demonstrate expertise in these more progressive and innovative collections areas. The resulting comprehensive plan should well serve to move OMCA forward for at least the next decade.

Beyond recruiting the highest level of expertise in all collection areas, we have also engaged conservators that are already familiar with our institution, its history, and our programs. Fortunately, the Bay Area hosts many of the nationally recognized experts. A few exceptions (ethnographic/natural history, and time-based media) have required OMCA to seek experts outside our immediate area, and we are fortunate to have engaged professionals who are both widely respected experts in their field and also very familiar with our institution.

Activity 1: Planning and Preparation. Conservation staff contact, coordinate and schedule with the eight visiting conservators. A packet of materials that shows the results of the initial 1989 survey, along with details of the subsequent work done to address their recommendations, will be sent to each of the consultants several weeks before their site visit. We will also include copies of other informative relevant documents such as a standard Museum facility report, our current strategic plan, and our Emergency Preparedness and Response plan, in addition to any other pertinent documents.

Activity 2: Initial Operational Survey: Jill Sterrett, Director of Collections and Conservation at SFMOMA, will review the 1989 survey and the work to date, as well as OMCA's multi-year

collections/audience initiatives. After the review, she will work with the conservation staff to help set a framework for the subsequent surveys that engage with curatorial and education programmatic agendas, and address the more global and progressive collections access activities that the Museum is developing. This is expected to take one day, with a follow-up later in the project.

Activity 3: Specific Site Surveys: After a review the 1989 report and a summary of the work done to date, each of the consulting conservators will survey both general conditions in collection areas (exhibition and storage) and the present condition of collections and facility areas within their field of expertise. They will view Museum exhibition and storage locations, undertake spot examinations of collections, review environmental conditions, operational methodologies and collections policy, and interview key staff.

Activity 4: Individual Reports: Consultants will submit a draft report of their findings, along with their initial prioritized recommendations and strategies for improvements. After a review by Museum conservation staff, annotated copies of all the reports will be distributed among the consultant team, in an effort to clarify areas of overlap and assist in developing priorities. John Burke and the consultants will communicate by phone and email briefly to address any inconsistencies or areas that need clarification, and the need for any other cross- consultant information sharing prior to completion of the individual final reports.

Activity 5: Operational Survey: Jill Sterrett will survey Museum facilities and operations overall, concentrating on environmental and operational conditions which impact collections (HVAC, lighting, IPM, security, collection management policies, etc). She will be given access to the preceding specific site survey results and, with the benefit of her Activity 2 survey, and the information from Activity 4, advise us on developing a plan that balances conservation issues with TBM and other progressive collections access programs. She will incorporate the results of this synthesis into her report to guide not only the strategic plan for conservation, but also the associated curatorial and education activities and programs as well.

Activity 6: Final Report Preparation: Museum conservation staff, directed by John Burke, will consolidate all the individual recommendations into a cohesive master report that organizes the various findings and recommendations into a narrative that looks at the Museum activities, problems, and recommendations overall. This report will be given to the curators, registration staff, educators, and exhibition staff to review, and a series of meetings scheduled to discuss the results, and begin establishing priorities and timelines for future implementation. The ultimate objective is a prioritized long-range plan for conservation activities as part of the Museum's overall strategic plan.

Project Resources: Time, Personnel, Budget

In this application, we are asking IMLS to provide support for one coordinating project staff member, as well as the daily rate for each Consulting Conservator including any travel or hospitality needs. This project will also require time on the part of OMCA's Chief Conservator, Object Conservator, Paintings Conservator, and Paper Conservator. However, the project is part of an institution-wide effort. All Chief Curators will be involved in the project as well as the Museum Executive Director and other curators. Museum Registrars and Assistant Registrars from each department will also work with consulting conservators. As needed,

Museum technicians with at least two years of work experience in handling of Museum collections will assist the visiting conservators.

John Burke, Chief Conservator and Project Director, assisted by Pamela Skiles, Painting Conservator, will be the principal contacts with the consulting conservators throughout the project. They will coordinate the site visits and coordinate staff conservators and other key personnel with their respective activities, as well as facilitating the recommendation review process, and follow-up with the consultants. Museum conservation staff, Julie Trosper, Object Conservator, Pamela Skiles, Painting Conservator, and Peng-Peng Wang, Paper Conservator, will be in direct contact with conservators in their areas of expertise, and will assist in the preparations, site surveys, technician and registrar coordination, writing and development of the final report. The Museum Registrars, Joy Tahan, Susana Macarron, and Carolyn Rissanen, will direct any required object location searches or collection movement activities, and will also participate in the preparation and debriefing sessions, along with site surveys in their respective departments as required, and will contribute their recommendations to constructing the final report. Curators in all content areas, including Philip Linhares, Chief Curator of Art, Louise Pubols, Chief Curator of History, Douglas Long, Chief Curator of Natural Sciences, and Barbara Henry, Chief Curator of Education will discuss priorities and program directions with the consultants. Assistant Registrars and Technicians will also be available throughout the site surveys to assist and facilitate the needs of the consultants.

Consulting Conservators
Each conservator listed has committed to this project. Their titles are included in the “List of Key Project Personnel” and their Letters of Intent and Resumes are also included in this application packet.

Conservator	Area	On-Site	Writing	Total
Elizabeth Cornu	Objects	4	5	9
Debra Evans	Paper	3	4	7
Tom Fuller	Ethno/Nat. Science	3	6	9
Pauline Mohr	Paintings	2	4	6
Denise Migdail	Costume and Textiles	2	4	6
Martin Salazar	Photography	2	4	6
Jill Sterrett	Operations	4	5	9
Glen Wharton	Time-based Media	2	3	5

John Burke, Chief Conservator at the Oakland Museum of California, will serve as Project Director, with overall responsibility for project staff, activities, and budget. Mr. Burke has directed conservation activities at the Museum since 1982 and specializes in the Museum environment and conservation of historic objects and artworks. From 1986-2003 he was adjunct Professor in John F. Kennedy’s Museum Studies Program. From 1996-2002, he served on the Board of Directors of the American Institute of Conservation, as Director of Professional Education and Director of Specialty Groups. He led the 1989 General Conservation Survey and all subsequent conservation projects at the Oakland Museum of California.

The Oakland Museum of California is actively involved in collections care and conservation utilizing established procedures of exhibits preparation and installation, staff training in the proper handling of artifacts, monitoring environmental conditions, appropriate housing for collections in storage, and conservation treatment of specific objects as funds are available. The Museum has a full-time Chief Conservator, three part-time Conservators and a conservation technician, and a well-equipped 3,600 sq. ft. Conservation Center located one block from the Museum.

The project budget was developed by John Burke, Julie Trosper, Pamela Skiles and Peng-Peng Wang with input from all eight conservators listed above. All conservators have agreed to work on this project and are enthusiastic about the direction of the Oakland Museum of California's collections priorities. Particular conversations with Jill Sterret of the San Francisco Museum of Modern Art have assisted in this project design.

Impact

The General Conservation Survey report will help summarize the successes achieved by OMCA's Conservation Department in the last two decades, identify where needs still exist, and determine what new opportunities exist due to changes in technology and conservation knowledge since the first survey conducted in 1989. After the staff has reviewed the findings and recommendations of this General Conservation Survey, John Burke will guide the leadership team to distill the overall priorities into a concise long-range plan for conservation activities. This plan will be ratified by the Leadership Team and form the goals for the collections care agenda into the next decade and beyond.

The final report produced by this survey will provide priorities for the next steps to be taken towards ongoing care of collections. These steps will be separated into short-, mid-, and long-term activities. After ratification by the Museum's Executive Director, OMCA will have a vital tool for working with the Museum's staff, donors and constituents to raise both funding and awareness of conservation needs. The document will also support the Museum's goal of integrating collections and conservation activities into the programmatic and public realms, increasing the Museum's responsiveness to its community.

The team-based approach to this survey will guide similar activities in other regional Museums and thus benefit the field as a whole. The unusual combination of art, artifacts and natural sciences objects makes our General Conservation Survey more comprehensive than that of other single disciplined Museums. One of OMCA's highest goals is "to preserve the legacy of the State of California by maintaining a suitable and secure environment and professional programs of conservation and restoration for the permanent collections the Museum holds in public trust." Other regional Museums with similarly multi-disciplined holdings look to the Oakland Museum of California to uphold the best-practice standard of collections care. Since the Museum is also known for its educational and community-related programming, the integration of these two efforts will be of interest as well.

The final report, along with our long-range plan, will be posted online for public and professional access. Subsequent projects to address the recommendations in the plan will also be incrementally added to the online narrative to document progress and provide a living educational resource for Museum conservation planning.

SCHEDULE OF COMPLETION

General Conservation Re-Survey

July 1, 2011 – June 30, 2012

ACTIVITIES	**2011**					**2012**						
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Activity 1: Planning and Preparation												
Activity 2: Initial Operational Survey												
Activity 3: Specific Site Surveys												
Activity 4: Individual Reports												
Activity 5: Operational Survey												
Activity 6: Final Report Preparation												

Section B: Summary Budget

	$ IMLS	$ Cost Share	$ TOTAL COSTS
1. Salaries and Wages	15,120.00	88,965.00	104,085.00
2. Fringe Benefits	4,536.00	39,353.00	43,889.00
3. Consultant Fees	57,000.00		57,000.00
4. Travel	1,074.00		1,074.00
5. Supplies and Materials			0.00
6. Services			0.00
7. Student Support			0.00
8. Other Costs	800.00		800.00
TOTAL DIRECT COSTS (1—8)	78,530.00	128,318.00	206,848.00
9. Indirect Costs			0.00
TOTAL COSTS (Direct and Indirect)	78,530.00	128,318.00	206,848.00

Project Funding for the Entire Grant Period

1. Grant Funds Requested from IMLS	78,530.00
2. Cost Sharing:	
a. Cash Contribution	128,318.00
b. In-Kind Contribution	
c. Other Federal Agencies*	
d. TOTAL COST SHARING	128,318.00
3. TOTAL PROJECT FUNDING (1+2d)	206,848.00
% of Total Costs Requested from IMLS	3,800.00%

* If funding has been requested from another federal agency, indicate the agency's name:

I. STATEMENT OF NEED

The Walters Art Museum in Baltimore requests a Conservation Project Support grant from the Institute of Museum and Library Services (IMLS) in the amount of $58,607 to undertake a detailed condition survey of Southeast Asian works of art given to the museum by the Doris Duke Charitable Foundation. When the Trustees of the Foundation approved a plan to distribute Ms. Duke's collection, in 2002, they recognized the Walters as holding one of the finest collections of Southeast Asian art in the United states and gave 162 works of art, including, manuscripts, works on paper, paintings, ceramics, furniture, armor, sculpture, and textiles primarily of 18th-20th century Thai origin. The Walters and the Asian Art Museum of San Francisco were the primary recipients of this important collection.

The Walters was founded by father and son William and Henry Walters, who amassed a comprehensive collection of world art from pre-dynastic Egypt into the early 20th century. Their collection of 22,000 works of art established the museum that opened to the public in 1934, and the permanent collection now contains nearly 30,000 objects, more than a third are from China, Japan, India and Southeast Asia. The Duke gift of Southeast Asian art has greatly enriched an already strong collection.

Over the years, the Walters has systematically and responsibly surveyed, developed and executed improvements to storage and display and provided preventive care and treatment of its collections. A detailed survey of the Duke material is currently the highest priority in collections care at the Walters. The survey is the first step in the process of safely integrating these works into our permanent storage facilities to permit conservation monitoring, preventive maintenance, and treatment. Most of the Duke works are currently packed in acid-free materials and moving boxes in the climate controlled offsite storage facility Artex, located in Landover, Maryland (approximately 25 miles from the Walters), where they are inaccessible to conservators. The majority of these objects demand a level of care and monitoring that is best provided within the museum. After the survey, 121 objects of the collection will be relocated to permanent storage in the museum. Due to a temporary limit on the Walters' available storage space, 41 objects, the largest in the collection, will stay in offsite storage. The survey will produce a condition report for each object, treatment proposals and conservation priorities, and recommendations for their storage and display. Based on survey findings, a long-range plan for preservation of the Duke material will be developed. Objects that can be cared for by Walters' conservators will be scheduled for stabilization and treatment. For objects that cannot be treated in-house, the museum will hire specialist contract conservators.

Preservation of the Walters' Duke collection is our ultimate goal. Some objects from the collection were badly damaged by the humid climate of Thailand and some were exposed to infestations from termites. In addition, less-than-ideal storage methods at Ms. Duke's residence contributed to their degradation. For example, in 1999, Hurricane Floyd impacted much of the East Coast and caused further damage to some rare furniture and textiles stored in Ms. Duke's covered red clay tennis court. Conservators anticipate working to remove visible tide lines left on some of these objects following the flooding of the storage space. Eventually, after relocating, rehousing and stabilizing the objects, the Walters will make the Duke collection accessible to the general public by placing images and the results of the conservation survey on our museum website (thewalters.org) and incorporating the collection into permanent gallery displays and educational programs.

This project will fulfill three institutional priorities: 1) survey the Doris Duke gift of Southeast Asian Art, especially the banners, scrolls and paintings on un-stretched textiles as the initial step toward long-term preservation; 2) reorganize, expand and bring stored objects from offsite storage to the main museum to increase conservation oversight and accessibility; and 3) make conservation information easily available to the staff and public. In 2009, in preparation for accommodating the Duke collection and this survey, museum leadership and our Board of Trustees recognized the need for timely action, expanded space, and improved conditions for storage; dedicating staff time and financial resources to

make the necessary changes. In 2010, additional storage space was created. This will allow us to begin the process of retrieving the Duke collection objects in preparation for the survey.

Ability to Complete the Project

Preservation of the Walters' permanent collection is an essential and integral part of the museum's activities. The Division of Conservation and Technical Research, established in 1934, includes eight full-time conservators, two one-year conservation positions, a Mellon-funded conservation scientist, and a part-time office administrator. The Division is dedicated to education and training and continuously hosts third year conservation program interns, pre-program conservation volunteers, and a Mellon-funded fellow. We have four labs specializing in paintings, manuscripts and paper, objects, and scientific research. Conservators are responsible for inspection, examination, preventive maintenance, and treatment of art works. We participate in activities for loans, temporary exhibitions, protection and movement during renovations and reinstallations, and environmental monitoring in conjunction with other staff. Conservators also are encouraged to undertake technical and research projects based on the collections.

The Walters has significant experience with specific object condition surveys. Most recently, detailed object surveys include: the Bourne collection of Ancient Americas objects (320 ceramic, wood, jade, ivory and stone objects, 2009-2011); selected Western manuscripts (124 mss, 2010-2011); frames in storage (300 frames, 2007-ongoing, 75% complete); Islamic manuscripts (279 mss, 2008); French drawings (486 drawings, 2002); and the Ford Collection of South Asian and Himalayan Art (200 paper, metal, paintings, ceramics and wood, 2000-2001). Older surveys include Barye bronzes, stained glass, furniture, and miniatures. We have completed general surveys of the entire facility and periodically update them. These surveys have been accomplished using a variety of different information recording systems such as paper-based forms, FileMaker Pro, Microsoft Office Access, and Microsoft Excel spread sheets. Samples of surveys completed by Walters' conservators are included in the Mandatory Attachment File of the application package.

The Walters has a deep commitment to the conservation of the art collection we hold in the public trust. As we clearly state in our institutional mission, the Walters "preserves and develops in the public trust a distinguished collection of world art from antiquity to the 20th century." Even as it faces real financial constraints, the Walters' museum leadership and Board of Trustees has devoted significant resources toward improving collections care over the past several decades. A significant amount of staff time from the Divisions of Conservation and Technical Research and Exhibitions and Collections Management is currently allocated to an IMLS Conservation Project Support grant to retrofit 40 display cases housing objects currently experiencing serious deterioration. By the end of the project 190 objects will be treated and reinstalled into contaminant-free cases. As part of an IMLS grant funded project in 2005, a cash match of $40,000 was invested in support of environmental upgrades in Hackerman House, an 1851 historic house in which our Asian art collection is displayed. A new Johnson Controls Metasys System was installed to better regulate the HVAC system and fifty Onset data loggers (U 12) and Elsec data loggers were purchased and deployed to monitor temperature, relative humidity, and light levels. The temperature and relative humidity setpoints were effectively relaxed to protect the historic structure. Other successful IMLS supported projects include: Conservation and re-housing of seven fragments from two rare Egyptian papyri rolls (2000-2003); treatment and stabilization of our Islamic manuscripts (1998-99); treatment of our portrait miniatures (1994-95); a survey of our portrait miniatures (1993-94); and treatment of 17 Asian objects (1990-91).

II. PROJECT DESIGN

The goals of the project are to complete a detailed condition survey of 162 works of art from the Duke collection, prepare a plan of action to achieve care and maintenance needs of the objects, and safely relocate the majority of the objects into accessible, conservation-quality in-house storage.

The detailed condition survey will be conducted by the Walters' conservators and by contract conservators who will assist with the examination of paintings on un-stretched textiles and lacquer objects. The Walters' conservators will facilitate the work of the contract conservators, especially in the rolling and unrolling of the large banners, and will learn from the specialist conservators at the same time. The museum's Curator of Asian Art will provide information about the objects' function, religious or ritual significance, and desired appearance for the survey. The Walters' conservation scientist will help with the identification of materials, and interns will participate and gain experience in survey and storage techniques.

The Walters' Administrator of Museum Databases and a contract software developer will develop custom survey forms using data fields provided by conservators and a software package called the Conservation Tracker System which is a networked SQL Server database application supported by the Andrew W. Mellon Foundation in New York. Throughout the survey, conservators will examine each object and enter the information into the custom forms. Because Tracker interfaces with our collection management software, The Museum System (TMS), the information will be integrated directly into the database and linked to object records. These will be the first conservation records linked to our TMS resource. The survey forms will be customized by the type and needs of the objects and materials and will include checkboxes, dropdown lists, narratives, and other commonly used survey formatting techniques. The Walters will be one of the first museums, in addition to the Philadelphia Museum of Art, to use Tracker. Tracker is free to the nonprofit museum community and we will advance and promote this software with the conservation community.

Each object included in this survey has already been accessioned into the Walters' permanent collection and basic data has been entered into TMS. The 121 objects that will return to the museum from offsite storage will be transported to the museum prior to the survey. The transportation cost for these objects is not part of this IMLS request and will be expended prior to the grant period. The 41objects remaining at Artex will be retrieved and their crates will be opened prior to the arrival of the conservators who will conduct the survey. They will be repacked after examination. As needed, these objects will be dusted, vacuumed, and re-crated with fresh and additional storage materials.

In order to survey 162 objects, the Walters will conduct the following work:

- Hire contract software developer, Thomas Murphy from Inventive Software Solutions.
- Hire contract conservators, Shiho Sasaki, Conservator of Paintings on Paper and Silk at the Asian Art Museum of San Francisco, and Donna Strahan, Conservator of Asian Objects at the Metropolitan Museum of Art.
- Hire paper technician, Vincent Carney, independent paper technician.
- Order basic housing supplies and survey equipment. Most equipment is needed to complete the offsite survey work at Artex. Housing supplies are primarily for storage mounts for objects in museum storage and banners and scrolls at Artex.
- Survey, rehouse and relocate objects.
- Prepare final long-range plan for the Duke Collection based on survey findings.

Survey object examinations and site visits will occur in the following order:

Survey of the Manuscripts

The Walters' Head of Book and Paper Conservator Abigail Quandt will survey four accordion-folded, double-sided manuscripts. We anticipate that these four manuscripts will require stabilization prior to their participation in a digitalization project at the University of Pennsylvania. The Walters' art handlers will bring the manuscripts to the paper lab. Storage boxes will be ordered. Independent paper technician Vincent Carney will customize and add trays for safe handling to the drop spine clamshell storage boxes. The manuscripts in their new boxes will be stored in the Department of Manuscripts and Rare Books at the Walters.

Survey of the Objects

The Walters' Senior Objects Conservator and Project Director Meg Craft will survey the 89 three-dimensional objects and complete their survey reports, assisted by interns and pre-program volunteers. Fifty-six objects will be examined in the Walters' object lab and 33 will be examined at Artex. Art handlers will transport the objects to and from the lab. At Artex, staff handlers will be hired to access, uncrate, and recrate.

Donna Strahan, Conservator of Asian Objects at the Metropolitan Museum of Art, will survey, consult and educate for five days on the 32 lacquer objects, especially those with flaking or water damage. Among the objects of concern are several large pieces of lacquer and wood furniture that were affected by the flood at Duke Farms. Several of these objects are known to have inactive mold that was left untreated after the flood. These objects will be vacuumed with a HEPA filter to prevent spreading the mold. Interns and preprogram volunteers will participate during all phases of object examination to learn from Strahan's experience working with Asian materials and other objects from the Duke Collection at the Asian Art Museum in San Francisco. Interns will assist Meg Craft by dusting and vacuuming and will help make storage mounts/housing, condition images, and conduct minor preventive actions, as needed. The objects survey will span most of the grant period, due to the large number of objects. The survey of objects at Artex will overlap with Shiho Sasaki's visit to keep labor costs at Artex as low as possible.

After being surveyed, objects at the Walters will have new storage mounts and will be taken to permanent storage locations selected by the registrar in charge of storage.

Survey of Paintings on Wood, Stretched Canvas and Cloth

The Walters' Paintings Conservators Eric Gordon, Karen French, and Gillian Quinn will conduct the survey of 20 paintings on wood panel and traditional stretched canvas in the paintings lab. Art handlers will bring the paintings to and from the paintings lab. Paintings will be dusted and hanging hardware strengthened as needed. The paintings will be stored on racks in paintings storage

Conservator of Paintings on Paper and Silk at the Asian Art Museum of San Francisco Shiho Sasaki will travel to the Walters for one week to examine the 38 paintings on un-stretched textiles. The painting conservators and interns will assist and will learn about the condition and needs of these paintings. The Curator of Asian Art Robert Mintz will also participate to share historical information and gain access to these rare works of art. All the paintings, except five, will be examined at the Walters. The remaining five will be examined at Artex. Artex requires a handler be present at all times during this process to ensure safety and security. The smaller paintings will be housed in folders and drop front boxes. All eleven banners and scrolls will be interleaved with acid-free paper and rolled into covered tubes and will be individually suspended in acid-free boxes. The boxes will be moved to permanent storage positions.

Survey of the Works on Paper

The Walters' Senior Paper Conservator Elissa O'Loughlin will examine 11 paintings on paper. Art handlers will bring the paintings to the paper lab. These are currently framed in acidic mats; Vincent Carney will un-frame the paintings on paper prior to the examination and reframe them after survey in new conservation-quality storage/display frames using acid-free mat board and UV protective glazing. As general policy, works of art on paper are displayed on a rotating basis for no more than 3 months at 5 foot candles of light exposure. These works will be restricted in the same manner. The reframed paintings will be re-located in hanging storage and/or *tangka* storage.

General Practices and Concurrent Work

Survey examination will be completed in conservation labs with good lighting and microscopes. Objects will be moved to the labs by art handlers. Large objects, including banners, scrolls, cabinets and large sculpture will be examined at Artex. Lab space will be rented at Artex to provide a safe adequately-sized space for the examination. The objects are boxed and stored on high shelves in a fully packed storeroom. Art handlers must be hired at Artex as a condition of secure access to the objects. The forklift must be operated by Artex staff. Throughout the survey period, Curator of Asian Art Dr. Robert Mintz and curatorial Mellon Fellow Dr. Rebecca Hall will be undertaking research on the objects in the Duke collection which they will share information with the conservators and interns.

The Development of a Long-range Plan

At the conclusion of the two-year grant period, Meg Craft will write a long-range plan for the future care of the Duke collection. The Walters will house smaller works of art. Objects needing stabilization and treatment will be added by priority to the conservation workflow. The museum will continue an effort to secure storage space for the larger objects. Interns will gain survey and curatorial experience. Conservation records will be available in TMS. We will share with the conservation community the successes of the Tracker system through lectures, personal communications, and papers, as appropriate.

Description of the Objects that are the Focus of the Project:

The Duke gift of 162 objects will be assessed and integrated into the Walters' permanent collections. Intended by Ms. Duke to be part of a recreated Thai village that was never realized, many of these objects are Buddhist in origin - religious panels, scrolls, banners and paintings retelling the 13 chapter Buddhist *jataka* tale of Vessantara, manuscripts and manuscript cabinets, and religious figures/sculpture. The other focus is decorative arts including swords, ceramics and lacquer ware. A few highlights are a Thammat (63.4) or a roughly 13' x 10' x 6' raised wooden temple pulpit elaborately decorated with gilded lacquer and glass; a mid 19th c. figure of the Buddha (25.232) made of wood and dry lacquer that is gilded and decorated with glass; a series of 13 paintings on wood panel in original frames illustrating the Vessantara *jakata*; and large rolled temple banners illustrating the same tale as told in the northern Thai / Laos border region. The diverse range of materials comprising these works of art include pigments/paintings on wood panel, unstretched textiles and paper, lacquer, gilt and/or pigments on wood furniture and sculpture, cast copper alloys, lead, ivory, porcelain, stone and stucco. Images can be seen in the Optional Attachment File in the application package.

III. PROJECT RESOURCES: TIME, PERSONNEL, BUDGET

The survey will be spread out and completed over a two-year time period so as not to disrupt ongoing conservation activities. As Project Director, Conservator Meg Craft's time devoted to the survey is already planned on the conservation schedule. A total of $58,607 is requested from the IMLS to support the hiring of specialist conservators, a contract paper technician, contract art handlers, and a

software developer, the rented lab space at Artex, housing materials, and survey equipment. As a match to this grant, the Walters will provide $111,141 in staff support from conservators, curators, information technology staff, and art handlers.

Project Staff from the Walters Art Museum:

- **Meg Craft,** the Senior Objects Conservator with 33 years in the field and 11 at the Walters will be the Project Director, managing schedules and insuring survey completion. She will also examine 89 objects including bronze, wood and lacquer sculpture, ceramic and metal objects, and write the long-range plan. Meg managed an IMLS CPS grant in 2005 and has completed many general and detailed condition surveys both at the Walters and in private practice. She is a graduate of the Winterthur Museum/University of Delaware Art Conservation Program in 1977.
- **Abigail Quandt**, the Head of Book and Paper Conservation, has worked at the Walters since 1984. Abigail's specialty is manuscripts. She oversees paper and book conservators, contractors and students. Her most recent major project is the Archimedes Palimpsest Project (http://archimedespalimpsest.org).
- **Elissa O'Loughlin**, the Senior Paper Conservator, has worked at the Walters for 11 years. She has surveyed and treated similar Asian paintings on paper in the John and Berthe Ford Collection at the museum.
- **Eric Gordon**, the Head of Paintings Conservation has worked at the Walters for 25 years. In addition to surveying paintings on wood and stretched canvas, he will assist Sasaki with handling and examination of the textile banners and scrolls.
- **Karen French**, the Senior Paintings Conservator, has a specialty in wood panel paintings. Karen has worked at the Walters for 17 years.
- **Gillian Quinn,** the Associate Paintings Conservator, has worked at the Walters for 11 years and will assist with all phases of the paintings survey.
- **Dr. Robert Mintz,** the Associate Curator of Asian Art, will help with object function and esthetics.
- **Dr. Rebecca Hall,** the Mellon Curatorial Fellow, has a specialty in Thai art and will help Rob Mintz with object function and esthetics.
- **Kate Blanch**, the Administrator of Museum Databases, will work with the contract software developer and assist conservators learning to use the survey forms.
- **Joan Elisabeth Reid**, the Chief Registrar, schedules and coordinates the art handlers.
- **Betsy Dahl**, the Associate Registrar for Collection Management, will find permanent locations for the objects in storage and direct art handlers.
- **Mike McKee**, the Senior Collections Technician/Supervisor, will undertake object movement.
- **Dr. Glenn Gates**, the Conservation Scientist, will assist with material identification, especially in identifying lacquer or binders on objects.
- **Terry Drayman-Weisser,** the Director of Conservation and Technical Research, will consult and monitor all activities in the conservation labs.
- **Art Conservation Program third year interns** will assist conservators in surveying and rehousing, especially preventive maintenance activities and mount-making for storage.

Project Consultants:

- **Shiho Sasaki** is the Conservator of Paintings on Paper and Silk at the Asian Art Museum of San Francisco. She has completed similar IMLS funded surveys of Asian paintings at the Cincinnati Art Museum and has treated a portion of the Duke Collection now housed at the Asian Art Museum. She graduated from the Royal College of Art/ Victoria and Albert Program in 2000.

- **Donna Strahan** is Head of Conservation of Asian Art at the Metropolitan Museum of Art, where she has worked since 2006. She has surveyed and treated portions of the Duke Collection at the Asian Art Museum. She has special expertise in lacquer conservation. Donna is a graduate of the George Washington University with a B.A. in Chinese Language and an M.A. in ethnographic and archaeological conservation.
- **Tom Murphy** from Innovative Software Solutions is the software developer who helped develop Tracker. He will modify the software and create custom survey forms to link to TMS. He will work with the Walters' Administrator of Museum Databases.
- **Vincent Carney**, independent paper technician, is a frequent contractor at the Walters. He will assist with matting and framing for rotating, loan, and special exhibitions and with re-housing of books and paper.

IV. IMPACT

This survey will permit the safe integration of the Duke collection into our permanent collection storage and allow the objects to be included in future public programming. One hundred and twenty-one works of art in the collection will be brought back to the museum to increase conservation oversight and accessibility. Preventive re-housing and dusting will improve preservation prospects. We will begin stabilization and treatments of objects deemed to be priorities and in need of attention. Ultimately stable objects will have digital images taken for inclusion on the collections web site, will be available for display, and will be incorporated in future exhibitions.

During the survey, we plan to examine and survey small works in the "conservation window" which allows museum visitors to observe and interact with a working conservator. This will allow the public to discover the Duke Collection, will promote the concept of examination and condition reporting, and will emphasize the importance of preventive conservation and stewardship. The conservation window is open from 12:30-4:00 p.m. on Fridays, Saturdays, and Sundays. Visitation ranges from 100-300 people per weekend.

Interns and preprogram volunteers will gain survey experience and have the opportunity to work with the curators and visiting specialist conservators. Museum conservators will gain expertise and education from contract conservators. Survey records will interface with TMS and give us the opportunity to easily share our records. Survey forms and programming successes will be shared freely/given to other conservators; talks or publications can be given.

Schedule of Completion
The Walters Art Museum
July 1, 2011-June 30, 2013

	2011						2012							2013											
Activity	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**
Project start date; hire contract staff; order supplies and materials	■	■																						
Create custom survey forms	■	■	■																					
Survey of the manuscripts (4)				■	■	■	■	■																
Survey of paintings on un-stretched textiles by contract conservator Shiho Sasaki (38)									■	■	■	■												
Survey of paintings on wood panel and traditional stretched canvas (20)							■	■	■	■	■	■	■	■	■	■	■	■	■					
Survey of objects (46)				■	■	■	■	■	■	■	■	■	■	■	■	■								
Survey of lacquer objects by contract conservator Donna Strahan (43)								■	■	■	■	■												
Survey of the works on paper (11)													■	■	■	■	■	■						
Development of a long-range conservation plan for the Duke Collection																				■	■	■	■	
Project Director Writes IMLS final report																								■

BUDGET FORM - PAGE FOUR

Section B: Summary Budget

	$ IMLS	$ Cost Share	$ TOTAL COSTS
1. Salaries and Wages		86,156.00	86,156.00
2. Fringe Benefits		24,985.24	24,985.24
3. Consultant Fees		30,730.00	30,730.00
4. Travel		4,665.00	4,665.00
5. Supplies and Materials		19,212.00	19,212.00
6. Services		4,000.00	4,000.00
7. Student Support			0.00
8. Other Costs			0.00
TOTAL DIRECT COSTS (1—8)	0.00	169,748.24	169,748.24
9. Indirect Costs			0.00
TOTAL COSTS (Direct and Indirect)	0.00	169,748.24	169,748.24

Project Funding for the Entire Grant Period

1. Grant Funds Requested from IMLS	58,607.00
2. Cost Sharing:	
a. Cash Contribution	
b. In-Kind Contribution	111,141.24
c. Other Federal Agencies*	
d. TOTAL COST SHARING	111,141.24
3. TOTAL PROJECT FUNDING (1+2d)	169,748.24
% of Total Costs Requested from IMLS	34.00%

* If funding has been requested from another federal agency, indicate the agency's name:

Mildred Lane Kemper Art Museum

Permanent Collection Conservation Survey: Sculpture

Narrative

1. Statement of Need

The Mildred Lane Kemper Art Museum at Washington University in St. Louis is one of the oldest teaching museums in the country. Established in 1881 as the St. Louis School and Museum of Fine Arts, the Museum was initially located in downtown St. Louis under the direction of artist Halsey C. Ives. Through donations, endowments, and acquisitions by such key people as benefactors Charles Parsons and William K. Bixby, art historians and curators H.W. Janson, Frederick Hartt, and William N. Eisendrath, Jr., and prominent St. Louis collectors Joseph Pulitzer, Jr., Morton D. May, Etta Steinberg, Sydney M. Shoenberg, Florence and Richard K. Weil, among others, the collection has grown to being one of the most important university museum collections of 19th-, 20th-, and 21st century European and American art.

In 2004, the Museum (formerly the Washington University Gallery of Art), was renamed the Mildred Lane Kemper Art Museum and in 2005 incorporated into Washington University's newly formed interdisciplinary arts center, the Sam Fox School of Design & Visual Arts. The Museum opened in its new building, designed by Pritzker Prize-winning architect Fumihiko Maki, on October 25, 2006. The new facilities offered, for the first time, gallery space dedicated to year-round display of the permanent collection and a plaza for the display of outdoor sculpture, significantly increasing public access to the collection. With this move, fresh identity, and new governance structure has come the opportunity to not only broaden our exhibition, educational, and scholarly purview, but to think comprehensively about our collection goals and policies. Indeed, the first goal of the Museum's Strategic Plan, which was developed in preparation for the new building and in conjunction with the Sam Fox School's ten-year strategic Design for Excellence, is care of the collection, and establishing a conservation program is listed as "one of the most crucial new initiatives for the Mildred Lane Kemper Art Museum" (see supplemental materials: Strategic Plan Excerpt).

The move into a new building brought the opportunity to act on what has long been a goal: to take the Museum's conservation program to a new level. State-of-the-art environmental controls and excellent storage facilities laid a foundation of solid preventive conservation, and prepared the Museum to embark on a more rigorous program of interventive conservation. Although the preservation and conservation of the collection has been a central concern all along, resources are now available to begin a concerted effort that matches short-term opportunities with long-term goals (see supplemental materials: Conservation Plan).

In preparation for the opening of the new building, a 2001 Conservation Assessment Program (CAP) grant from the Institute of Museum and Library Services (IMLS) supported a survey of the general needs of the Museum and a review of the permanent collection (see supplemental materials: CAP Report Executive Summary). Saint Louis Art Museum conservator Paul Haner conducted the survey, which proved instrumental in helping the Museum prioritize physical needs in the new building. Among other recommendations, the survey's report called for stable temperature and humidity controls, bigger, better storage facilities, and a room suitable for performing conservation examinations and basic treatments. Haner's report, which especially addressed the painting collection, also noted that hundreds of works in the Museum's collection were in need of treatment, ranging from basic cleaning and cosmetic treatments to structural stabilization. He suggested documenting the condition of the collections through a series of condition surveys that would form the foundation for a comprehensive analysis and assessment of conservation priorities.

The Museum's new building achieved many of the goals recommended in Haner's report, including maintaining stable environmental controls; offering larger, state-of-the-art storage facilities; and housing a space for basic conservation examination. The Museum surpassed the minimal additional staffing recommendations in the report, adding not only more security staff and a second preparator, but also a parttime facilities assistant, a third registrar, and two curators, all of whom raise the level of care and attention the collection receives. In summer 2010, as part of the long-term plan, the Museum improved its conservation work space by outfitting a modest conservation laboratory. The Strategic Plan also calls for the hiring of a paintings conservator in 2011-12 to begin sustained conservation and preservation of the Museum's historic paintings collection (in keeping with Haner's recommendations, the first objective of the new conservator will be a systematic survey of the Museum's paintings collection). Progress toward these goals has changed the order of short-term conservation priorities, shifting the immediate focus away from paintings and toward other areas of the collection, presently sculpture.

In 2004, the Museum received an IMLS Museums for America grant to complete its Collections Access Project, which supported the Museum's efforts to make the collection database available on the Museum's website. This user-friendly website now enables the general public, museum professionals, scholars, faculty, and students to browse, search for, and find visual and written information about the objects in the Museum's collection as well as helps promote educational programs and collections-related activities, exhibitions, and lectures. Last year, in 2009, as a result of the research interests of Washington University classics professor Susan Rotroff and Laura Gorman, Saint Louis Art Museum conservator, and the support of a grant from the National Endowment for the Humanities, we conducted an in-depth assessment of one of the most important small collections within the sculpture collection, a group of ancient Greek pots. The project has since moved forward and the group of pots is currently being conserved by Gorman with the assistance of a pre-program intern at the Saint Louis Art Museum.

The next step in the Museum's overall conservation plan is to begin the series of condition surveys recommend in Paul Haner's 2001 CAP report with a sculpture survey. The sculpture collection is the smallest group of objects within the permanent collection, and yet it also includes a number of important and historic works that would benefit from assessment and the eventual conservation that will be the outcome of this survey. Conservation activities on this part of the collection up till now have occurred sporadically, often spurred by loan requests or outside research activity, such as Gorman's assessment of the Greek vases. A dedicated sculpture survey will allow the curators to prioritize future sculpture conservation and in turn determine expanded exhibition and research opportunities as the institution continues to grow.

Although the sculpture collection has not yet benefitted from a comprehensive conservation examination, it has received excellent care in terms of storage and preventive conservation measures. In preparation for the move into new facilities, Museum staff constructed custom archival storage boxes to serve the dual purpose of protecting smaller and fragile objects during transport and subsequently in storage. The acid-free boxes were individually fitted with ester foam inserts and cotton twill tape that support each object and cushions it from shock while minimizing contact with painted or other delicate surfaces.

This series of planned condition surveys—sculpture (the subject of this application), followed by painting (when a conservator is hired), and works on paper (to complete the series)—is vital to the development of one of the Museum's most fundamental new initiatives, a conservation program that will protect and preserve the Museum's outstanding permanent collection. The capstone of this expanded program will be a state-of-the-art conservation laboratory housed in a new Sam Fox School building, projected for completion in 2020. The establishment of the laboratory and expansion of conservation staff (eventually including a paper conservator and conservation assistant) will afford unprecedented educational opportunities for students in cross-disciplinary art conservation coursework, to be developed in collaboration with key departments in the College of Arts & Sciences and the College and Graduate School of Art, as well as with the Saint Louis Art Museum.

The University's support of the Mildred Lane Kemper Art Museum's commitment to responsible care of the collection has been and continues to be remarkably strong. Care of the collection was the main impetus for providing the Museum with a new building; further evidence of institutional support is the recent expenditure of $75,000 in capital funds to retrofit existing facilities for the modest conservation lab this past summer. The Museum also supports staff training and development in collections care, as evidenced most recently by sending Assistant Registrar Kim Broker to attend the course "Care of Paintings" at the Campbell Center in Illinois in September 2010.

2. Project Design

The Permanent Collection Conservation Survey: Sculpture project is designed to provide a detailed conservation survey of the Mildred Lane Kemper Art Museum's sculpture collection of approximately 435 objects, ranging from antiquities to contemporary sculpture.

The primary goal of the survey is to get a baseline assessment of each object in the Museum's sculpture collection to be used for planning a long-term conservation strategy. An additional related goal is to identify ten objects most in need of immediate treatment and to devise a plan for their conservation. Two specialists in object conservation from the Midwest Art Conservation Center, Donna Haberman and Nicole Grabow, will travel to St. Louis to spend one week examining the objects. Haberman and Grabow have broad expertise that closely aligns with the types of materials in the Kemper Art Museum collection. During their examinations, they will note condition details, treatment needed, urgency of treatment, and estimated treatment time. They will also confirm the medium of the object whenever possible. In order to assess the large number of objects, they will use a checkbox form illustrated with an image of each object and make additional notes as needed (see supplemental materials: Object Condition Survey Form). Prior to their visit, Museum staff will work with Haberman and Grabow to tailor the object examination form to the needs of the Museum's collection, and to clarify parameters for ranking the urgency of treatment. Museum staff will then produce the illustrated worksheet for each object in advance of the conservators' arrival.

During the conservators' visit, Museum preparators and art handlers will systematically move each object to one of two examination rooms, where the object will be unpacked, examined, photographed as needed, repacked, and returned to storage. Staff will accompany the conservators at all times during their examinations; the registrars' and curator's participation and observation is expected to significantly increase knowledge of collection conservation in general as well as the special needs of individual objects within the collection. At the end of their visit, the collection curator will assess the worksheets and with the conservator select ten of the highest priority objects to receive more detailed treatment proposals. The conservators will write these proposals after returning to Minneapolis.

Each conservator will examine approximately 217 objects over the course of their week-long site visit. Many of the objects are small, numerous, and similar, such as a group of 46 Japanese netsukes. Nevertheless, efficiency will be key to the success of the project. Groups of artworks to be examined in each session will be planned in advance based on similarity and storage proximity. In order to maintain flexibility, the composition of the groups and their order will be predetermined and benchmarks will be set for each day. Museum staff will support the conservators by handling all of the packing and unpacking, and by methodically preparing each batch of artworks for examination. With both the new conservation lab and the Museum's Study Room available for the entire week, the conservators can focus their time during their visit to examining artworks. As they examine the objects in one room, the preparators and art handlers will set up the next group of artworks in the adjacent room. By swapping rooms after each examination session is complete, clarity about which objects have been examined will be ensured and the focus and level of activity in each room will be consistent. Throughout this process, parttime student assistants who work for the Museum in both paid (Federal Work Study) and unpaid (intern; docent; volunteer) capacities will observe and assist as needed. These include but are not limited to those trained to handle art, those employed through the security department as Kemper Museum Assistants, and those hired to assist with registrarial

and curatorial duties. (Note: funds for these are not included in the budget. See Budget Justification.)

After the visit, Museum staff will incorporate the reports and photographs into the collection database and artwork files. The prioritization assigned to each object will allow Museum staff to develop a long-range plan for stabilizing the collection and addressing any cosmetic issues that would inhibit its being exhibited or sent out on loan.

The Kemper Art Museum's sculpture collection to be surveyed consists of a broad range of objects, including 115 modern metal, stone, wood, and mixed media sculptures; 111 Asian ceramics, ivories, metals, and lacquers; 83 North Native American leather, beadwork, wood, metal, basketry, and ceramic objects; 50 ancient classical and Egyptian ceramic, terracotta, stone, bronze, and glass objects; 49 Pre-Columbian stone and terracotta sculptures; 18 modern ceramic and glass decorative arts; and 9 African wood and metal sculptures. A dozen of these objects, all modern sculpture, are installed outdoors. A varying number of objects are installed inside the Museum's galleries, primarily in the May Department Stores Foundation North Foyer and in the Bernoudy Permanent Collection Gallery. The vast majority of the collection is housed in sculpture storage. Small and medium-sized objects are housed in custom-built archival boxes. Larger objects are placed on plinths and – in most cases – covered with a large dust jacket. Some objects could benefit from improved housings, and some large objects could be safely boxed to add another layer of protection. A follow-through component of the project will be the construction of new housings for those objects that the conservators feel would benefit from improved storage.

3. Project Resources: Time, Personnel, Budget

The core work of the survey will take place during the week-long conservators' site visit. During that time, the Museum's collections staff will be largely devoted to the project. By scheduling the week during the summer and well in advance of its occurrence, however, normal Museum operation will be minimally affected. The Museum staff routinely devotes time each summer, when the level of public activity at a university museum decreases, to in-depth collections projects such as inventories. This project is planned as part of that routine. The Museum staff has also planned for the preparation and follow-up work to fit into their regular schedules during 2011-12.

Having moved the entire Museum collection into the new building in fall 2006, the Museum staff understands well the amount of preparation that will be necessary to orchestrate the survey smoothly and efficiently. Should the team progress through the material more quickly than expected, the conservators will be able to spend time on additional treatment proposals. If the schedule moves more slowly than expected, Museum staff is prepared to stagger schedules in order to allow longer hours for examination each day while minimizing any staff overtime costs.

In conjunction with Kate Butler, assistant curator whose primary focus is on the collection, Chief Registrar Rachel Keith will lead the team through project planning and execution. Assistant Registrar Kim Broker will coordinate all artwork movement and the incorporation of the reports into Museum records. Assistant Registrar Bryan Stusse will photograph areas of concern and manage the integration of the photos into Museum records. Assistant Curator Karen Butler will establish curatorial priorities considering treatment priority, aesthetic value, historical importance, and exhibition plans in order to select the ten objects to receive full condition reports, and to then prioritize the remaining objects for the Long-Range Conservation Plan. Preparators Jan Hessel and Ron Weaver will move, unpack, and repack all artwork during the site visit and will construct new housings as needed per the conservators' recommendations. Security Supervisor John Launius will coordinate additional security needed for the increased activity during the survey. Managing Editor of Publications Jane Neidhardt will oversee the administration and reporting of the grant as well as edit any written documents intended for public or professional use.

As evidenced in the Budget and described in the Budget Justification, the Museum's matching funds will come primarily from staff time. Additional dollars required will come from a modest endowment fund dedicated to collection care. (See supplemental materials: MACC Budget.)

4. Impact

As a university art museum, all activities of the institution are based on education, study, and research. This project directly supports the Museum's core educational mission and strategic goals. In addition to improving the quality of the objects for exhibition and study purposes, the project will expand our understanding of the material nature of the objects and provide the opportunity to disseminate both new and existing scholarship, while at the same time increasing public awareness of this important collection. Immediate and direct educational benefits will include not only increased understanding on the part of staff members of conservation concerns relating to the collection, but also exposure to the field by the paid and volunteer students who will assist with the project. Indirect benefits will include all those for whom the collection is an aesthetic or research resource.

With the new building, the development of the current Strategic Plan (2009–2018), and significant additions to staff in all departments including registrarial, curatorial, publications, and education, the Museum has placed new emphasis on its permanent collection and on public programs relating to the collection. This includes, among other initiatives, the development of a series of Focus exhibitions drawn primarily from the permanent collection, a series of scholarly essays and public lectures called Spotlights that focus on a select work in the collection to provide deeper analysis and promote public discussion, and continued improvement to the catalogue information in the collection database, such as the compilation of detailed cataloging information about the permanent collection in the database. Moreover,

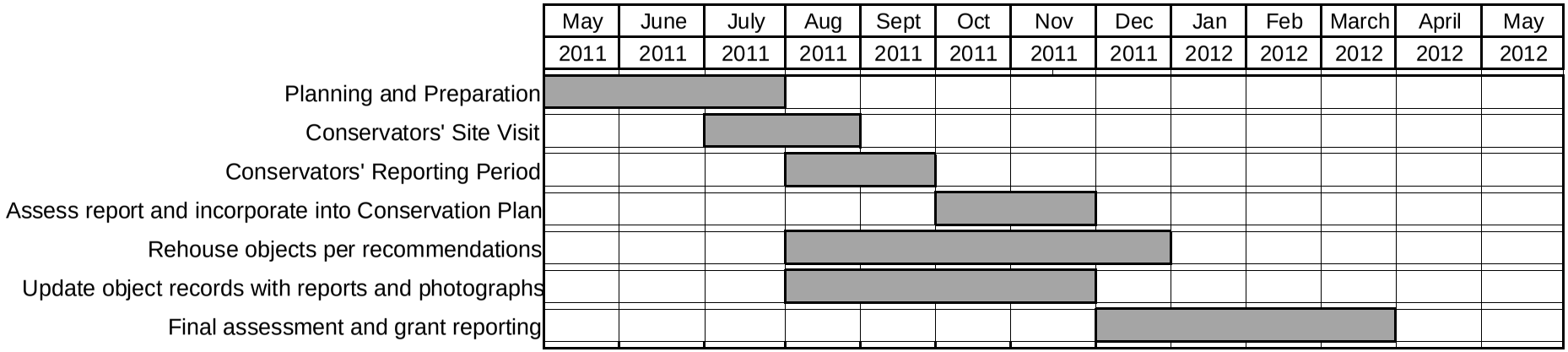
in honor of the five-year anniversary of the new building in fall 2011, the Museum is preparing for a major reinstallation of the permanent collection as well as significant expansion of its didactic materials (including the creation of detailed text labels for each object on display, self-guided tours on the permanent collection, and a guide to the outdoor sculpture plaza, for example). A fair number of objects in the collection, however, cannot be exhibited, due to poor condition.

A report providing a baseline assessment for each object in the collection will allow the Museum to make long-range plans for conserving and exhibiting the collection. The detailed condition reports and treatment proposals will guide the Museum in readying the most important objects for exhibition at the Museum, as well as preparing them for loan to other institutions, and provide invaluable information about the nature of each object for research purposes. In addition, the individual worksheets will supplement the Museum's existing cataloging information for each artwork, particularly concerning medium, but in some cases for culture or date. All of this information, as well as photographs included as part of each object record, will be available to scholars, members of the campus community, and the public.

A wide variety of web-based venues will be utilized for the dissemination of information about the conservation activities and the grant from IMLS. These include the publication of a News highlight on the Museum's website and on the website of the Sam Fox School of Design & Visual Arts, the publication of a more detailed discussion of the conservation assessment plan in the Museum's seasonal newsletter *FYI*, and news entries on our various social media outlets. Information about the project will also be publicized in a press release, which will be sent to all local newspapers and websites and posted on the Mildred Lane Kemper's website, and information about the grant and project will be presented at the Sam Fox School National Council meeting, Museum membership steering committee, and Art Collections Committee meeting.

We expect the short- and long-term effects of this survey, by building on past conservation efforts and paving the way for future comprehensive care, to positively benefit all aspects of our institutional mission as well as all segments of our public and professional communities.

Mildred Lane Kemper Art Museum
Washington University in St. Louis
Schedule of Completion



BUDGET FORM: Section B, Summary Budget

	$ IMLS	$ Cost Share	$ TOTAL COSTS
1. Salaries and Wages	$0.00	$17,173.00	$17,173.00
2. Fringe Benefits	$0.00	$5,825.00	$5,825.00
3. Consultant Fees	$20,640.00	$0.00	$20,640.00
4. Travel	$1,510.00	$1,548.00	$3,058.00
5. Supplies and Materials	$2,395.00	$0.00	$2,395.00
6. Services	$0.00	$0.00	$0.00
7. Student Support	$0.00	$0.00	$0.00
8. Other Costs	$0.00	$0.00	$0.00
TOTAL DIRECT COSTS (1-8)	$24,545.00	$24,546.00	$49,091.00
9. Indirect Costs	$8,591.00	$8,591.00	$17,182.00
TOTAL COSTS (Direct and Indirect)	$33,136.00	$33,137.00	$66,273.00

Project Funding for the Entire Grant Period

1. Grant Funds Requested from IMLS	**$33,136.00**
2. Cost Sharing:	
a. Applicant's Contribution	**$33,137.00**
b. Kind Contribution	**$0.00**
c. Other Federal Agencies*	**$0.00**
d. TOTAL COST SHARING	**$33,137.00**
3. TOTAL PROJECT FUNDING (1+2d)	$66,273.00
Percentage of total project costs requested from IMLS	**50 %**

*If funding has been requested from another federal agency, indicate the agency's name:
n/a

AMERICAN MUSEUM of NATURAL HISTORY

CONSERVATION OF AMBER FOSSILS AT THE AMERICAN MUSEUM OF NATURAL HISTORY

1. STATEMENT OF NEED

The American Museum of Natural History (AMNH) seeks $149,996 over 19 months to conserve its unique and global collection of amber fossils from the severe deterioration that has been caused by exposure to ambient conditions such as light, temperature, and relative humidity. The AMNH amber collection is one of the world's largest, most diverse, and scientifically significant, with 16,752 pieces containing well over 25,000 inclusions of insects and other ancient life forms, including 456 primary, scientifically irreplaceable "types" (holotypes and neotypes) from the Tertiary (Arkansas, Baltic, Dominican Republic, Mexico, Wyoming) and Cretaceous Periods (Alabama, Alaska, Lebanon, Myanmar, New Jersey, South Dakota). Scientists around the world study the collection (137 scientific papers have been published on it thus far) and display specimens are regularly loaned for temporary exhibits, nationally and internationally. Nearly 100 pieces from the AMNH collections were exhibited in the enormously popular AMNH developed exhibit, *Amber: Window to the Past* (1996), which was viewed by approximately 940,000 visitors over its four-year tour.

Today, however, this world-class collection is under threat, with some unique, rare, and holotype specimens already showing signs of deterioration or vulnerability. Exposed to ambient conditions, amber darkens, its surfaces craze and delaminate, and fractures extend through its thickness. Without treatment, continuing damage can lead to pieces that can no longer be safely handled and inclusions that can no longer be studied. In many cases, damage can result in complete loss of both research and exhibit values. Such deterioration can be prevented, however, through a combination of proper storage and sealing or embedding within epoxy resin; it is for such treatment that these funds are requested. More specifically, this proposal requests the purchase of basic supplies and 19 months of support for an experienced, full-time conservation technician to treat the scientific types, as well as unique and rare specimens.

NEED AND PRIOR EFFORT

Since its founding in 1869, the American Museum of Natural History has been steadfastly committed to its joint mission of scientific research and public education. Over the last decade, AMNH's strategic planning and programmatic priorities have allocated increasing resources to the management and preservation of these collections, which constitute a major repository of the nation's cultural and scientific heritage. Such improvements include the storage, management, conservation, and access to its collections, libraries, archives and exhibits, the continued development of a highly professional, world-class conservation and collections management staff, upgrades to virtually all collection spaces with, among other things, climate control, security systems, and fire detection/suppression equipment, and development of a new collections policy in June 2008 (see *appendix 1, AMNH Improvements and Renovations, 2000-2010*).

Institutional planning and priorities have been determined through a series of collection surveys and evaluations, the first of which involved an IMLS-supported conservation survey (1996-1997) and more currently the IMLS-supported risk evaluations of collections, exhibitions, and library/archives (2007-present). In addition, individual collection conservation surveys are performed as needed, using internal resources. Through these combined surveys, the institution has identified its amber fossil collection as the highest priority for treatment. Specifically, it has determined that, while the collection's curation and security are excellent, the conditions under which specimens have been kept over the past century – such as the absence of air conditioning prior to 1980 – have led to deterioration in many specimens. Without treatment, invaluable scientific data could be lost forever.

Amber. Deposits of amber, the hardened and fossilized form of tree resin, occur around the world, generally ranging in age from the Early Cretaceous (ca. 140 MYA) to the Quaternary (1.75 MYA to present). Baltic amber

is best known, since it is the world's largest amber deposit and has a history of cultural and artistic use among European peoples extending to 13 millennia (Grimaldi, 1996)(unless otherwise indicated, all reference details are listed in *Staff Resume, David Grimaldi*). This amber was formed about 45 million years ago from an extinct pine, and preserves more extinct insect species than any fossil deposit in the world. In all ambers, not just Baltic, it is the microscopic preservation of life forms that has captured both popular and scientific imagination. The internal tissues of insect and plant inclusions are preserved with ultrastructural fidelity, including cells as well as organelles such as nuclei, mitochondria, and chloroplasts (Grimaldi et al., 1994). While the authenticity of ancient DNA in amber is highly doubtful, the unparalleled anatomical preservation of the insects and plants in amber has profound evolutionary implications, in allowing precise study of the amount of change that has taken place between extinct species and their modern relatives (Grimaldi and Engel, 2005).

Resins are complex mixtures of terpenoids and other biomolecules: over 100 individual compounds have been identified from just seven botanically distinct amber deposits. In fact, resins and amber from different species of trees have unique chromatographic and spectroscopic profiles, which to some extent allows identification of the tree family and genus that produced a certain amber deposit (see *table 1*). The molecular uniqueness of most deposits of amber, along with age and geological history, generally determines the physical characteristics of the amber: its color, hardness, fractility, temperature of dissociation, solubility in solvents, and, particularly relevant to this proposal, its susceptibility to oxidation and other forms of deterioration. For example, Baltic amber is extensively crosslinked with succinic acid, rendering it naturally hard, with a surface that receives a glassy polish. This amber, however, turns deep red and crazes (i.e., develops fine surface cracks) over decades when exposed to ambient conditions. Copal, which is hardened, subfossil class Ic resin formed just centuries or millennia ago, is incompletely polymerized, and a polished surface will extensively craze within just a few years.

The AMNH Collection. The collection of fossiliferous amber at the AMNH is the most scientifically significant one in the world: an exquisitely preserved, unique archive of ancient life that requires meticulous care. The collection's very modest beginnings included the acquisition of relatively small collections in the early 1900s (200 pieces of Baltic amber acquired from Ward's Scientific Establishment) and the inheritance of relatively larger collections in the 1980s (the orphaned Columbia University Mineral Collection, which contained several hundred pieces of Baltic amber). While many of these original Baltic pieces contain some large, rare insects, virtually every piece has deeply reddened (see *appendix 2: Conservation Assessment and Treatment Proposal - Amber Specimens (rare, unique & type), figs. 1-6*). Beginning in 1987, when Dr. David Grimaldi joined AMNH's curatorial staff, the amber collection has steadily grown through purchase, donation, and fieldwork. The largest component of the collection is Miocene (20 MYA) amber from the Dominican Republic, comprising 6,742 pieces and 169 of the 456 total holotypes.[1] AMNH houses a modest collection of Mexican amber, which has a very similar age and botanical origin to Dominican amber. Besides the old Baltic amber holdings, AMNH purchased two large private collections of rare insects in Baltic amber, as well as assorted select specimens. The Baltic collection is especially significant for Hymenoptera and contains the world's most important assemblage of fossil bees.

Amber from the Cretaceous (65-145 MYA) has particular scientific significance, since it is during this period that there ensued dramatic changes in continental positions, the radiations of the angiosperms, and the end-Cretaceous mass extinction, all of which had huge effects on the Cretaceous biota. AMNH houses the most comprehensive collections of Cretaceous amber, the main holdings being from New Jersey, Myanmar (formerly Burma), and Lebanon (see *table 1*), and smaller collections from Alabama, Alaska, and South Dakota. The South Dakota material is significant since it is 65 MYO – formed just prior to the end-Cretaceous (Grimaldi and Engel, 2005). Fossils of considerable scientific value in the Cretaceous amber collections include the most

[1] When a new species is described, a holotype specimen is designated, which establishes a standard for the species. If the published description is ambiguous, say with the discovery of a complex of very similar species, then the holotype must be examined to determine correct identity. Holotypes are scientifically irreplaceable.

diverse assemblage of early fossil ants and termites. Growth of the Cretaceous amber collections began in approximately 1993, and required developing techniques of vacuum-embedding the amber pieces to ensure their preservation (see *appendix 2, figs. 20-22*). The AMNH amber collection, overall, is an exquisitely preserved and scientifically unique archive of ancient life, which requires meticulous care.

Table 1. Main holdings of amber and copal in the American Museum of Natural History

Source	Age	Botanical origin	Chem Class	# spcmn	# types	Kgs unprocessed
Tanzania[a]	1000 y	*Hymenaea**	Ic	59	0	0
Zanzibar[a]	1000 y	*Hymenaea**	Ic	294	0	0
Dominican Republic	20mya	*Hymenaea**	Ic	6,742	169	1
Mexico	29 mya	*Hymenaea**	Ic	267	4	0
Baltic	45 mya	Pinaceae	Ia	1,921	52	1
Arkansas	48 mya	Dipterocarp**	II	113	0	5
India	50 mya	Dipterocarp**	II	408	0	30
Wyoming	60 mya	Cupressaceae		626	0	5
S. Dakota	65 mya	unknown		130	0	1
Alabama	85 mya	Cupressaceae	Ib	47	0	0
New Jersey	90 mya	Cupressaceae	Ib	2,559	108	20
Alaska	94 mya	unknown	Ix	588	0	10
Myanmar (Burma)	100 mya	Cupressaceae?	Ib	2,673	83	1
Lebanon	125 mya	Cheirolepidac.	Ix	325	30	3

[a] copal, or subfossil resin, * An extant tropical genus of trees in the Leguminosae, ** Dipterocarpaceae, an extant family of large trees predominant in southern Asia

2. PROJECT GOALS AND DESIGN

The goal of the project is to safeguard this irreplaceable collection for future generations of scientists, students, researchers, and the public. The proposed conservation plan is based on decades of treatment experience and investigation within the AMNH amber and conservation labs, and will be accomplished in two stages:

- Amber Conservation: Rare, Unique and Type specimens. The first and most important stage in the AMNH conservation plan, for which we are seeking funding from IMLS, will treat all of the most scientifically important and some of the most deteriorated pieces. A list of 630 such specimens to be treated is presented in *Appendix 2, Conservation Assessment and Treatment Proposal - Amber Specimens (rare, unique & type)*, specifying the method of treatment for each.
- Amber Conservation: General Collections. The second stage, to be funded through other sources, will treat the prioritized pieces within the rest of the collection, some 16,122 specimens.

CONDITIONS

The amber pieces in the collection show dramatic variation in deterioration. The most degraded pieces are old (>80 years) Baltic amber pieces, which are heavily crazed and very deep red (see *appendix 2, figs. 1-6*), as well as the Zanzibar copal pieces, which are deeply crazed (see *appendix 2, fig. 7*). This deterioration is primarily due to the poor storage conditions prior to 1980 (e.g., lack of air conditioning, amber stored loose in drawers). But even the New Jersey amber that was collected and polished 15 years ago, and stored individually in tight plastic boxes shows fine surface crazing, and some pieces have developed interior cracks (see *appendix 2, figs. 13-15*). Many Dominican and Mexican amber pieces have noticeably darkened and also developed very fine crazing (see *appendix 2 figs. 15-16*). As noted above, such conditions impacts investigators' ability to visually evaluate the life forms enclosed within amber and accelerates the oxidation and continued degradation of the enclosed specimens. Once the conservation project is complete, AMNH will be able to maintain the specimens in conditions that will preserve them for future use.

The curation of the amber collection is excellent. All pieces and inclusions are databased with MS Excel©, according to catalogue number, origin, and types of inclusions, along with other information. The collection is arranged according to country of origin, then geological formation, then taxonomic ranks of the inclusions (Phylum, Class, Order,). Many pieces have multiple inclusions, and these are arranged according to catalogue number, so the database is essential for retrieving pieces containing particular types of insects. Approximately 1200 pieces have digital photomicrographs of the inclusion(s), made with a customized imaging system (Infinity© Optics, Dynalite© and MicrOptics© lighting, Nikon cameras), housed next to amber llcoection. All data and images associated with the collection are stored on the division server, which is backed up daily.

The collection is currently housed in two customized, enamel coated, steel cabinets, each with two columns and two doors, which fully seal against a synthetic gasket when closed (see *appendix 2, fig. 23*). The doors presently lock with a key, but have also been outfitted with two thumbprint readers that will be connected to main security. Each cabinet column holds 51 finished wooden drawers (see *appendix 2, fig. 24*), or 102 total drawers per cabinet. The cabinets are housed in the office/lab of David Grimaldi at the AMNH (floor 5, section 13, room 3N), since he works with the collection daily. Each unique collection/catalogue number is printed on an archival label and stored with the amber piece in a small, friction-fitting, plastic, polypropylene box. Larger pieces are stored in small zip-lock 10-mil polypropylene bags.

Research & Investigation. To ensure that its conservation plan would meet AMNH's goals, our Conservation and Amber Labs conducted a comprehensive, accelerated-aging study of amber, in order to determine the relative effects of exposure to light, heat, and fluctuating humidity on four chemically and geologically disparate ambers (Burmese, New Jersey, Baltic, Dominican) as well as Zanzibar copal. All of these fossil resins comprise important parts of the AMNH amber collection. Sets of 420 amber pieces, all trimmed and polished to uniform sizes (see *appendix 2, figs. 8-11*), were exposed for one year to the conditions described above. The most pronounced deterioration (i.e., visible crazing and cracking: see *appendix 2, fig. 12*) occurred under combined exposure to light and fluctuating humidity; heat was the most important variable in darkening (tested with a spectrophotometer). Even though the older fossil resins have polymerized and crosslinked more, there is no relation between age and durability. Instead, chemistry of the fossil resin appears to be an important factor to durability. New Jersey amber showed the greatest susceptibility, then (in decreasing order) Zanzibar copal, Dominican amber, Baltic amber, and Burmese amber. Through this accelerated-aging study, combined with real-time observations of the conditions and changes in the various ambers in the collection over several decades, we identified the need to prioritize specimens for treatment. As a result, AMNH has created a priority list that includes those specimens that are scientific types, unique, and/or very rare, starting with New Jersey amber (before further deterioration occurs), followed in order by Dominican amber, Lebanese amber,[2] Indian amber, Baltic amber, and Burmese amber

Previous treatment. Glass applied with a mountant (Canada Balsam) has proven to be an impermeable sealant, and specimens that have been mounted this way for many decades show very little deterioration (see *appendix 2, fig. 18*). However, this technique has several serious problems: it obscures some surfaces and details of the inclusion, it prevents any further preparation of the piece by future investigators who will need to study the piece, and it prevents any CT or synchrotron imaging of the piece. In effect, embedding amber within/between glass permanently compromises further study of the inclusions and is no longer used or recommended.

Amber pieces of particular significance, including those being studied, are more commonly prepared by trimming, polishing, and, in some case, embedding of the piece in epoxy under vacuum in a bell jar, as per protocols described in Nascimbene and Silverstein[3]. Vacuum-embedding permits the epoxy to infiltrate fine

[2] While the Lebanese amber was not tested, its is scientifically very significant as there are AMNH types for 27 species.

[3] Nascimbene, P. and Silverstein, H. 2001. The preparation of fragile Cretaceous ambers for conservation and study of organismal inclusions. *In*: *Studies on Fossils in Amber, with Particular Reference to the Cretaceous of New Jersey*, pp. 93-102. Edited by D. Grimaldi. Backhuys Publishers, Leiden, The Netherlands.

cracks within the amber, stabilizing it against fracture during trimming and polishing, which is done using a water-fed saw with a 1 mm-thick diamond edge, and a Buehler flat-lap wheel with 400-, 600-, 2400-, and 4000-grit emory papers. The Cretaceous ambers, in particular, are very brittle and have been routinely embedded. This preparation allows one or two flat surfaces of the amber close to the inclusion to remain exposed (this is required for high-magnification microscopy); the other 6-7 flat surfaces are epoxy, with the surface of the amber several millimeters beneath these. The Tertiary ambers (e.g., Dominican, Baltic) are typically not embedded prior to study, just trimmed and polished, since these are not brittle. One of the key benefits of such embedding is that researchers can get much closer to inclusions and have much clearer views of important characters being studied without risking breakage or internal cracking. Many fossil insect specimens in amber could never have been properly studied without this process.

Until recently, AMNH has used Buehler Epoxycure Resin, a bisphenol-A epoxy resin with N-butyl glycidyl ether (BGE) and a mixture of amine hardeners. A great advantage of this epoxy is that it fully cures overnight and allows better CT and synchrotron scanning of inclusions than do alternative epoxies. Epoxies have been extensively tested for use in art conservation, and generally are found to deteriorate in the form of yellowing, particularly upon exposure to light and heat. Though the Buehler Epoxycure has not been specifically tested, other epoxies with BGE and amine hardeners show yellowing with aging, even in dark conditions. Such epoxy yellowing has been seen in the AMNH amber collections but is of minimal concern as benefits to amber pieces previously embedded in epoxy far outweigh potential negative effects. However, the curators/conservators at AMNH strive to use the highest quality materials possible. For this reason, we have begun using Epo-Tek 301-2 instead; an epoxy commonly used in glass and ceramic conservation and one that tests highly in accelerated aging studies. Practical studies in our lab have shown that this epoxy adheres very well to amber and to Buehler epoxy (if re-treatment is necessary). It has excellent clarity (see *appendix 2, figs. 20-22*) and thin layers of it applied to glass slides do not visibly yellow after one year of exposure to 70°C and ambient air. The Epo-Tek formulation is slower cure (up to a week) and will slow the treatment process to some degree, however the improved aging characteristics outweigh the quicker set time found with the Buehler.

PROPOSED TREATMENT

The primary goal of the treatments proposed is to stabilize the specimens so that they can be safely stored, handled and preserved for future research and exhibition. The conservation methods that will be utilized to treat these specimens will be in accordance with accepted modern conservation practices. An object-level condition survey was accomplished as a collaborative effort between the conservator and the curator of all the rare, unique and type amber specimens in the AMNH holdings (see *appendix 2, Conservation Assessment and Treatment Proposal - Amber Specimens- rare, unique & type*). From the conservation survey it was determined that there are **630** individual pieces of amber (holotypes, paratypes, neotypes, unique, and rare specimens) that will require treatment. Treatment will include trimming, polishing, embedding, re-embedding, and post-embedding trimming/polishing and/or coating.

1. Treatment. Each type, unique, and rare amber specimen will be treated with the Epo-tek 301-2 epoxy, either by coating exposed surfaces or embedding whole pieces within, so as to prevent the darkening and crazing that obscures and damages inclusions. The curator and conservator will closely guide the conservation technician in these procedures.
   Embedding Specimens. Pieces with two or more large surfaces exposed (i.e. specimens near these surfaces) will need to be embedded or re-embedded in Epo-Tek 301-2. The conservation survey highlighted **540** pieces that need to be either embedded for the first time, or re-embedded. Many of the Dominican and Baltic amber pieces require trimming and polishing prior to embedding, to remove darkened and/or crazed surfaces. Many of the Cretaceous pieces will require re-embedding, but will first need to be trimmed of excess Buehler epoxy and then polished, prior to embedding in EpoTek 301-2.
   Coating specimens. Amber pieces with only one exposed surface, or with a second, narrow surface, will be coated with one to two layers of Epo-Tek 301-2, applied with a soft sable brush. The conservation survey

highlighted **91** pieces requiring coating, most of which are the Cretaceous amber specimens and some of which are larger pieces (at least 3 cm in diameter) that cannot be embedded. Fortunately, the sealed surfaces of amber embedded in Buehler epoxy show no deterioration, so these surfaces will not need treatment.

An estimate based on extensive past experience is that ten pieces can be fully treated per week (this includes pre-embedding, trimming and polishing, embedding, and post-embedding trimming and polishing). For the remaining **91** pieces requiring coatings it is estimated that 20 pieces can be fully treated per week (see *Schedule of Completion*).

2. Documentation**.** Date and type of treatment will be included in the amber database for each treated piece. The scientific assistant will document each specimen both before and after treatment using the specialized imaging system described above. All after images will be made accessible via the web supplementing the already existing amber fossil type webpage on the AMNH Invertebrate Zoology website (http://research.amnh.org/iz/link/amber-fossil-type-list). The conservator will survey the remaining, general collections (as the unique, rare and types were surveyed) to determine more precisely the resources necessary to stabilize the specimens and upgrade their housing.
3. Environment. Each specimen cabinet will be fitted with an appropriate amount of silica gel to buffer against relative humidity fluctuations (both short-term and seasonal). Data-loggers will be purchased and placed inside cabinets to monitor internal relative humidity levels and determine when silica gel needs reconditioning. Anoxic microenvironments were considered for long-term storage of the specimens. Unfortunately, space limitations and the active use of the collection by the current curator and visiting researchers make such a system impractical.

TRAINING

Both the Amber Lab and the Natural Science Conservation Lab routinely provide training to volunteers and interns in conservation and preparation of natural science specimens. It is expected that this project will be supported with a conservation intern and a volunteer form the amber lab, providing an opportunity to learn the approaches, materials, and techniques specific to the conservation of amber collections.

Natural Science conservation is a relatively new field and the AMNH has taken the position as a leader in this area. Even more pronounced, the amber collection and its support lab is world renowned, accomplishing research on physical characteristics of amber, aging of amber, inclusion fossils, and proper treatment. At the completion of the project, AMNH will seek alternate funding to sponsor an amber preparation and conservation workshop, to train personnel from institutions that house collections of amber, including UC-Berkeley, University of Kansas, Smithsonian Institution, Harvard MCZ, Field Museum, LA County Museum, CNC Ottawa, Tyrrell Museum, ROM, London NHM, Paris Natural History Museum, and the University of Copenhagen.

3. PROJECT RESOURCES.

Time and Budget.

Based on a combined 60 years of experience at AMNH in amber preparation and conservation, a 19-month work plan has been developed (see *Schedule of Completion*). Most of the requested funds will support one full-time position for 19 months; the remaining funds will purchase supplies for treatment. AMNH has an amber laboratory devoted exclusively to the preparation of amber, which is where the proposed work will take place. It contains a chemical hood, sinks, lapidary wheels, trim saws, microscopes, and a computer. Other resources are additional microscopes and digital photomicrography equipment, which are housed next to the amber collection.

AMNH will commit a percentage of time from three key personnel (see below) with specialized expertise in conservation, preparation, and curation of amber. All the investigators have records of performance excellence, and AMNH has adequate systems in place to support them in successfully completing this project. In

estimating time and resources for this project, AMNH has drawn on its history of successfully carrying out federally supported programs on time, on budget, and in full compliance with all award terms and conditions. Cost estimates – based on the most reasonable prices available – are derived from institutional experience and direct quotes.

Personnel.
Project personnel comprise a uniquely experienced, cross-departmental team. AMNH personnel's regular work assignments will be relieved or adjusted so as to accommodate their participation in this effort. Lisa Elkin, Director of Conservation, Natural Science Collections, will serve as Project Director. Ms. Elkin has nearly 20 years of AMNH experience and has successfully directed prior and current IMLS grants – including the Collections Risk Assessment; the Emergency Response and Salvage Plan for Collections, Libraries, and Archives; and currently, the Exhibits Risk Assessment and the Library/Archive Risk Assessment. Ms. Elkin will devote 12% of her time to project coordination and personnel, ensuring project milestones are met, outlining and refining conservation procedures for treatment, ensuring appropriate documentation protocols are followed, and performing a conservation survey for the Stage 2 amber treatment (general collections). Co-Project Director David Grimaldi, Curator of Invertebrate Zoology, has been at AMNH for 24 years and is a world expert on amber. Dr. Grimaldi will devote approximately 12% of his ti to the project, duties of which will include examining each piece prior to treatment, advising on preparation and treatment, assisting in the preparation of some specimens, and overseeing the full-time hired conservation technician as well as Mr. Tam Nguyen, Senior Scientific Assistant at AMNH, who works with Dr. Grimaldi. Mr. Nguyen will devote 25% of his time to this project, by updating the amber database, doing photomicrography of each treated piece and regularly reporting on the project via the Amber webpage. The ideal full-time conservation technician to hire is Mr. Paul Nascimbene, who has worked at AMNH for 17 years on various grants and special funds, 15 of those years working on amber (http://research.amnh.org/iz/staff/paul-nascimbene). He has collaborated on research on amber, attended conferences, participated in fieldwork, screened thousands of pieces of crude amber for inclusions, and most importantly, he has refined techniques of preparation. Over those years, he has prepared approximately 4500 pieces of amber and is arguably the most experienced amber preparator in the world. 100% of the technician's time would be devoted to the project.

4. IMPACT
In the largest sense, this project will help ensure the preservation and accessibility of the Museum's priceless amber collections for the benefit of generations to come. Initially, the project's product will be a collection of rare, unique, and type amber specimens preserved and stored in optimal conditions, thus ensuring future research and investigation. This will have a long-term and direct impact on scholars from around the world as well as post-graduate, graduate, and under-graduate students who use the collections for their research (onsite or by loan) and who rely equally on the supporting documentation (publications, databases, image libraries). Beyond AMNH, the project will have long-term impacts on the field of conservation and preservation as it helps to inform other institutions in how to preserve and protect their amber collections.

Dissemination. As one of the leading collections-based institutions in the world, AMNH takes seriously its responsibility to the field of collection management, preparation, and conservation, and plans to share lessons learned and procedures developed with other such institutions. AMNH will:

- Present lectures at professional conferences, including the Society for the Preservation of Natural History Collections, the American Institute for Conservation, and related groups:
- Publish in journals such as *Collections Forum and* the *American Institute for Conservation Journal*;
- Post the project, descriptions and images of project activities on the Web (http://research.amnh.org/iz/collections/amber-collection) and update such postings throughout the project duration

All of these activities will ensure that AMNH's conservation experiences gained in the amber project will be added to the relevant literature.

Conservation of Amber Fossils at the American Museum of Natural History
Schedule of Completion

Lisa Elkin, 9/30/10

		2010		2011												2012												2013		
		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
IMLS Proposed Project Period																														
Staffing	Conservation Technician																													
	AMNH Staff match																													
	Volunteers & Interns																													
Internal & External Reporting										★			★			★			★			★				★				
Planning	AMNH Internal Planning																													
	Purchase supples and equipment																													
	Set up Lab																													
Treatment	New Jersey Amber																													
	Dominican & Mexican Amber																													
	Baltic Amber																													
	Lebanese Amber																													
	Burmese Amber																													
General Collections Survey																														
Final Reporting																														
Dissemination										★			★			★			★			★				★				

BUDGET FORM: Section B, Summary Budget

	$ IMLS	$ Cost Share	$ TOTAL COSTS
1. Salaries and Wages	$64,267.00	$67,462.00	$131,729.00
2. Fringe Benefits	$27,113.00	$28,462.00	$55,575.00
3. Consultant Fees			
4. Travel			
5. Supplies and Materials	$2,520.00		$2,520.00
6. Services			
7. Student Support			
8. Other Costs			
TOTAL DIRECT COSTS (1-8)	$93,900.00	$95,924.00	$189,824.00
9. Indirect Costs	$56,096.00	$57,305.00	$113,401.00
TOTAL COSTS (Direct and Indirect)	$149,996.00	$153,229.00	$303,225.00

Project Funding for the Entire Grant Period

1. Grant Funds Requested from IMLS	**$149,996.00**
2. Cost Sharing:	
a. Applicant's Contribution	**$153,229.00**
b. Kind Contribution	**$0.00**
c. Other Federal Agencies*	**$0.00**
d. TOTAL COST SHARING	**$153,229.00**
3. TOTAL PROJECT FUNDING (1+2d)	$303,225.00
Percentage of total project costs requested from IMLS	**49.47 %**

*If funding has been requested from another federal agency, indicate the agency's name:

OMB Number 3137-0071; Expiration Date: 7/31/2010. Estimated burden for both detailed and summary budget forms: 3 hours.

Statement of Need

The Henry Francis du Pont Winterthur Museum Inc. is a museum with an unparalleled collection of decorative arts and Americana set amidst the rolling hills of an extensive country place. The founder, Henry Francis du Pont, collected silver for his 175 museum room settings from all thirteen original colonies. Today this collection includes approximately 2,900 silver and silver-plated objects on view and approximately 9,000 silver objects in storage as a reference collection of American silversmiths' marks. The silver on view in Winterthur's museum room settings and museum galleries is the subject of this grant proposal. It is a distinguished collection of colonial and pre-industrial era silver made or used in America including some of the first coins minted in Boston, the only known set of six matching Paul Revere, Jr. tankards, the largest extant collection of British fused plate lighting devices, and the Campbell's collection of British, European, and American soup tureens. **The proposal addresses critical conservation issues for this collection and is Winterthur's highest conservation treatment priority.**

Mr. du Pont envisioned his collection as a museum for the public and encouraged its study and publication of the collection. Multiple volumes written by silver scholar Martha Gandy Fales featured Winterthur's silver, and Louise Conway Belden's invaluable resource, *Marks of American Silversmiths* (1980), placed the museum on firm footing as a major research center for American silver. The Henry Luce Foundation for American Art encouraged the publication of a selection of the collection and Ian M. G. Quimby produced *American Silver at Winterthur* in 1995. In preparation for Quimby's book, a portion of the silver collection was analyzed by Winterthur's scientific lab and the XRF data was made available in the catalogue, making it an invaluable resource for scientists as well as students of American silver.

Preventive conservation standards maintained at the Museum, as in any historic property, are challenged by the open display of silver in the museum rooms. The majority of the collection, including dining and drinking vessels, flatware, lighting, personal jewelry and spectacles, is displayed on furniture, fireplaces or in open cabinets in the 175 museum room settings. Preservation of the collection is also influenced by the museum's teaching mission, which means that much of the collection is handled carefully, with gloves, on a regular basis. For instance, museum staff, graduate students (the Winterthur Program in American Material Culture and the Winterthur/University of Delaware Program in Art Conservation), and participants in special workshops (instructed in proper care and handling skills), all have access to the silver collection. In addition, preventive conservation aides regularly dust the silver as well as the rest of the artifacts.

Winterthur's Board of Directors has identified preservation of its collections as the institution's highest priority as expressed in the Vision and Mission Statement: "to inspire, enlighten, and delight all of its visitors while preserving and enhancing its buildings and landscape, its collections and programs and its history as a great American country estate." Winterthur's Conservation department was established in 1965 to service over 50,000 objects; today, the collection numbers more than 85,000 objects plus a library collection of 87,000 volumes and over one million manuscripts. The department currently has a staff of 19 (8 conservators, 2 scientists, 2 conservation assistants, a photographer, 3 lighting specialists and 3 preventive conservation aids). The conservators are recognized as leaders in their field and most also serve as professors for the Winterthur/University of Delaware Program in Art Conservation. Conservation and preservation planning are a part of every collection-related activity at Winterthur from exhibition lighting and maintenance procedures for live floral displays to the choice of glazing for window replacement in the period rooms and responsibility for the collection emergency plan. Winterthur's Guidelines and Procedures for Preventive Conservation Manual and Collection Emergency Plan have served as models for several other institutions. In recognition of its leadership, Winterthur received the Heritage Preservation/AIC Award for Outstanding Commitment to the Preservation and Care of Collections in 2003.

Assessment of the environment and surveys of the collections are ongoing and the information gathered is incorporated into the department's conservation planning. Winterthur's overall conservation plan is embodied in the Preventive Conservation Manual (*see appendix*) which is updated annually. The last overall survey of the collection occurred in 1997-2001 during the four year long project to upgrade lighting in all the period rooms. Approximately 60,000 objects were assessed and several hundred high priority objects were identified and treated during this period. Focused surveys, such as the one completed in the preparation of this proposal, are undertaken as needs are identified. The need to assess coatings on the silver collection and begin a recoating program has been an increasing concern for the last decade. In 2008, with the arguments presented by decorative arts curator Ann Wagner and objects conservator Bruno Pouliot, it was identified as the highest conservation priority and plans for a survey began. The results of the survey, discussed below, confirmed that recoating of the most vulnerable parts of the silver collection should remain the highest treatment priority for the museum collection. *See appendix for a summary the State of the Collections: Survey, Storage and Conservation Priorities.*

Winterthur has successfully applied for and completed several IMS/IMLS grants including a GOS grant in 2002, a recataloging grant in 2004 and several Conservation Project Support grants including two for the stabilization and rehousing of library collections, one for the treatment of historic wallpaper and one to purchase equipment and upgrade our X-ray capacity. These grants have been critical in helping Winterthur care for the most vulnerable parts of its collections when these needs have exceeded the available resources. Winterthur now faces a similar challenge with its silver collection.

Care of the silver collection was an early concern of the Conservation Department. Regular polishing of the collection, even with the gentlest methods, removes some silver with each cleaning, resulting in softening and ultimate loss of design elements such as engraved ornament and delicate moldings; for silver-plated objects, the loss of the thin silver display surface reveals the copper body below. Given the exhibition, handling and preservation needs of the collection, the staff investigated the use of coatings in the late 1970's and began a comprehensive silver coating program in 1982[i]. The initial program prepared and coated more than 1,000 objects in five years using two technicians supported by a grant from the NEA. The chosen coating material was Agateen Lacquer #27, a cellulose nitrate product that provided the best balance of minimal visual intrusion, stability and tarnish protection. The program was quite successful and many museums across the country and the world opted to apply similar cellulose nitrate coatings to their silver collection, when the option of closed cases with scavengers was not available.[1, 2, 3]

When the coating project began, research suggested the life expectancy of the Agateen Lacquer would be approximately 30 years[1]. That prediction has proven to be true – a significant number of coatings have begun to fail. Failures appear to be a function of application defects, coating age, moving parts such as hinged lids, complex surface topography, and use. **Of particular concern is the manner and speed at which tarnish forms in the failed areas of the coating, and the slight tarnish that forms through the coating after it has been in place for several years. Current theory suggests that these lacunae may serve as galvanic cells promoting particularly fast and aggressive local corrosion that will permanently damage the silver.** Winterthur must begin a major recoating program for its silver or risk significant damage to the collection, so this project has become the highest treatment priority for the museum collection. Additionally, much of the flatware on exhibition and complex multi-media objects such as watches, jewelry and spectacles were never lacquer coated. These items now exhibit significant tarnish and, with care, most could be cleaned and successfully coated to improve their preservation.

To better assess the scope of a recoating project, two pre-program conservation interns were charged with a survey of the silver collection during the summer of 2009. The results of their work, supervised by objects conservator Bruno Pouliot and decorative arts curator Ann Wagner, form the

backbone of the supporting material for this grant proposal. They surveyed the target collection and entered that information in a spread sheet, providing the information necessary to prioritize the coating and recoating needs of the collection. This data, combined with past research and new analysis proposed as part of this project, will result in a comprehensive understanding of silver coating behavior over a 30 year period. As a leader in the preventive practice of lacquer coating silver, Winterthur intends to publish its analysis using actual results to augment the significant evaluative testing conducted by previous scientists and conservators. Few other institutions can share findings of this nature, and it is our goal to offer recommendations and cautions for lacquer coating silver and for collections care based upon two generations of results gathered by Winterthur Museum.

Project Design

The goal of this project is to address Winterthur's highest treatment priority - failing coatings on its outstanding silver collection. The project will remove failed coatings, polish, and recoat approximately **650** silver and silver-plated objects identified as having serious coating failure issues as identified in the survey. These objects include coated silver exhibited in Winterthur's museum rooms (496) and exhibit galleries (150). In addition, the project will polish and coat approximately **100** highly vulnerable uncoated objects in the period rooms including dining table and tea wares, porringers, salvers, candlesticks, sconces and lighting implements, flatware (forks, spoons, ladles, sugar tongs), and small personal items such as tobacco boxes, hair combs, and spectacles. Many items chosen for treatment have a significant ownership provenance and were made by silversmiths working throughout the eastern United States.

Winterthur began coating its silver objects in 1982 to prevent damage caused by the repeated polishing required to maintain a desirable surface condition for display in museum room settings. The coating applied to many of the objects in the early years of the program has reached the end of its life expectancy and needs to be replaced. A survey conducted during the summer of 2009 confirmed that the silver collection is beginning to experience widespread and potentially damaging coating failure. Among the 1475 silver objects surveyed, about 1200 were coated. Among those pieces, 58% of the coatings were in good condition, while 42% showed varied forms of serious coating failure.

The tasks necessary for this program include:

- Hire and train two technicians who will work 3 days/week. Theoretical and hands-on training will be provided in the causes of silver tarnish, the role played by the coating, removal and application methods of the coating, and tarnish removal on silver. Bruno Pouliot has 12 years of experience training graduate conservation students and other interns in appropriate methods for silver care, and has also offered several workshops on the subject to a more general audience.
- Hire a part-time conservator to help respond to exhibition needs and to routine collection care and treatment projects in the Objects Lab while objects conservator Bruno Pouliot is engaged with this project. Winterthur has one object heavy exhibit scheduled for 2010 as well as a possible metals gallery reinstallation. Planning has begun for both and it is clear that this additional help will be needed. Inquiries have been made to several conservators in the area who would be interested in this position.
- Install a new fume hood in the Metals Lab to allow safe spray coating of silver objects.
- Set schedule with Registration Office for art handlers to move objects in and out of collection on a weekly basis. Work with Visitor Services to minimize impact on visitor experience.
- Complete documentation of the condition of each piece and photograph representative areas of damage using an SLR digital camera and lighting set up designed for silver. Technicians will work with conservation photographer and image management specialist Jim Schneck on proper

- Remove coatings that have failed with one of two methods: use of a steamer or the appropriate solvent mixture. The use of a steamer as a method for lacquer removal on silver was proposed a few years ago by conservators at the Rijksmuseum, and the method is efficient and safe.[4] However, many silver objects that have organic components or attachments, such as wooden handles or ivory rings, do require the use of a solvent mixture. In those cases the old coating is exposed to the solvent fumes, and then the coating must be manually removed with absorbent pads, a process that requires care and time, as well as the proper ventilation.
- Polish silver surfaces with a slurry of precipitated calcium carbonate, or in cases where the tarnish is more tenacious, with a slurry of aluminum oxide. Either of these abrasives is soft and the micron size of the particles ensures that a minimal amount of silver is removed, while no scratches are created on the surface. Either of these polishing compounds are then carefully rinsed off the surface in an aqueous solution and then dried with the use of compressed air. A final degreasing of the surface with a solvent, and buffing of the surface with a Selvyt cloth finalizes the preparation of the object for lacquering.
- Apply at least two coats of the Agateen # 27, either via brush application or with a spray gun. Both methods can be appropriate for most pieces, and both have advantages and disadvantages based on the experience of the user, the topography of the surface, and the presence or absence of moveable parts and components made of other materials.
- Inspect the dried coating for any visible flaws and check the integrity of the coating with a continuity tester. The accession number is then re-applied over the top of the coating in an inconspicuous area of the object. A particular color is chosen to indicate the presence of a coating, as compared to the color used to write accession numbers on the rest of the Winterthur objects. The treatment is then fully documented, and the information entered in the conservation records for the object.
- Identify and submit appropriate examples to Jennifer Mass of Winterthur's Scientific Research and Analysis Lab (SRAL), for analysis of the corrosion areas. The goal of this study is to examine the chemical and morphological nature of the silver tarnish (H_2S-acanthite) that forms in the lacunae of lacquer-coated objects over time in a typical modern museum environment. The tarnish layers inside of film lacunae will be examined by SEM and Raman spectroscopy to determine their morphological and molecular compositions respectively. An additional variable to be explored is how the nature of the coating (silane, siloxane, acrylic, or cellulose nitrate) affects the corrosion that forms both beneath the coating (if observed) and at the lacunae. Results will be compared with those in a study by Catherine Sease (Sease *et al*., "Problems with Coated Silver: Whisker Formation and Possible Filiform Corrosion", *Studies in Conservation* 42 (1997) 1-10), which studied silver in a far more corrosive environment.
- Disseminate project results by preparation of professional presentations and journal articles by Bruno Pouliot, Ann Wagner and Jennifer Mass for venues such as the AIC Annual Conference, the Journal of AIC, and the ICOM Committee for Conservation Metals meeting in 2013. Additionally, articles about the project and also about silver care and display will be written for journals and fine arts publications such as *Silver Magazine* (Greensboro, NC: Page/Fredericksen Publishing Company), the magazine *Antiques & Fine Arts* (Watertown, MA), as well as regional silver society newsletters, such as the *New York Silver Society* in order to disseminate the results of the research.
- Periodically update a description of the project in the conservation section of Winterthur's website.
- Provide tours including the project to the public, members, and donors.

Choice of Coating Material:
The chosen coating material is Agateen Lacquer #27, a cellulose nitrate product that provides the best balance of minimal visual intrusion, stability and tarnish protection. Winterthur now has almost 30 years of experience with this material. In the early 1990's, many conservators began questioning the choice of cellulose nitrate as a coating, based on research that indicated a certain instability of this material, particularly when it was used as an adhesive.[5] At Winterthur attempts were made to use other coating materials known for long-term stability, particularly acrylic polymers, but both the appearance and the performance of these coatings in preventing tarnish were unsatisfactory. Further in-depth research within the Winterthur/University of Delaware Program in Art Conservation, confirmed the overall superior performance of cellulose nitrate as a coating for silver[6] so Winterthur returned to the use of cellulose nitrate (Agateen #27) for its coating needs.

Project Resources: Time, Personnel, Budget
Time – Winterthur requests funding for two years to coat and recoat the 750 most at-risk silver objects in its collection. Winterthur plans to use the first two months of the grant period to hire and train two part-time technicians, one part-time assistant conservator, install a new down flow spray paint-rated fume hood and create a detailed schedule with the Registration Department for movement of the objects in and out of the lab. Positions will be advertised and the contractor scheduled prior to the beginning of the grant period. Treatment will begin with the study collection on the 8th floor and progress downward through the third floor and end with silver on exhibit in the Galleries, completing an average of 8-10 objects each week. The average is based on 30 years experience cleaning and coating silver and will vary with the complexity of the pieces. Within each floor, treatment will begin with flatware, the least complex of the forms, and progress through objects without moving parts, objects with moving parts, lighting implements and personal/other objects. Samples of both unusual and representative corrosion will be submitted for analysis throughout the grant period with most of the samples coming during the first year. During the second year staff will compile data and prepare professional presentations and publications.

The two technicians will work three days per week and Winterthur's conservation assistant will work 1 day per week. This schedule accommodates the space, time and supervisory staff available. Also, the repetitious nature of the project would lead to mental and physical fatigue if pursued full time. Bruno Pouliot is Winterthur's only object conservator and 50% of his time is absorbed by teaching duties in the Winterthur/University of Delaware Art Conservation Program (WUDPAC). Because of Bruno's expertise, he is the most appropriate conservator to supervise the project which will take 20% of his time. He will therefore hire an assistant conservator to work one day/week (20% of fulltime) to maintain the routine duties of the Objects Lab which include collection maintenance, treatment and preparing objects for exhibit and loan. The time commitment for other staff members is manageable within their existing positions and is part of their core activities.
Personnel – Key staff involved in this project include:

- Lois Olcott Price, Director of Conservation and project director, will supervise the hiring of staff for the project, monitor its progress and dissemination, and submit reports to IMLS. Lois received a MS in art conservation from WUDPAC in 1980 and has served as participant or project director for several IMLS grants. She has been Director of Conservation at Winterthur since 2007.
- Bruno Pouliot, Objects Conservator, will train and supervise the technicians, monitor the quality and progress of their work, supervise the part-time assistant conservator, coordinate research activities with the Scientific Research and Analysis Lab, and participate in preparing professional presentations and journal articles. Bruno received his MA in art conservation from Queen's University in 1983. After several challenging assignments, he served as Objects

- Ann Wagner, Associate Curator of Decorative Arts, will work with Bruno to schedule objects for withdrawal from exhibition, arrange for the installation of substitute objects where necessary, consult with Bruno, Jennifer Mass, and the technicians on treatment and research issues, and participate in the preparation of professional articles and presentations. Ann received an MA degree in Early American Culture from the Winterthur Program in 2004 and earned an MA in Art History from the University of Washington in 1996. She has been the curator responsible for metalwork at Winterthur since 2005 and received grants from the NEA, The Henry Luce Foundation, and the Americana Foundation for a recent exhibition.
- Dr. Jennifer Mass, Senior Scientist and head of the Scientific Research and Analysis Laboratory (SRAL), will conduct analysis of corrosion areas with SEM and Raman spectroscopy to characterize the corrosion on selected objects with the goal of improving understanding of coating failure and its impact on the object. She will participate in preparing professional articles and presentations with Bruno and Ann. Jennifer received her Ph.D. in Inorganic Chemistry with a concentration in Materials Engineering in 1995. After research and teaching positions including three years at the Metropolitan Museum of Art, she joined Winterthur's staff in 2001 where she has continued to teach research and present her findings in national and international journals and conferences.

Budget - The budget for this project has been designed based on 30 years of experience cleaning and applying coatings to silver. Allowing an average of one day per object, Winterthur plans to treat 750 objects during the grant period using two part-time technicians hired for the project and one staff conservation assistant with experience coating silver. All will work under the supervision of objects conservator, Bruno Pouliot who will devote 20% of his time to the project. Because 50% of Bruno's time is already committed to teaching in WUDPAC, the project requires an additional part-time assistant conservator in Winterthur's object lab to let Bruno devote adequate time to the silver project. Salaries for grant staff are consistent with Winterthur salary ranges for those positions. Because of the undergraduate and graduate conservation programs at the University of Delaware and Winterthur, there is a rich pool of qualified applicants available. *See appendix for position descriptions.*

Costs for equipment and supplies for silver cleaning and coating have been estimated using Winterthur's established vendors who are chosen for reliability as well as price at the time of purchase. Estimates for the documentation equipment (camera, lights, and diffusion dome for silver) were researched in the same manner. Winterthur has a computer, a high quality monitor, and software (Photoshop) available to the project for processing the digital images. Images will be stored on a separate existing server dedicated to conservation images as well as backed up on Winterthur's network. The new ductless fume hood, with a three stage filtration system rated for a spray application, is required to avoid conflicts with other users (staff and graduate students) of the single spray booth available to the Conservation Department since this project will occupy most of the time in the booth three days a week for two years. Existing fume hoods in the metals lab were evaluated by an outside engineer, but they do not meet code and safety (OSHA) requirements for a spray application so a new hood is the only option. Modern Controls recently installed three fume hoods in the Conservation Department and did an excellent job, so they were asked to consult and submit a proposal for this project.

Impact

The plan submitted has three immediate intentional benefits. It will:

- Enable conservators to maintain effective preventative care for silver and silver-plated objects experiencing imminent threat through failure of their lacquer coating. A successful project will meet the goal of coating or recoating the most at-risk portion of Winterthur's silver collection.
- Continue to provide access for visitors and students by protecting silver objects displayed openly in museum room settings and used in teaching environments. A successful project will maintain safe access to the collection for visitors, collectors, and scholars.
- Bring quantifiable results from nearly 30 years of lacquer coating practices to the international conservation community by publishing the project's findings. A successful project will produce a publishable assessment of the coating program and associated scientific analysis, offering recommendations and cautions for the lacquer coating of silver.

While the recoating project will be conducted largely in the laboratory, out of sight for most visitors, the project's results will be appreciated by every tour and every workshop involving the silver collection. Those visitors taking conservation area tours and attending some programs may observe a stage of the process. Students in both graduate programs (54 in residence during the course of the project) will have the opportunity to observe the project and talk to project staff.

Documentation of the project will allow for conservation treatment methods to be featured on the Museum's website as well as in gallery labels and on conservation tours. As curator Ann Wagner attests, "No matter what is the subject of my lecture, the first question the audience asks is, 'How does the museum clean its silver?'" Care and cleaning are primary concerns voiced by the public and Winterthur conservators have a 50-year long reputation of recommending best options for both concerns. The results of this recoating project may yield recommendations most appropriate for institutional care of silver rather than for private collections, but the broader discussion of methods for tarnish prevention is appealing to many specialist groups.

The project team of conservator, curator, and conservation scientist anticipate contributing reports of this project to AIC (*Journal of The American Institute for Conservation)* and IIC (*Studies in Conservation)*, and hopefully to ICOM for the metals meeting in 2013. Additionally, an article about silver care and display will be written for silver journals and fine arts publications such as *Silver Magazine* (Greensboro, NC: Page/Fredericksen Publishing Company), the magazine *Antiques & Fine Arts* (Watertown, MA), as well as regional silver society newsletters such as the *New York Silver Society*.

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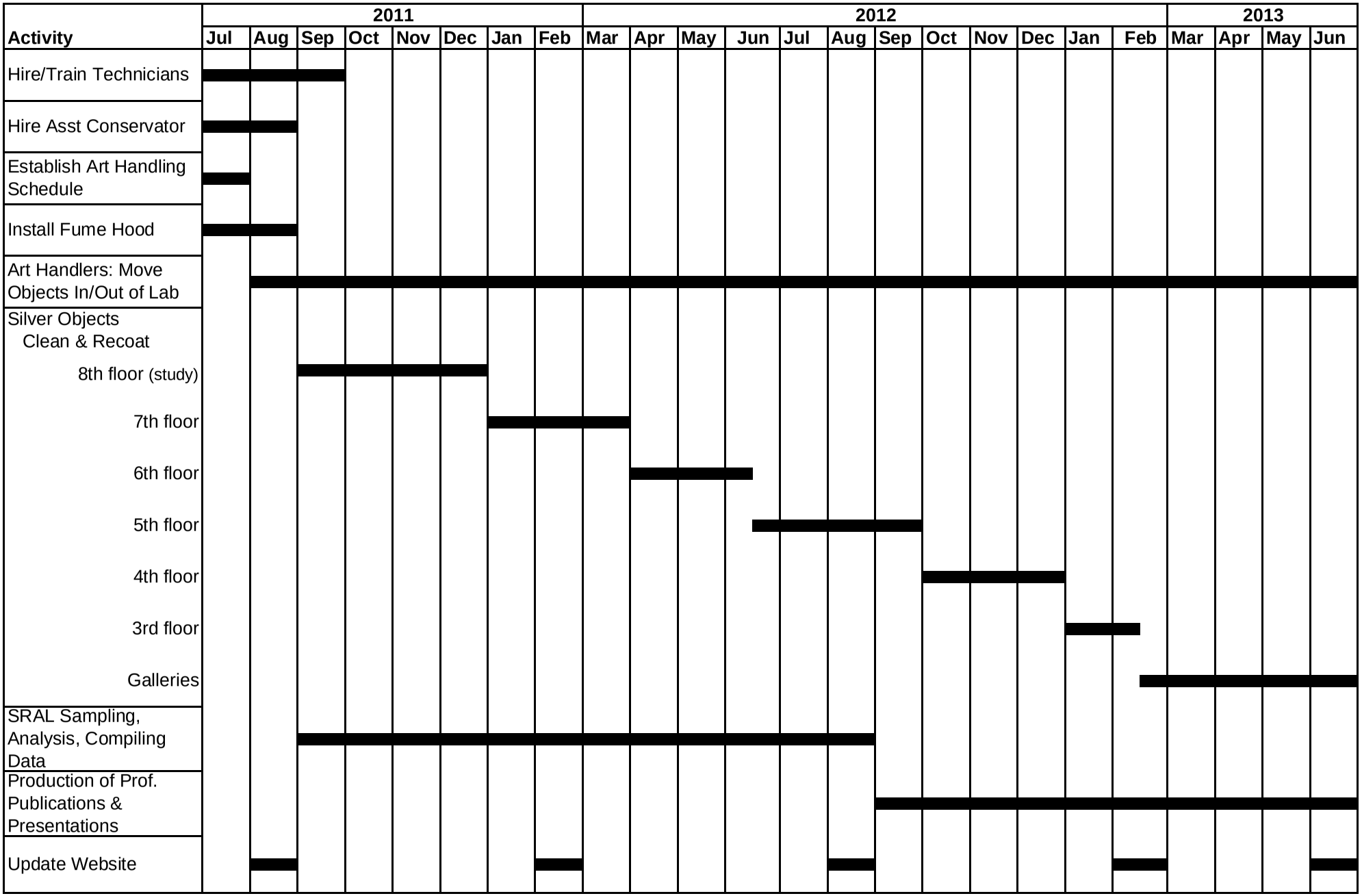
[1] Don B. Heller. "The Coating of Metal Objects at Winterthur." AIC Preprints. Washington, DC: AIC, 1983. pp 57-64.
[2] Dandridge, P. 2005. The exhibition of unlacquered silver at the Metropolitan Museum of Art. JAIC 44(3): 175-183.
[3] Metcalf, S. January 1997. Weighing up silver objects: evaluating past and future conservation methods. V&A Conservation Journal. 1-2.
[4] Ankersmit, H.A., and R. van Langh 2002. The removal of lacquers from silver by steam. *Contributions to Conservation. Research in Conservation at the Netherlands Institute for Cultural Heritage*. Eds. J.A Mosk and N.H. Tennant. London, UK: Archetype Publications. 1-9.
[5] Selwitz, C. 1988. Cellulose nitrate in conservation. Marina del Rey: Getty Conservation Institute.
[6] Reedy, C.L., et al. 1999. Evaluation of three protective coatings for indoor silver artifacts. AIC Objects Specialty Group Postprints 6: 41-69.

IMLS SILVER GRANT

SCHEDULE OF COMPLETION



BUDGET FORM - PAGE FOUR

Section B: Summary Budget

	$ IMLS	$ Cost Share	$ TOTAL COSTS
1. Salaries and Wages		86,156.00	86,156.00
2. Fringe Benefits		24,985.24	24,985.24
3. Consultant Fees		30,730.00	30,730.00
4. Travel		4,665.00	4,665.00
5. Supplies and Materials		19,212.00	19,212.00
6. Services		4,000.00	4,000.00
7. Student Support			0.00
8. Other Costs			0.00
TOTAL DIRECT COSTS (1—8)	0.00	169,748.24	169,748.24
9. Indirect Costs			0.00
TOTAL COSTS (Direct and Indirect)	0.00	169,748.24	169,748.24

Project Funding for the Entire Grant Period

1. Grant Funds Requested from IMLS	58,607.00
2. Cost Sharing:	
a. Cash Contribution	
b. In-Kind Contribution	111,141.24
c. Other Federal Agencies*	
d. TOTAL COST SHARING	111,141.24
3. TOTAL PROJECT FUNDING (1+2d)	169,748.24
% of Total Costs Requested from IMLS	34.00%

* If funding has been requested from another federal agency, indicate the agency's name:

Narrative

1. Statement of Need

- **How the project ties in to the museum's long-range conservation plan and/or conservation priorities.**

This project centers on the conservation treatment of *Battle of the Animals*, one of the most important and unusual Renaissance tapestries in the Memorial Art Gallery's permanent collection. This tapestry, which was woven in Flanders during the 1560s or 1570s, is in extremely fragile condition and has not been exhibited for several decades. The proposed conservation of *Battle of the Animals*, which was identified as of highest priority in a recent detailed condition survey (attached as "Optionaldoc3"), is an outcome of the museum's long-standing efforts to establish and realize long-range conservation priorities.

The goal of establishing a program for systematic condition surveys with an eye toward determining treatment priorities has long been at the fore of the Gallery's collections care program. In the museum's 1991 General Conservation Assessment Survey, Tom Branchick, Director of the Williamstown Art Conservation Center (WACC), identified as a high priority "updating or obtaining a prioritized object specific survey for the collections and applying for funding for the most urgent conservation treatments." During the process of writing the Gallery's Long-Range Preservation Plan in 2002, the Collections Department determined with consultant Barbara Moore that the complete evaluation and treatment of the Gallery's European tapestries are essential to the responsible stewardship of the museum's collections. The 1991 Conservation Assessment Survey and summary update as well as relevant excerpts from the Gallery's Long-Range Preservation Plan are attached to this application as "Supportingdoc1" and "Optionaldoc2," respectively.

The primary benefit of creating a detailed long-range conservation plan is that it forces an institution to schedule major conservation treatment and collections care projects logically and well into the future. The Gallery's Long-Range Plan was thus written as a guiding document that enables the Gallery to identify and execute large projects in as timely and judicious a manner as possible. In the case of the European tapestry collection, we determined that, because of its quality and importance, the complexity and expense of conservation, the necessity of treatment before any possibility of exhibition, and, due to light sensitivity, the need to establish a regular rotation schedule as recommended by the conservator, this initiative would play a major role in the conservation treatment priorities of the museum.

In 2003-2004, an IMLS-funded detailed condition survey of the tapestry collection was performed by Marlene Eidelheit, director of the Textile Conservation Laboratory (TCL) of the Cathedral of St. John the Divine in New York City, in order to systematically evaluate each tapestry, determine its condition, provide a proposed treatment plan, and establish treatment priorities based on condition and historical and aesthetic importance. We determined that nine medieval and Renaissance tapestries, all of which received high priority ratings during the detailed condition survey, would form the core of a larger Tapestry Initiative that has as its long-term goal the treatment and research that will culminate in publication and new, comprehensive web- and technology-based educational materials. To date, these efforts have resulted in grants to conserve two major Renaissance Flemish tapestries, *Musical Game Park: A Forest Scene with Peasants* (NEA 2005) and, most recently, *Trellised Garden with Animals* (IMLS CPS 2009).

- **Why this project is among the museum's highest collections care priorities at this time.**

The conservation of *Battle of the Animals* is among our highest collections care priorities for several reasons. First, if this grant application is successful, we will have achieved an important milestone of the Tapestry Initiative: to have three major tapestries available for regular, scheduled rotation in the Renaissance gallery.

Although one tapestry has been successfully conserved under this long-term initiative and another is presently undergoing treatment, the necessity of implementing a strict rotation schedule requires that each tapestry rest for a period of at least 2 years. Our goal of conserving all three tapestries would allow for at least the minimum rotation schedule (1 year on, 2-3 years rolled and off view) suggested by the conservator, and provide an even wider variety of engaging visual and educational material to our visitors, including schoolchildren, for whom the Renaissance is a major component of their Social Studies curriculum.

Second, the tapestry is in extremely fragile condition and, as outlined by the conservator in her condition report and treatment proposal ("Supportingdoc3"), cannot be displayed in its current state. Although it does not continue to deteriorate as it languishes in storage, new research has shown that *Battle of the Animals* is of major historical and aesthetic importance to the subgenre of Renaissance zoological and botanical tapestries as well as the history of science. The piece is too unstable to be hung even for the short time necessary for photography; until treated, scholarly research and educational outreach are at a standstill.

Finally, the tapestry collection, and particularly *Battle of the Animals*, is closely intertwined with the history and mission of the museum. The Gallery and its original building were founded in 1913. In 1926, Lawrence White of the well-known New York architectural firm McKim, Mead and White designed an addition to the original building that included a monumental gallery space with clerestory windows. Mr. White determined that it was essential for the museum to purchase a major tapestry for the 1926 inaugural exhibition. After much effort, he located several possibilities that he presented to the director. Ironically, the tapestry that was eventually chosen—*Battle of the Animals*—had originally been in the collection of his infamous father, the architect Stanford White. *Battle of the Animals* was the first tapestry to enter the collection; its popularity led to the purchase of other major medieval and Renaissance tapestries during the following decades.

- **How the project ties into the museum's previous and current collections care activities.**

The conservation treatment of *Battle of the Animals* is consistent with both our conservation history and the implementation of our Long-Range Collection Preservation Plan. Caring for, conserving, documenting and exhibiting the permanent collection is at the core of the Memorial Art Gallery's mission. Implementation of the priorities in the Long-Range Plan is a staff-wide, interdepartmental effort; staff and institutional resources and funds are allocated equitably among infrastructure and object-based preservation, evaluation, improvement, and treatment. While the Memorial Art Gallery does not have a staff conservator, local and regional conservators are utilized for both regular site-visit examinations and, when possible, on-site treatment. The curatorial department dedicates one day per month to the thorough cleaning and inspection of objects in individual galleries. A smaller group of works is cleaned by curatorial staff on a weekly basis to minimize the accumulation of dust. An integrated pest control system is in place and the University of Rochester Facilities department provides expertise in the event of infestation. Lighting is kept at levels recommended by standard conservation practice. Temperature and humidity are regulated and monitored through computerized systems. Recent accomplishments of the Facilities department that directly impact the collections include the hiring of a full-time, permanent HVAC mechanic to maintain, monitor and repair the interior building climate control system; systematic cleaning and encapsulation of ductwork; incapacitating old steam pipes in storage rooms; and rebuilding humidifiers for improved control and efficiency. In 2005, the museum resolved the serious issue, noted by Mr. Branchick in the 1991 GCAS, of direct light from the arched glass windows in the Fountain Court gallery by installing panels of Kalwall, a composite window material that diffuses sunlight and radically lowers light levels while maintaining the aesthetic of natural daylight. In 2007, wireless environmental monitoring devices were installed in all storage rooms.

A priority within the curatorial department has been the complete inventory of all storage rooms in order to facilitate the accurate record keeping, history and coordination of all object locations, conservation records

and art movements in EmbARK, the museum's collection management database. These inventories have also provided staff with the opportunity to rehouse objects when necessary and to take registration photography. At present, inventories of painting, temporary, textile, and print storage are complete, while small objects and large-scale sculpture and furniture storage rooms are slated for completion at the end of 2011. In the summer of 2007, a conservator from WACC conducted a much-needed 3-day detailed condition survey of the museum's outdoor sculpture. Conservation treatment, whether funded solely by the museum or in conjunction with private donors and foundations or state and federal grants, is ongoing. In the past few years, over 75 paintings, 140 works on paper, one tapestry and several large-scale sculptures have received much-needed conservation treatment. In 2008 the Gallery received funding from the Luce Foundation to treat six important American portraits; in 2009, Greater Hudson Heritage Network provided full funding for the treatment of two ancient Greek kylixes, one African Senufo mask, and a North Native American clam basket.

The Gallery has also benefited over the past 25 years from IMS and IMLS conservation grants. These include 1985, 1986, and 1988 conservation surveys of prints, drawings and watercolors; sculpture; and paintings and objects. Grants related to upgrades in the environment and housing of objects include a 1996 Environmental Survey of the Fountain Court and a grant in 2000 to completely refurbish permanent storage for works on paper. Treatment grants from 1992 and 1999 supported respectively the treatment of the 17th-century Chinese wall painting *Bearer of Good Tidings* and seven important European and American paintings and frames. As already noted, in 2003, the Gallery received an IMLS grant for the detailed condition survey of our collection of European tapestries; in 2004, IMLS funded the conservation treatment of nine sculptures by Gaston Lachaise. Finally, and most important to the Tapestry Initiative, in 2009 IMLS awarded the museum a CPS grant for the conservation of *Trellised Garden with Animals*.

- **The museum's overall financial commitment to conservation as well as the governing authority's commitment.**

The Memorial Art Gallery is committed to the support of ongoing conservation analysis and treatment. As a subscribing member of WACC, the Gallery pays dues each year that are applied toward treatment and site visits. The curatorial department also maintains a separate budget line for emergency treatment or treatment by local or specialized conservators. A charitable lead trust established several years ago by an individual donor for conservation projects has provided matching funds for conservation grants and facilitated treatment beyond the Gallery's operating funds. Private donors have contributed to conservation in areas of special interest, such as Asian and ancient art; a new conservation endowment was established by a private donor in 2009; and the Gallery Council, the primary support organization for the museum, provides a yearly budget line directed to conservation activity. Finally, the Gallery's development and curatorial staff actively seek sources of outside funding for conservation from granting agencies, private foundations and individual contributions. At the Board level, the museum's Strategic Plan has as its first priority the care, interpretation and presentation of the permanent collection and actively continues to seek special endowment funds to ensure these activities continue well into the future. The Chief Curator worked closely with Senior Staff, the University of Rochester, and outside consultants to develop a comprehensive emergency preparedness and disaster plan. In 2008, a local private foundation provided funds to purchase supplies for this initiative.

2. Project Design

- **Project goals and objectives.**

Objective a: The primary objective of this project is the full conservation treatment of and resulting documentation for *Battle of the Animals* so that it is again fit for exhibition, research, and education. Information learned during the process of conservation, documentation photography by the conservators

throughout the course of treatment, and an extensive final treatment report will greatly enhance the material knowledge of the tapestry. The benefits of treatment to the tapestry are innumerable: not only will colors and materials show marked aesthetic improvement through cleaning and, when appropriate, the removal of old and discolored restoration, it will be repaired, stabilized, and relined to provide the best possible support, allowing its exhibition on rotation well into the future.

Three additional major objectives that stem from this treatment include b) art historical research; c) professional high-resolution digital photography suitable for publication; and d) the creation of an interactive, multimedia web-based presentation that explores the tapestry's conservation treatment, iconography and historical context. **Objective b:** Despite the tapestry's obvious aesthetic quality and unique imagery, there is a dearth of information in the object files. To the curator's knowledge, there has been no substantial research on *Battle of the Animals* since its acquisition in 1926. Through recent correspondence with scholars, however, it has become clear that the tapestry is extremely important within the genre of Renaissance zoological and botanical tapestries and illustration. Teeming with a wide variety of exotic, fantastic and real animals as well as detailed flora, *Battle of the Animals* is closely related to an elaborate series of 44 similar tapestries commissioned in the 1560s by the Polish king Sigismund II August for his Wawel castle in Cracow. This information opens the door to further research that will provide insight into the tapestry's extraordinary iconography and, perhaps, lead to the identification of the city and workshop where it was created. **Objective c**: TCL has worked extensively with the photographer John Taylor; he also photographed our recently-conserved *Musical Game Park*. The results of his efforts, in part due to the appropriate space available at TCL and in part due to his familiarity with the process and specialized nature of tapestry photography, were of extraordinary quality. These high-resolution digital files are large enough for scholarly research and any print or web publication, making available a level of detail well beyond that visible to the naked eye. This photography will also be invaluable for all future projects, including the Gallery's handheld technology initiative and a projected print or web-based catalogue of the tapestry collection. **Objective d**: Two reviewers of the Gallery's 2009 IMLS CPS grant awarded for the conservation of the tapestry *Trellised Garden with Animals* suggested documenting the conservation process through video for use on the Internet. The curator found this an intriguing idea, and, after discussion with the webmaster, determined that she could easily use Pachyderm, a simple interactive multimedia web-based authoring tool, to create a presentation that explores the conservation, iconography, and historical context of *Battle of the Animals*. Developed by the San Francisco Museum of Modern Art and The New Media Consortium and funded by IMLS, Pachyderm is software designed for users with minimal authoring experience. Although professional video would be prohibitively expensive in the context of this project, the curator discussed this idea with the conservator, who agreed to participate by informally videotaping the progress of treatment. This presentation will provide the unique opportunity for museum and virtual visitors to experience the conservation process from start to finish and to visually explore the object, even when not on view.

- **Museum's plan to ensure that normal museum operations are not disrupted.**

This project will cause no disruption of normal museum operations as all treatment will occur off-site at TCL. Research on key objects in the permanent collection is already a component of the curator's responsibilities. Packing and shipping are normal museum activities.

- **Conditions to which the object is currently exposed and why it deserves merit at this time.**

Battle of the Animals is being stored in excellent environmental conditions as well as new and appropriate housing until treatment is possible. During the 2003-2004 detailed condition survey, Ms Eidelheit trained museum curatorial and facilities staff in the proper handling of tapestries; at that time, all the Gallery's tapestries were rolled with polyester padding on new, acid free tubes with new muslin fabric and Tyvek

wrapping. The project deserves merit at this time because of the tapestry's fragile condition, high priority treatment status, and aesthetic, scholarly, and historical importance.

- **A description of the object that is the focus of the project.**

The focus of this project is the conservation of the Renaissance tapestry *Battle of the Animals* (Visual Documentation is attached as "Supportingdoc2"; the numbers in the text below refer to those in the Visual Documentation), which was made in the 1560s/1570s by an unidentified Flemish workshop most likely located in the tapestry-making centers of Oudenaarde or Brussels. Large and elegant, the tapestry is completely intact, finely woven of wool and silk, and measures 9 feet 11 inches high x 16 feet 4 inches wide.

If a single phrase could describe the overall impression of this lavish tapestry, it would be "frenetic activity, frozen in time." The main body of *Battle of the Animals* teems with exotic, real, and fantastic animals engaged in myriad pursuits, not the least of which is aggressive behavior (full view #1). At lower left, an ocelot stalks his prey (#2), while at center the contorted body of a large red hunting dog with a jeweled collar snatches a water fowl from a stream (#s 4-5). An ostrich surrounded by different types of reptilian creatures pecks at flora on the bank (#3); the peacock at the right cranes its head to observe the animals behind it (#6). Two hopping hares are seen in the right corner. Behind the ostrich, an equine animal rears on its zebra-striped hind legs, while a nearby unicorn gracefully extends her front foreleg (#6). In the entire background of the tapestry, hunters on horseback and foot, along with their dogs, race through a wooded landscape, including a castle and farmstead (#7). A wide variety of trees and foliage fill the entire body of the tapestry, all of which were distinctly woven for clarity. The action-packed border, filled with Renaissance ornament, grotesques, satyrs, and animal-headed musicians is equally impressive (#s 8-11). The figure of Diana, shown here with her dog, is found in both the left and right lower corners (#8-9). Her presence as Goddess of the Hunt links the iconography of the main tapestry and its borders. Dr. Carmen Niekrasz, whose dissertation focuses on this genre of animal tapestries, wrote in an e-mail: "To my knowledge, yours is the most remarkable example of a 16th-century animal tapestry in any North American museum."

Condition problems are shown in #s 12-19. Some of *Battle of the Animal's* original brilliant and variegated colors of blue, yellow, green and reddish-brown have faded over time; others are muted because of heavy soiling. This results in a monochromatic, gray overall tone, which makes it difficult to discern the elaborate detail throughout. Although the conservator was unable to remove the entire backing during the survey, she was able to tell that there have been several campaigns of restoration over the centuries. We expect that even more information will emerge once the backing is removed—perhaps, even, a maker's or town mark.

- **Conservation methods in terms of efficiency, reliability, and safety.**

The proposed treatment is reliable and is based on the conservator's years of experience with tapestry conservation. The tapestry will be packed according to the conservator's recommendations and shipped to New York City via Northeast Transit, a regional fine arts transit company used frequently by the museum. *Battle of the Animals* will be conserved at the Textile Conservation Laboratory (TCL) of the Cathedral of St. John the Divine in New York City, which is considered one of the top tapestry and textile conservation labs in the United States. Ms. Eidelheit is well familiar with *Battle of the Animals* from her thorough examination during the 2003-2004 detailed condition survey. TCL's equipment is state of the art; treatment, including wet cleaning, humidification, consolidation and relining, will take place on site by Ms Eidelheit and other experienced textile conservators under Ms Eidelheit's supervision.

- **Rationale for the proposed training curriculum, if applicable.**

  Not applicable to this project.

3. Project Resources: Time, Personnel, Budget

- **Time allocated to complete project.**

The conservator and curator determined the timeframe for this project based on prior experience and the upcoming deadlines at TCL. Accordingly, the project is designed to last 18 months. The time actually allotted for treatment is about 14 months. The amount of time required by Gallery staff for their various activities is based on prior experience with all aspects of the project, including packing, shipping arrangements, research, and the preparation of educational and web-based materials. The project curator has allocated 320 hours for the travel, research, and educational media development components of the project. This time also includes e-mail and telephone contact with the conservator to discuss potential new avenues for research based on discoveries made as treatment progresses. Throughout the project, the curator and conservator will work together to determine the appropriate course of treatment as well as the most interesting activities for the videos that will be included in the web-based multimedia presentation. As seen on the Schedule of Completion, there is enough time bracketed for all activities at MAG that each can be reasonably incorporated into the existing schedules of project personnel.

- **Key staff and consultants involved in the project, their qualifications, commitment to project activities, and how they will balance project responsibilities with other ongoing duties.**

Conservator

Marlene Eidelheit is the Director and Chief Textile Conservator of the Textile Conservation Laboratory of the Cathedral of St. John the Divine in New York City. Ms. Eidelheit and her staff are responsible for the conservation and restoration of the Cathedral's collection of Barberini and Mortlake tapestries as well the textiles of private and institutional clients, including the Metropolitan Museum of Art, the J.P. Getty Museum, and the Detroit Institute of Arts. At the Textile Conservation Laboratory, she oversees the laboratory and all conservation projects, including wet cleaning, mounting, dyeing, analysis, consulting, and surveys.

Memorial Art Gallery Key Project Personnel

Nancy Norwood will be the director of the project. She has been the curator of European art at the Gallery since 2000. She was the project director for both the 2003-2004 tapestry survey and the IMLS-funded conservation of *Trellised Garden with Animals*. Ms Norwood will be responsible for communicating and meeting with the conservator to discuss issues involving treatment and progress; art historical research and materials; creating, with the webmaster, the interactive, multimedia presentation for the museum's website; and determining materials for use by the education department. Ms Norwood is well qualified for this research, as her area of academic specialization is the art and culture of late medieval and early modern Northern Europe, the chronological and geographic frame of the tapestry *Battle of the Animals*. As research on and interpretation of the permanent collection is a component of her curatorial work, this project will not pose a conflict with her other responsibilities.

Lucy Harper is the Gallery's webmaster and librarian. She will work with the curator to develop the Pachyderm interactive, multimedia web-based presentation focused on the conservation treatment, iconography, and cultural and historical context of *Battle of the Animals*. Ms Harper is well familiar with the Pachyderm software and authoring tool through her key technological role in the creation of the educational modules for a recent IMLS MFA grant, *The Arts of the World Within Reach*. This module, *Picturing the Story*, is on the Gallery's website at http://mag.rochester.edu/PicturingTheStory. A primary component of her job is the development of teacher resources; this project fits within her regular responsibilities.

Monica Simpson has been the Gallery's Permanent Collections Registrar since 1995. She will be responsible for packing, shipping, and installation. Ms Simpson worked closely with Ms Eidelheit during the 2003-2004 survey, an experience that resulted in intensive training in the handling, care and storage of tapestries. As Permanent Collections Registrar, Ms Simpson is responsible for the coordination of all conservation treatment. She holds a degree in Museum Studies and is highly experienced in collections management and care. Ms Simpson's time on the project is limited to activities that are a normal part of her job responsibilities and will be factored into her schedule accordingly.

- **Budget allocation to accomplish project activities, including both the applicant's contributions and how the applicant will meet the required 1:1 match.**

As outlined in Ms Eidelheit's detailed cost estimate ("Supportingdoc3," final page), the cost of conserving *Battle of the Animals* at TCL is $79,812; the total project costs amount to $111,262. We are requesting $55,600 from IMLS to offset the actual conservation treatment; the Gallery has earmarked conservation, photography, and travel funds that, along with salary support and indirect costs, will comprise the 1:1 match. In addition, the museum is and will continue to actively seek funding specifically for tapestry conservation from private national and local foundations and individuals.

4. Impact

- **How the results will be assessed and their significance if known.**

The immediate success of this project will be realized through the successful treatment of the tapestry and the material and art historical knowledge obtained throughout the conservation and research process. A measurable impact will also be seen after the web presentation is online, both in terms of numbers of viewers and correspondence with scholars who have expressed an interest in studying the tapestry. At least as important, however, will be the public response of visitors, docents and students, most of whom have never seen this fascinating work of art.

- **Information about any intended products that will result from this project.**

The conservator will provide an extensive final treatment report as well as pre-, mid- and post-conservation documentation photography. The Pachyderm presentation will be accessible through MAG's and TCL's websites. High-resolution digital photography suitable for print and the web will be utilized by curators, outside scholars, and educators. Curatorial research will be compiled and provided to the education department for the development and production of docent training materials.

- **Variety of media and other means the project will use to reach audiences that would benefit from its work.**

The accessibility of the multimedia presentation on the museum's website, as well as TCL's, will be the primary medium used to disseminate the project well beyond a regional or even national audience. Educational resources documenting the conservation of and new research on the tapestry will be directed to local and regional teachers, who will use them in their classrooms to reach the thousands of schoolchildren participating in the Gallery's school programs. Once *Battle of the Animals* is installed on rotation, it, along with information about *Musical Game Park* and *Trellised Garden with Animals*, will be integrated into the most popular 6th-grade school tour, *Passport to the Past*. The general public will be encouraged to visit this new gallery highlight through the museum's blog, e-mail blasts, and print publications. All of this information will also be announced to the press via news releases.

Schedule of Completion: Conservation Treatment Project for the Renaissance tapestry *Battle of the Animals*

ACTIVITY	**2011** Jul Aug	Sep Oct	Nov Dec	**2012** Jan Feb	Mar Apr	May Jun	Jul Aug	Sep Oct	Nov Dec
Tapestry packed and shipped to TCL									
Conservation of tapestry									
Conservator writes final treatment report									
Curator researches tapestry; coordinates video/photo documentation w/ conservator; works with webmaster to develop multimedia web-based presentation of conservation & research									
Curator visits lab to examine tapestry and discuss treatment progress/options w/ conservator									
Photography at TCL; curator provides research information, new photography and comparative images to Education department for docent preparation and teachers; info to PR department to publicize project									
Tapestry returned to MAG for installation on rotation in Renaissance gallery; multimedia presentation on website goes live									

BUDGET FORM: Section B, Summary Budget

	$ IMLS	$ Cost Share	$ TOTAL COSTS
1. Salaries and Wages	$0.00	$9,157.00	$9,157.00
2. Fringe Benefits	$0.00	$2,930.00	$2,930.00
3. Consultant Fees	$55,600.00	$27,813.00	$83,413.00
4. Travel	$0.00	$1,200.00	$1,200.00
5. Supplies and Materials	$0.00	$100.00	$100.00
6. Services	$0.00	$1,200.00	$1,200.00
7. Student Support	$0.00	$0.00	$0.00
8. Other Costs	$0.00	$0.00	$0.00
TOTAL DIRECT COSTS (1-8)	$55,600.00	$42,400.00	$98,000.00
9. Indirect Costs	$0.00	$13,262.00	$13,262.00
TOTAL COSTS (Direct and Indirect)	$55,600.00	$55,662.00	$111,262.00

Project Funding for the Entire Grant Period

1. Grant Funds Requested from IMLS	**$55,600.00**
2. Cost Sharing:	
a. Applicant's Contribution	**$55,662.00**
b. Kind Contribution	**$0.00**
c. Other Federal Agencies*	**$0.00**
d. TOTAL COST SHARING	**$55,662.00**
3. TOTAL PROJECT FUNDING (1+2d)	$111,262.00
Percentage of total project costs requested from IMLS	**50 %**

*If funding has been requested from another federal agency, indicate the agency's name:
n/a

OMB Number 3137-0071; Expiration Date: 7/31/2010. Estimated burden for both detailed and summary budget forms: 3 hours.

Newark Museum – IMLS Conservation Project Support Application

1. Statement of Need

a. Overview of need and identification of priorities:

The Newark Museum requests a grant to support the rehousing of approximately 1,800 objects in the Museum's Jewelry collection, currently stored in the Museum's Main Building basement storage area, into conservationally sound and customized cabinetry. This conservation project would remedy an inadequate storage configuration that puts these treasures in the Museum's collection at risk of corrosion, exposes them to contaminants, and is difficult for Museum staff to access as they work to make the collection accessible for the Museum's visitors, scholars and collectors. The most recent General Conservation Assessment completed by Wendy Jessup and Associates, Inc. in 2010 identified the need to rehouse the jewelry collection as one of the highest collections care priorities for the Museum.

The jewelry collection is stored in a 100 square foot storage room designated for valuable metals, which, in addition to the jewelry collection, includes objects from the Museum's silver collection. In this room, the jewelry storage is grossly inadequate. The collection is confined to eight compartmentalized cardboard boxes; three century-old wooden units that, in the 1920s, were salvaged and re-used for jewelry collection storage; and two 1960s metal units inadequately prepared for their storage of the bulk of the cross collection (which dates from the 14th century and is some of the earliest jewelry contained in the collection). The more recent acquisitions are all simply laid out on open shelves – a practice which is inefficient, deleterious, and unsecure. In this current storage configuration, the objects in the jewelry collection are overcrowded, at risk of corrosion, infestation and exposure to particulate and gaseous contaminants.

The Museum has identified the jewelry collection as the highest priority for conservation for several key reasons. With a collection composed of European and American jewelry from the 14th century to the modern day, the Museum is one of the few in the nation with an active program of collecting and documenting the history of jewelry and is aware of its responsibilities as stewards of a broad collection of scholarly, technical, and artistic significance. Its Newark jewelry collection, which contains exquisite pieces of jewelry as well as supporting technical and business documentation, dates from the era of Newark's dominance in the national jewelry industry in the 19th century and is a resource that simply does not exist in other institutions. It is an important record of American cultural and manufacturing history that would otherwise have been lost. In addition, building upon Newark's jewelry roots, the Museum is one of only a few institutions that have taken on the responsibility of conserving and documenting the American art form of jewelry along with its manufacturing and technical history. The Museum is committed to assembling a strong collection of American jewelry holdings – another area in which very few museums are actively collecting. Other collecting strengths include contemporary studio jewelry by important European and American craft designers as well important early pieces of European jewelry.

Finally, in line with its mission to hold the objects in its collections in trust for its constituents, the Museum is committed to guaranteeing public access. The creation of an endowment and the Lore Ross Jewelry Gallery in 2009 - one of only four such galleries in the United States and the only one in New Jersey– allows the Museum to place more objects on view for its enthralled visitors. As an important resource for collectors and scholars, host to several major exhibitions over the years, and a major attraction for the Museum's audiences, the jewelry collection is an active area of collections. As a result, there is a need for frequent and thorough accessibility that is not being met by current storage facilities.

b. How project fits ongoing conservation activities and overall institutional commitment: For more than 20 years, the Newark Museum has been taking progressive steps to improve the overall preservation of its collections. As part of the Museum's institution-wide Long Range Plan, entitled *Toward the Centennial, 2000-2009,* the Board of Trustees adopted renewed goals and strategies, affirming as a primary objective the commitment to the "long-term preservation, storage and documentation needs of all collections." The Museum is currently undergoing the process for updating the institutional Long Range Plan for 2010 and beyond, of which conservation care will continue to be a central focus. To carry out day-to-day implementation of this institutional priority, all collection care responsibilities are consolidated under the authority of the Office of the Registrar. The position of Consulting Conservator was created in 1994 and is currently held by Linda Nieuwenhuizen. The consultant visits the Museum on a monthly basis (more frequently as needed) and meets with collections management and curatorial staff. Her regular consultant visits will continue during the grant period, and in addition she will spend several days, as outlined, to work on this project.

As part of extensive renovations that occurred in the late 1980s, the Museum made substantial upgrades of its fourteen collection storage rooms. This involved systematic improvements to the environment of all areas and the overall preservation of its collections. Conservation activities included the installation of then state-of-the art climate control and

security in collection storage facilities and galleries. Then state-of-the-art storage furniture was also procured for most areas. Since that time, the Museum has continued to allocate additional resources toward collections and preventive conservation. In 1994, the Institute for Museum and Library Services provided funding for the Newark Museum to conduct a General Conservation Assessment of its collections, which was updated in 2005 and again in 2010. Guided by these surveys, the Museum completed a number of vital conservation and facility improvement projects that have greatly enhanced the Museum's mission to ensure long-term preservation, storage and documentation needs of its collections. Projects included: surveys of the paper, photography, science and African art collections (for which both the paper and African collections surveys received support from IMLS funds); upgrade of the textile storage area including installation of textile racks and rods to stabilize American quilts and coverlets; installation of compact shelving for the paper-based collection; lease of high security, climate controlled off-site storage for the industrial collection; renovation of the science storage area, purchase of new compact storage equipment and rehousing of most of the science collection; expansion of the storage area for the African, Native American and Pacific art collections with associated resolution of long-term leak and dampness problems; conservation of paintings from the American art collection for reinstallation of *Picturing America;* and retrofitting the temporary object holding storage area. In 2006 the Museum installed gaseous pollutant filtration on the mechanical system. Additional IMLS Conservation Project grants include support of the rehousing of the Tibetan tangka collection, the ceramics and glass collections, and the African collections in 2006, 2007, and 2009, respectively.

c. How the project meets highest conservation needs:

As the Museum has undergone extensive growth in both collections and programs and has completed the majority of the most pressing issues outlined in the 2005 General Conservation Assessment (GCA), it was determined that a survey was crucial to the Museum's continued efforts to preserve its collections. The Museum retained Wendy Jessup and Associates, Inc. to conduct a thorough assessment of the Museum's facilities and collections with the goal of providing recommendations for improvements for the next five to seven years. Ms. Jessup submitted an updated *General Conservation Assessment Report* (sections of which are attached) to the Museum in September of 2010. Although still in the process of final review, it will be used as the basis for collection management and conservation upgrades and reflects the urgent need for improvements in the Jewelry storage area.

Recognizing the Museum's achievements of having addressed a number of the highest conservation priorities outlined in the 2005 report (which include the above mentioned conservation projects) as well as the shifts in the Museum's planned facilities expansion, the 2010 General Conservation Assessment issued a list of the most critical concerns to take priority as the Museum moves forward. At the top of this list is the overcrowding and lack of storage space across all collecting areas. As the report states: "The following critical concerns were identified during this project to update the *General Conservation Assessment* for the Newark Museum: Continued overcrowding in collections storage and lack of expansion space…All collections storage areas are filled beyond capacity. This places the objects at risk of damage or loss despite the museum staff's best efforts at intellectual and physical control." (4-5) Later in the report, the GCA states "the amount of space currently available in the Museum's building is finite and as the collection continues to grow, the need for additional storage will become critical…Resolving the storage space issue should be considered one of the highest priorities for the Newark Museum." (22).

In light of the economic barriers to expanding facilities, the Assessment provides immediate recommendations to ameliorate the Museum's critical storage concerns. On page 33, the report, in order of priority, recommends that the Museum: "Seek funding from granting agencies or other sources to replace cabinetry in the remaining areas where it is needed…In the future, The Newark Museum is encouraged to seek funding for additional storage equipment in the following priority order: 1. Metal drawer units for the jewelry collection sized to fit the existing mobile aisle shelving currently installed in the precious metals storage area. This will improve access to the collection, improve efficiency and space usage in the collections storage area and reduce the potential damage to the metals caused by wood acids;"

Based upon these considerations, the storage area for jewelry is the highest priority for the Museum at the present time. Included with the attachments are sections from the 2010 updated GCA detailing the state of the Museum's jewelry collections, storage recommendations to support its protection and conservation, and establishing the Jewelry Storage Project as the Museum's top conservation priority. The Museum, taking the GCA as a starting point, consulted with its conservator to determine the best industry practices and best equipment and has designed a one year project to rehouse the Jewelry collection in conservationally sound cabinetry that will mitigate potential damage from gaseous and particulate

contaminants and overcrowding. Funding is requested through the IMLS Conservation Program for the purchase and installation of 3 cabinets, drawers, and dividers.

2. Project Design

a. Current Conditions:

The Newark Museum's fine jewelry collection is stored in a small, highly secure room in the basement of Museum's Main Building. Access is by curators and registrarial staff only; cameras are installed to oversee all movement in the area. Inside the room there is a small compact shelving unit which holds both jewelry and precious metals, primarily silver objects. The jewelry is also stored in an open three-shelf unit against one of the walls. One of the shelf units hold the majority of the cross collection, other material is not grouped in any particular way. Currently the jewelry collection is housed on these open shelves in a variety of ways: in two metal containers from the 1960s and three wood containers from the 1920s that are all constructed of substandard materials, in compartmentalized cardboard boxes, in plastic bags, or laid out on open shelves. Each of these storage methods compromises the jewelry collection in different ways. The metal containers (which are unpainted and without a powder coat) and wood containers are composed of unstable, reactive materials with the potential to off-gas acid fumes - the result is an increased risk of oxidation or an acceleration of other issues that pose a risk to the valuable materials they contain. To reduce the potential for corrosion, auxiliary desiccant humidification equipment and gaseous pollutant filters have been installed on the air handler for this room, but these rooms do not have filters for particulate contaminants. Jewelry on the open shelves are exposed to dust, which can form a layer of grime on these metals that is difficult to clean and poses a threat to the integrity of the object. Several pieces in the collection are composed of natural fibers or fabric and are at risk from light exposure and pest infestation. Nor does the current configuration allow for any specialized storage methods that specific materials might require. For example, the high water content of opals requires a higher humidity than other materials. The current storage configuration doesn't support the creation of microclimates calibrated to the conservation requirements of different materials. Also, although some materials can be safely stored in the existing system, most of the materials need to be evaluated and placed in new, enclosed units.

b. Conservation methods: Storage equipment options were discussed with Linda Nieuwenhuizen, consulting conservator; Ulysses Dietz, Senior Curator; Rebecca Buck, Deputy Director for Collection Services and Chief Registrar; and Jason Wyatt, Senior Preparator. Based on their evaluations, it was determined that cabinets similar to those selected for the ceramics collection would serve as the best storage units for jewelry. In the Museum's experience, these cabinets have proven to be conservationally sound, and are recognized within the industry as meeting best practices in fabrication and construction. Drawers are to be outfitted with dividers. Individual jewelry pieces can then be stored in mounts, boxes, etc. inside the divided drawers. Quotes were requested from Borroughs and from Delta Designs, Ltd. for the cabinets.

In order to ensure safety of the collection objects during the upgrade, which includes moving the objects to a temporary holding space during furniture installation and a subsequent return to the permanent storage area after processing, the conservator will review objects and work with collections staff to determine priorities and handling procedures. The conservator will also help in the design of storage mounts that will insure the least movement of the jewelry once it is back in permanent storage. The project plan also calls for a part-time jewelry technician who will be assigned to the project so that other collection activities are not delayed and time will be available to properly build storage mounts as needed for the most delicate material. Processing will include condition check, decision about best storage mount and mount production, photography, placement and inventory. Documentation will be checked for completeness as this process develops. Temporary holding will be in the small metals room approximately 10 feet from the jewelry room, with pieces stored in boxes for processing back into permanent storage.

c. Goals and Activities: The overall goal of the project is to rehouse the jewelry collection in a way that will protect the objects while enhancing access to the collection and preventing any damage.

- Objective 1: Order Materials

The storage cabinets will be installed in the space where the jewelry collection is now stored. Staff will order three cabinets and dividers from Delta Design, Ltd, and archival supplies for developing linings and custom boxing that are inert and stable. These cabinets are 3 36" wide x 84" high x 24"deep, each with double steel doors and full width drawers that will protect the objects from gaseous and particle contamination, light, pests. Each drawer also has the capability of supporting microclimates tailored to the conservation needs of specific materials. The cabinets and supplies will be ordered at the beginning of the grant period.

- Objective 2: Hire Jewelry Technician

The Museum will hire a part-time temporary Jewelry Technician dedicated to this project to work under the direction of the Senior Preparator and with input from the consultant conservator. With the regular and special project workloads of the Museum's fulltime registrar staff, it is necessary to hire one temporary Jewelry Technician who can devote his/her full attention to the implementation and success of this project.

- Objective 3: Conservation input for move and storage

Linda Nieuwenhuizen, Conservator, will review the jewelry collections and advise on the priorities for storage mounts, and pieces that might be stored without damage on existing shelving. Conservator will develop guidelines for object handling and review procedures for the movement to and from temporary storage. Conservator will also work with Jewelry Technician to prepare jewelry for moves to and from temporary storage.

- Objective 4: Move jewelry to temporary holding in Small Metals (N008)

A secured, environmentally-controlled temporary holding area for the jewelry will be created within the Small Metals storage area across the hallway from the Precious Metals storage area. Jewelry will be boxed and moved from Precious Metals (N005) to Small Metals (N008). Jason Wyatt, Senior Preparator and David Bonner, Assistant Preparator, will work with the Jewelry Technician dedicated to this project to move the jewelry collection to temporary storage. Specific procedures developed by the conservator will be followed.

- Objective 5: Secure precious metals and prepare space for new storage units.

Collections remaining in the storage area to be renovated will be protected against dust, paint and the activities of installation with tyvek and with extra boxes as necessary.

- Objective 6: New cabinets and floor inset will be installed.

The cabinets will be placed in their permanent position and a small flooring inset will be constructed by Mark Depetris, Lead Technician at the Museum, to level the floor area with the level of the compact shelving tracks.

- Objective 7: Photography and accession checks and rehousing.

Performed by the Rights and Reproductions Registrar and the Jewelry Technician, each piece of jewelry will be examined, documentation photography prepared, and records checked for reconciliation. The Assistant Preparator and Jewelry Technician will prepare storage mounts, protective liners, or boxes for re-housing the new jewelry according to its optimal storage requirements.

- Objective 8: Move collection to new cabinets, inventory

The jewelry technician will move jewelry to new cabinets. Inventory locations will be updated in the collections management database (ARGUS) by Heidi Warbasse, Database Administrator.

d. Plan to ensure normal operations are not disturbed: The areas in question will be reviewed by Antonia Moser, Associate Registrar, and curator Ulysses Dietz to be certain that all material will be accessible as necessary. If the curator determines that new images are needed, photography will take place as part of the move procedures. Staff who will work on the project have this type of work in their job descriptions, and are constantly working from one project to another as need and funding converge. It is anticipated that there will be no disruption to other areas of storage and that needed parts of the collection will remain accessible.

e. Importance of the Jewelry Collection – The Newark Museum is one of the few museums in the nation with an active program of collecting and documenting the history of jewelry and one of very few dedicated to collecting and documenting American jewelry. This institutional commitment was further solidified with the opening of the Lore Ross Jewelry Gallery in 2009. One of only four such dedicated jewelry galleries in the United States, it serves as a permanent showcase for the collection. Although the Museum's global collections include jewelry from every corner of the earth, from antiquity to modern times; it is the Decorative Arts department that `maintains the largest jewelry holdings, comprising European and American jewelry from the end of the middle ages to the present day. Its collections consist of over 1800 objects, including both jewelry and jewelry-related objects (design drawings, historical photographs, lead test strikes, books). Although the first piece of jewelry acquired for this collection was donated in 1911, it is in the last fifteen years that collecting has become particularly active; reflecting the institutional commitment to building a collection of national and international importance. Jewelry collecting includes both contemporary and historical material

Not only does the collection possess objects that are exemplars of aesthetic and technical design, but the collection also strives to document the interaction between design and production in daily life. This is a museum of objects that interact with the way people live and when people visit the Newark Museum they come to see jewelry that informs and

sheds light on history. These objects from Newark, America, and Europe hold artistic, technical and scholarly significance and, most importantly, are held in trust for the scholars, collectors, students and visitors of whom the Museum's diverse audience is composed. Several areas of particular collecting strength distinguish the Newark Museum jewelry collections from those of other institutions.

- The Museum's Newark collection is a mix of exquisite objects that illustrate the technical skill of Newark artisans and manufacturers as they also reveal an important piece of American cultural and manufacturing history. It is a resource that is unmatched at any institution. Because Newark was the center of the American fine jewelry industry between 1850 and 1950 (at its peak Newark produced 90% of all the gold jewelry made in the USA), an important sub-set of the collection is related to Newark's output. In 1997, *The Glitter & The Gold: Fashioning America's Jewelry*, a major exhibition, highlighted the Newark jewelry in the collection. This exhibition not only established Newark's central role in the American jewelry industry, but its related catalog has also become the standard reference for Newark's role in America's jewelry manufacturing history. Dozens of manufacturers are documented in this collection as in no other public collection in the country. Of the 574 artifacts related to the Newark jewelry industry, about 130 are completed pieces of jewelry, with the remainder being related artifacts such drawings, photographs, or lead test strikes from jewelry dies. A few highlights from the Newark include:a brooch and earrings by Ferdinand Herpers from ca. 1872, incorporating the earliest American patented prong setting for diamonds; a diamond-set bracelet by A. J. Hedges & Co. from ca. 1886, employing a patented gold-patination technique; an art nouveau "butterfly woman" brooch published in 1904 by Henry Blank & Co.
- Arising out of its focus on the Newark jewelry industry, the Museum is also one of the few institutions with a commitment to collecting and documenting American made jewelry – conserving important examples of this American art form. Recent acquisitions include: A large diamond dagger brooch made in ca. 1900 by Theodore B. Starr for a Newark heiress; an extremely rare "Japanese" style necklace in three colors of gold made by Tiffany & Co. ca. 1875; an art deco diamond and platinum bracelet produced in the late 1920s by the Philadelphia jewelry J. E. Caldwell & Co.
- Because the Museum also collects contemporary decorative arts, studio jewelry by important craft artists, European and American, is a key collection. Wendy Ramshaw, Mary Lee Hu, Robert Ebendorf, William Harper, Earl Pardon, and Arlene Fisch are among the contemporary names added to the collection in recent years.
- The European jewelry holdings, which comprise the earliest examples of jewelry in the Museum, include such highlights as a 16th -century coral and gold rosary from Spain, one of the finest of its kind in the country; a large gold pectoral cross from 17th-century Spain set with table-cut amethysts; a silver-gilt and jasper pectoral cross from 14th-century Russia. Later examples of important European jewelry include an "Estruscan" necklace and earrings in their original case from Nicola Marchesini, Florence, ca. 1870 (given by Thomas Edison's daughter Madeleine); an enamel and amethyst half-mourning jewelry by Charlotte Newman, England's first female artist-jeweler.

3. Project Resources: Time, Budget, Personnel

a. Time: If this rehousing project is funded by an IMLS grant, the Museum will implement the following schedule of activity to complete the move in one year:

- *July 2011*: order storage equipment and rehousing supplies (objective 1); hire temporary Jewelry Technician (objective 2) and solicit conservation input to prepare for the temporary move (objective 3);
- *August – September 2011:* Move jewelry collection to Temporary Holding Area (object. 4);
- *October 2011*: Secure remaining collections and prepare area to accommodate new storage equipment (object. 5);
- *November 2011:* Install floor inset and new cabinets (objective 6);
- *December 2011 – end:* Prepare storage mounts, liners and boxes, complete documentation and records check (objective 7). Return collections to the upgraded storage room and update locations in ARGUS database (obj 8). Goal is to complete all tasks necessary to make collection and its records readily accessible from this point forward.

b. Budget: The final budget was developed by the Deputy Director of Collection Services and Chief Registrar and reviewed by the Museum Director and senior administration. Whenever possible, the Museum is utilizing in-house staff and resources to carry out the project to ensure that all costs are reasonable and appropriate and that best practices are observed. The Museum has also conferred with the consultant, Linda Nieuwenhuizen, and obtained her written input in formulating the budget. Brett Danielson of Delta Designs, Ltd provided estimates for the cabinets.

c. Personnel:

Rebecca Buck, Deputy Director for Collection Services and Chief Registrar, will serve as the project director (12% of her time) and will work closely with the curator, consulting conservator, and Museum staff to oversee the re-housing process, photograph documentation, input of collection data, and all administrative functions. Ms. Buck has a Master of Education degree from Boston University and has worked in the museum profession for more than 25 years. She is co-editor of the *New Museum Registration Methods* and co-author *On the Road Again: Developing and Managing Traveling Exhibitions* and *Collection Conundrums: Solving Collection Management Mysteries*. She is the 2001 recipient of the AAM Dudley Wilkinson Award of Excellence and was recognized by the AAM as one of the museum world's "one hundred champions" of the past 100 years. Ms. Buck is responsible for the registration of the Museum's collection of approximately 200,000 pieces, collections care and documentation, storage and maintenance.

Ulysses Dietz, Senior Curator and Curator of Decorative Arts, will spend approximately 15% of his time on the project, working with the Chief Registrar, conservator, and preparators and providing input into the rehousing of the jewelry collection. Ulysses Dietz has been the curator of Decorative Arts at The Newark Museum since 1980. He received his BA from Yale in 1977, and his MA in Early American Culture from the University of Delaware's Winterthur Program in 1980 and has been the curator of over 80 exhibitions during his tenure. 1997 Mr. Dietz was the project director for *The Glitter & The Gold: Fashioning America's Jewelry*, the first-ever exhibition and book on Newark's once-vast jewelry industry. In 2003 Mr. Dietz published *Great Pots: Contemporary Ceramics from Function to Fantasy*, the first catalogue of the Museum's studio pottery collection, which accompanied an exhibition of the same title. Additionally, Mr. Dietz has published numerous articles on decorative arts, as well as books on the Museum's art pottery, and furniture collections.

Jason Wyatt, Senior Preparator will work with the consulting conservator to plan the rehousing of the jewelry art collection, will oversee the removal of objects from their current location, and installation into the new cabinetry, and oversee the temporary Jewelry Technician and will allocate 5% of his time to the project. Mr. Wyatt has a Bachelor of Arts degree from Arizona State University and a Master of Arts degree in Museum Professions from Seton Hall University.

Linda Nieuwenhuizen, Consulting Conservator, has a Master of Arts and Certificate of Advanced Studies from the State University of New York and extensive experience in assessing conservation needs and conducting treatment of objects for museums and galleries. Her prior experience includes monitoring, examining and conserving ethnographic and archeological artifacts from North, Central, and South America, Asia, Africa and Oceania for the American Museum of Natural History. Ms. Nieuwenhuizen has been working with the Newark Museum since 1995, is very familiar with its collections, and will address conservation concerns related to the jewelry collection project. She will work with the curator and preparators to determine weaknesses, special handling needs during the temporary relocation and assess which objects will be stored in the new cabinets. She will also help determine the plan for developing necessary storage mounts.

Antonia Moser, Associate Registrar for Permanent Collections, holds a Masters degree in registration from Seton Hall University and will spend 5% of her time working with Mr. Dietz to determine access needs for the collection throughout the rehousing project. She will also work with location updates throughout the project and retrieve specific objects as needed for projects.

David Bonner, Assistant Preparator, holds a Masters degree from Seton Hall University with a concentration in registration. He will spend 15% of his time working with the Jewelry Technician on collections moves and mount building.

Mark Depetris, Lead Technician, will work with the Senior Preparator, to prepare the storage room for the installation of the storage cabinets and will allocate 1% of his time to the project. He will perform any necessary repair work on floors and walls and build a small flooring inset to level the floor area.

Jewelry Technician, to be hired, will focus on all aspects of the project of rehousing the jewely Art collection in new compact storage cabinets. The work will include but not be limited to physical moves of objects, inventory updates, storage mount building, and rehousing. This is a part-time temporary position and a job description is attached.

Associate Registrar for Photography, Rights and Reproductions, to be hired, will spend 15% of her time on the photographic documentation of the jewelry collection as needed and inputting this information into the ARGUS database. This is a full-time permanent position and a job description is attached.

4. Impact:

The impact of the Jewelry Collection Rehousing Project will be far-reaching, affecting the museum's collections operations and strategic plans, the scholarly study of Decorative Arts and the Museum's established constituency of Decorative Arts and Jewelry enthusiasts. In terms of museum operations, the rehousing project will greatly relieve the time and pressure put upon the registrar staff to accommodate review of the collection. At the present time, requests to review

works from the collection – whether on the part of the curator or visiting scholars – require much preparation time on the part of the registrars due to the fact that the collection is difficult to access and is not housed in a logical, easily accessible manner. In addition, as the Newark Museum moves forward with its plans to establish a collection of national and international importance, there have been increasing requests from scholars to study the collection. The rehousing project will enable the Museum to overcome these challenges and make the collection readily accessible for retrieval, review and study by the curator, scholars and other museum professionals, thereby adding to the Museum's knowledge of its jewelry collection, which can inform public exhibitions and publications. Information learned though scholarly study will be captured in the ARGUS database, adding to the object records achieved through the rehousing project and making them even more comprehensive.

The project is also timely due to a current institutional emphasis on strengthening this collecting area – including important acquisitions of American and European Studio Jewelry and American Jewelry – which has added pressure to the current storage capacity available for the collection. Within the last decade, the decorative arts department has acquired over 200 pieces for the jewelry collection, including a number of gifts. The trustees have strongly supported the purchase of major examples, and in the last five years the larger part of the decorative arts acquisition budget has been devoted to jewelry acquisitions. Among collectors and curators, the Museum is recognized as a leader in the field, nonetheless, potential donors to the Museum are discouraged when they go 'behind the scenes' to study the collection and are taken into storage. To aid the Museum's efforts to protect important pieces of American and European jewelry, the storage area needs to be brought up to national standards to encourage jewelry collectors to donate significant objects to the Museum.

The impact of the Jewelry Rehousing Project will be greatly beneficial to the Museum's diverse audiences. The popularity of this collection among the Museum's public audience has grown through several major exhibitions over the past several years – including *Women's Tales: Four Leading Israeli Jewelers (2008), Objects of Desire: 500 Years of Jewelry (2006),* and *Baubles, Bangles and Bling Bling: A World of Jewelry (2004)*. The collection also has the benefit of a dedicated membership group of enthusiasts through the Friends of Decorative Arts, who contribute funds to the Decorative Arts department (which encompasses the Jewelry collection). Due to membership programming that provides in-depth access and insight into the collection, they are enthusiastic and knowledgeable advocates for the appreciation and study of Decorative Arts throughout the New York/New Jersey region. In addition, the curator is a sought-after speaker by numerous educational and arts organizations, and some of his most popular topics are jewelry and Newark's own jewelry industry. Lastly, the curator receives a steady stream of scholars, students, museum professionals and collectors who wish to study one aspect of the jewelry collection, or to review individual pieces in the collection for possible exhibition loans. The improved accessibility and thereby study of the collection will enable the Museum to better serve these committed groups.

The Museum also has a number of exhibition projects focusing on aspects of the Jewelry collection planned for the next several years that will further engage public audiences, and which the rehousing project will help make possible. The Lore Ross Jewelry Gallery, one of only four dedicated jewelry galleries in American museums at present, was inaugurated in 2009, and plans are in progress for a re-installation of that space in 2011-12. The Museum recently lent a number of jewelry pieces to the San Diego Museum of Natural History, for their current two-year exhibition *All That Glitters: The Splendor and Science of Gems and Minerals*. Having full accessibility to the jewelry collection and comprehensive records is essential to the Museum's ability to fulfill the ever growing expectations of its growing audiences for Decorative Arts and to allow the Museum to fulfill its mission to allow the broadest public access to its collections.

The Museum has begun to make a concentrated effort to more effectively educate its public about the importance of collection care and conservation, periodically publishing articles in its *Access* member's magazine that explore recent conservation activities and which explain why such activities are essential to Museum operations and to the future enjoyment of the public. The article focusing on the Tibetan tangka rehousing project, which was funded by IMLS, is included with this application. Given the broad interest in the collection and its conservation, a similar article will be developed and published for the jewelry rehousing project should it be awarded funding.

Finally, the Museum is committed to the thorough and timely evaluation of all of its activities. To ensure that the Jewelry Rehousing Project achieves all of its goals and objectives and to evaluate the Museum's processes and methods, the Conservator will monitor the progress of the project. In addition, the conservator will evaluate the project after the installation is complete to confirm that it meets the highest conservation standards and best practices of the field.

IMLS Conservation Grant 2011-2012 Th e Newark Museum Jewelry Collection Rehousing

Activity Ju	ly '11	Aug '11	Sept '11	Oct '11	Nov '11	Dec '11	Jan '12	Feb '12	Mar '12	Apr '12	May '12	June '12
1 Order cabinets and supplies												
2 Hire jewelry technician												
3 Conservation input for move/Evaluation	1st					2nd					3rd	4th
4 Move Collections												
5 Prepare space												
6 Install cabinets												
7 Photography and rehousing												
8 Move collection to new cabinets												
9 Inventory												

* Numbers in boxes indicate conservation visits by conservator. 4 visits total.

BUDGET FORM: Section B, Summary Budget

	$ IMLS	$ Cost Share	$ TOTAL COSTS
1. Salaries and Wages	$17,000.00	$42,250.00	$59,250.00
2. Fringe Benefits	$1,870.00	$10,562.50	$12,432.50
3. Consultant Fees	$4,000.00	$0.00	$4,000.00
4. Travel	$0.00	$0.00	$0.00
5. Supplies and Materials	$22,425.00	$1,500.00	$23,925.00
6. Services	$1,738.00	$0.00	$1,738.00
7. Student Support	$0.00	$0.00	$0.00
8. Other Costs	$0.00	$0.00	$0.00
TOTAL DIRECT COSTS (1-8)	$47,033.00	$54,312.50	$101,345.50
9. Indirect Costs	$0.00	$5,067.28	$5,067.28
TOTAL COSTS (Direct and Indirect)	$47,033.00	$59,379.78	$106,412.78

Project Funding for the Entire Grant Period

1. Grant Funds Requested from IMLS	**$47,033.00**
2. Cost Sharing:	
a. Applicant's Contribution	**$59,379.78**
b. Kind Contribution	
c. Other Federal Agencies*	
d. TOTAL COST SHARING	**$59,379.78**
3. TOTAL PROJECT FUNDING (1+2d)	$106,412.78
Percentage of total project costs requested from IMLS	**44 %**

*If funding has been requested from another federal agency, indicate the agency's name:

OMB Number 3137-0071; Expiration Date: 7/31/2010. Estimated burden for both detailed and summary budget forms: 3 hours.

1. STATEMENT OF NEED

The Hearst Museum is requesting support for the first one-year phase of a three-phase project to protect its unique 200,000 strong audio-visual collections from the increasing risk of deterioration. An IMLS-funded, Audio-Visual Collections Survey conducted in 2001 identified the audio-visual collections as an immediate priority for the Museum.

The scope of the audio-visual anthropology collections is global and their significance interdisciplinary; the collections provide documentation of the history of the discipline as much as they document the people and places that are the subject of the research. Consequently, they are in high demand by researchers and students, however, access and preservation needs cannot be met by the current storage environment.

In 2005, the Museum submitted a similar grant to IMLS but the high cost of the requisite electrical upgrade at the Marchant facility in Emeryville, CA made the grant untenable. Since 2005 a number of changes have occurred that we feel make our revised application compelling. First, we have moved a large part of the collections stored at Marchant to a new 17,000 sq ft fully climate-controlled space at the Regatta facility in Richmond, CA. Second, we are close to completion on what was originally slated as Phase II of the Museum's long-term Media Collections Preservation Plan (the SAT, NEH-funded installation of a large walk-in, cold storage unit at Regatta to house a significant part of the media collections). Third, UC Berkeley has committed substantial funds to defray the high cost of electrical and seismic upgrades to Regatta. Fourth and finally, the Museum has a new Director whose leadership and collections expertise have enabled the Museum to prioritize short-term collections needs and to finalize long-term institutional plans.

Why is the project among the museum's highest collections care priorities?

Over the past forty years there has been increasing concern over the condition and preservation of the visual holdings in the Museum. As early as the 1970s, projects were started to duplicate original glass plate negatives, nitrate negatives, acetate films, etc. By the mid-1990s, originals, prints, and sometimes several generations of duplicates were stored in the same envelope. Much of the film collection is still stored in highly acidic envelopes and face further deterioration. The increasing demand for these images and the lack of a proper environment in which to store them led the Museum to prioritize the preservation of the media collections and to seek extramural funds for a conservation survey of all the audio-visual collections.

Resulting from this prioritization process was an IMLS-funded, Audio-Visual Collections Survey conducted in 2001 (please see supporting documents) by photographic conservators Timothy Vitale of the Library of Congress. Both surveyors pointed out the need to ameliorate the environment in which both audio and visual collections were stored, as well as the longer term enterprise of sorting out generations of photographs, film, negatives, sound recordings, etc. Cold storage, both cool and sub-zero, were recommended immediately for the photographic collections, the acetate / nitrate film negatives and positives, the motion picture film collection, and the color slide collection. As Vitale reported, the acetate film collection (with a survey

estimate of 90,000 originals, 130,000 items in total) needed to be re-housed in sub-zero cold storage as soon as possible in order to slow down the autocatalytic Vinegar Syndrome process. He also stated that the color slide collection was in immediate need of sub-zero storage to prevent further fading. A Media Collections Preservation Plan (please see supporting documents) was the product of this survey and a commitment to creating a Media Collections Center resulted from this plan.

How the project supports the long-range conservation plans of the Museum and fits the overall institutional commitment to conservation

As part of the Hearst Museum's commitment to caring for collections, our Institutional Plan incorporates clear conservation and preservation elements including the creation of the Media Collections Center at Regatta. This Plan has been the driving force behind the Museum's commitment to upgrade and improve its collection care facilities, and to prioritize preservation and conservation treatments for the collections. Our commitment to this objective is demonstrated by the fact that since our last application to the IMLS, we have added 39,000 sq. ft. of climate controlled space; upgraded storage for 200,000+ objects, captured 50,000+ object images; and increased UCB student access by 30%. Between 2004 and 2008 highlights have included but have not been limited to:

- 2004 – The relocation of 10,000+ North American Indian baskets & 7,000 global ethnographic textiles to 18,000 sq. ft. of renovated collections space. Funded by overlapping NEH, NSF & NEA grants totaling $1.2 million;
- 2004 - Mesopotamian tablet scanning project. Scanned 1,000+ Mesopotamian tables for inclusion in the Cuneiform Digital Library. Funded by CITRUShttp://www.citris.berkeley.edu/;
- 2006- The re-housing and photographing 2800+ Asian textiles. Funded by NEH;
- 2006 - Museum Loan Network Grant: photography and full data entry of Museum's Yoruba collection, @1000 objects
- 2007 – The relocating, photographing and building of crates (and a small number of mounts) for 7,000 Egyptian ceramic and stone objects. Funded by Hearst Foundation Endowment and campus;
- 2008 – Phase II of the Media Collections Center. Re-housing and documenting a portion of the media collections including glass plate negatives, wax cylinder recordings, film and micro film; building cold storage room. Funded by Save America's Treasures – NEH;
- 2009 – The North America Archaeology Inventory and Re-housing Project of 200,000+ objects. Funded by Hearst Foundation Endowment and campus;
- 2009 - Pre-Regatta surge collections relocation project; relocated 1500+ textiles (worldwide), 50 paintings, 2200 works on paper, 300+ baskets (Asia, Philippines, Mexico and Africa) and 100 bark paintings from Australia.
- 2009-10 – The Collections Surge: Packing @50,000+ objects for relocation to Regatta building; photographing an additional 5,000 objects for move;
- 2008-10- Michael Black, Head of Research and Information Systems, actively participating in the Mellon funded collaborative *Collections Space* database project to develop solutions for museums that want to redefine ways in which collections information is managed, preserved, and published: http://www.collectionspace.org/

The Museum and governing authority's overall financial commitment to conservation

In addition to those projects listed above, the Museum and University's financial commitment to the collections includes but is not limited to: negotiating two gifts totaling $2.4 million towards an endowment from the Hearst Foundation – a portion of this fund was used to hire a second permanent Conservator and other income from the endowment has been used (for example) to re-house and relocate 100+ oversize Egyptian stelae and statuary and 100 oversize Classical marble statues and sculpture; hiring a full-time Media Collections Manager in 2008 to care for and increase access to the collections; the provision of support from campus to re-house part of Reisner's Egyptian collection, including 6000 pots, 1500 stone objects and more than 100+ limestone stelae in 2006-08; the provision by campus of a 17,000 sq. ft. space at Regatta equipped with climate-control to house a large portion of the Museum collections; and for this project campus has committed $20,000 to mitigate the cost of necessary electrical upgrades to the Regatta facility.

2. PROJECT DESIGN: Goals and Objectives

The Media Collections Center will be rolled out in three phases. Phase I is described in this proposal; Phase II (SAT Cold Storage) is near completion; and Phase III will involve systematic curating, scanning, and digitization of the collections. The overall goal of this project is to re-house the rapidly deteriorating media collections in order to preserve them until the funds can be raised to carry out Phase III. The entire project will result in the provision of online and physical access to these irreplaceable and unique collections.

Objectives:

1) To equip Regatta with twelve upright freezers to hold acetate film, color transparencies, and those parts of the motion picture film most in need of sub-zero storage;
2) To hire an experienced Media Collections Assistant and two work-study students. These hires are the key to enabling this project to proceed whilst normal Museum work continues;
3) To separate out nitrate from acetate film collections and re-house them in chemically inert envelopes as necessary prior to their being packaged in acid free boxes for the move off-site to freezer storage (we have been given space in the Bancroft Library Freezer at no cost for this purpose). This work will be carried out in the conservation laboratory where the fumehood can be used to test quickly for nitrate/acetate by the standard sink-or-float trichloroethylene test described by Henry Wilhelm in *The Permanence and Care of Color Photographs*, Preservation Publishing Company, 1993;
4) To move collections located in various Museum spaces and buildings to the new facility where the Media Collections Assistant and intern will repackage the collections for cold storage, inventory individual if not bulk container contents, and record new locations in the Museum's database. Color slides, for example, will be placed in polypropylene slide sleeves within chemically inert short lid card boxes (ca. 400/box) and placed in heavy weight polyethylene zipper bags; acetate negatives will be placed in acid-free envelopes, boxed in 12 inch acid-free negative boxes (ca. 375/box), and placed in heavyweight polyethylene zipper bags. All boxes and envelopes purchased will have passed the Photographic Activity test (ISO 18916:2007) or meet ISO 19802:2007.
5) To identify the contents of each freezer package. In addition to the time consuming task of separating out duplicates from the masters which had previously been stored together, the

Media Collections Assistant and Interns will enter data for each item into The Museum System (TMS).

How the Museum will ensure ongoing Museum functions are not inhibited

To mitigate the impact on staff we will hire a full-time one-year Media Collections Assistant to separate, move, repackage, store, and document the new locations of the collections. One part-time intern and two part-time work-study students will work with the assistant. These positions will report to the Media Collections Manager who will devote 30% of her time to the project. The Director has given her full commitment to this plan. All staff involved work on these collections as part of their normal duties and are used to prioritizing (within an overarching institutional plan) based on funding availability.

Current object conditions and why they merit attention at this time

Timothy Vitale, referencing the *IPI Storage Guide for Color Photographic Materials,* pointed out that the color slide collection, with its anticipated 40-year useful life expectancy at room temperature and 50% R.H. (described as 30% fading), had already used up on the average 34 of its 40 years in 2001. By putting the collections into subzero storage immediately, the life expectancy would increase to 525 years. As nearly a decade has passed since Mr. Vitale's recommendation, moving these collections into frozen storage is more critical than ever. In reference to the acetate film collection, Vitale, referencing the *IPI Storage Guide for Acetate Film*, showed how immensely the progression of Vinegar Syndrome in the acetate film collections would be slowed down. These additional centuries will buy the Museum the time it needs to systematically begin duplication and/or reformatting, and to fully curate the collections, while keeping the collections accessible to researchers, heritage communities, and the general public

Description of objects that are the focus of this project and their importance

The collections of the Phoebe A. Hearst Museum of Anthropology number approximately 3.8 million objects, including approximately 91,300 original (or 130,000 total including copies) film negatives and positives, 50,000 color transparencies, 7, 500 nitrate film negatives, deteriorating motion picture film reels that are the focus of this proposal. The scope of the visual anthropology collections is global, with holdings from the fields of fine arts, decorative arts and classics to the core disciplines of archaeology and ethnography. Increasingly, scholars from interdisciplinary programs, such as Ethnic Studies and Native American Studies, research the Hearst's visual collections. The collection of California Indian ethnographic photographs —at 3300 images with negatives and hundreds more in print format — is the largest and most comprehensive in the world. This well-documented collection was produced by leading anthropological photographers such as Alfred Kroeber, Pliny Goddard, Samuel Barrett, and Edward Gifford, primarily between 1900 and 1930. Representing most of the tribes in California, it has been the cornerstone of all research and publication on the subject, and is constantly consulted by contemporary Native communities. Members of heritage communities, mainly Native Californians, represent an increasingly strong constituency with a deep interest in the Museum's visual anthropological holdings. A high percentage of tribal visits over the past year devoted time to listening/viewing to the audio-visual collections of the Museum.

Other important collections in the visual holdings include motion picture film and photographic documentation of early disciplinary fieldwork, the twentieth-century Egyptian archaeological excavations directed by George Reisner (copy negatives and prints from the Boston Museum of Fine Arts that complement our 18,000 artifact collection), the ancient Peruvian excavations of Max Uhle (the so-called "Father of Peruvian Archaeology, which complement his 10,000 object collections and field catalogues), and ethnographic field photos from North America, South America, Africa, and Asia. Among these are well documented collections from Roy Barton of the Ifugao; the William Bascom photo collection from Africa and the Caribbean; and the Katherine Jenkins collection from Mexico. A recent acquisition of some 2,250 Tibetan ethnographic field photographs along with thousands of negatives came as part of a major bequest to the University. They were collected by Theos C. Bernard, who went to Tibet in 1937 and was the first westerner to participate in sacred Tibetan religious rites.

The final collection to be safeguarded by this project is the American Indian Film Collection created by Museum anthropologist Samuel Barrett between 1957 and 1965, with funding from the NSF. Unique in North America it is recognized by the National Moving Image Database Project for its documentation of events from start to finish. Barrett and his crew documented surviving aspects of traditional cultures, and recreated some moribund practices using shared oral information. They shot throughout the United States, but focused on the Western States, particularly California. The collection of original film footage is supplemented by sound tapes, still photos (b/w, color slides), artifacts and fieldnotes. Fifteen educational films were produced by the project which created ca. 450,000 feet of film.

Proposed Conservation Methods: efficiency, reliability, and safety

The proposed conservation methods were recommended by Timothy Vitale, who has recently confirmed that his 2001 recommendations are still best practice. The plan was developed by Hearst conservator, Madeleine Fang, who identified the risk, organized the survey, worked with the surveyors during their Museum visits, wrote the Media Collections Preservation Plan (with input from curatorial, collections and administrative staff) and oversaw implementation of Phase II of the project. It also follows recommendations from: James M. Reilly, *IPI Storage Guide for Acetate Film*, Image Permanence Institute, 1993; Stefan Michalski, *Guidelines for Humidity and Temperature for Canadian Archives*, Canadian Conservation Institute, 2000; and Sherelyn Ogden, *Preservation of Library & Archival Materials: a Manual*, NEDCC, 1992. Additional information was sought in publications by well-respected Photographic Conservators, e.g. Henry Wilhelm, Paul Messier, and Mark McCormick-Goodhart.

The choice of frost-free Sears Kenmore (made by Frigidaire) upright freezers was made for several reasons. First, in spite of known problems with frost-free freezers (rapid temperature rises during the defrost cycle accompanied by humidity increases to 100%), they are relatively inexpensive. Second, if the need arises to replace a freezer, the cost will not be prohibitive. Third, ½-inch thick archival polyethylene foamsheet will be used to line the freezer walls to separate the temporarily wet walls of the frost-free freezers from the contents and avoid stickiness problems with the packages inside. Fourth, unlike the more sophisticated freezers

the need to monitor and maintain them will not overburden the Museum. If a freezer were to fail, dial-up alarm probes installed in each freezer and connected to one of two dial-up alarms would immediately alert staff. The freezer contents could be moved quickly into another freezer or gradually warmed up (in the existing cold storage unit at Regatta). Given widespread Sears service, the freezer could be looked at quickly and a replacement purchased immediately. Fifth, and finally, a full climate-control system was installed in Regatta in 2009. The system is powerful enough to neutralize humidity and the warm air the freezers will generate.

All of the materials selected for re-housing and packing film collections for storage are well known in the field of conservation and are readily available from archival suppliers. All materials selected to re-house the collections are chemically inert. The negative envelopes and boxes will meet ISO 19802.2007 or have passed the Photographic Activity Test. Finally, the move from building to building will take place in the Museum van. Loading the van is safely carried out in the Museum loading entrance and unpacking will take place in the secure parking lot at Regatta.

PROJECT RESOURCES

Time

In conjunction with the consultant, and the Media Collections Manager, the Museum Conservator Madeleine Fang was able to determine that the project would take approximately one-year (please see the attached schedule). The projected timetable is also based on past experience in working with the university's capital projects team. A series of smaller photographic re-housing projects undertaken by the Media Collections Manager have also been used to estimate the time needed to complete parts of the projects.

Personnel

Project Director, Mari Lyn Salvador, Director of the Phoebe A. Hearst Museum of Anthropology, has over 30 years experience leading museums through institutional change and in overseeing physical and digital collections development and care (5%). Project Manager, Alicja Egbert, Media Collections Manager has over 12 years experience working with media collections, both at the Cantor Arts Center, Stanford, and at the Hearst Museum. In addition, she is an experienced conservator and photographer (30%). Conservator Madeleine Fang has led the Conservation Department since 1991 and has had extensive conservation experience in other anthropological museums prior to the Hearst (15%). The Media Collections Assistant, (to be hired) will focus testing and separating the nitrates and on re-housing the media collections for frozen storage (100%).

Other project staff contributing 5% of their time to the project include Head of Collections, Victoria Bradshaw has overseen all the collections projects listed above; Research Anthropologist, Ira Jacknis, has conducted extensive research into the Museum's audio visual collections, and regularly lectures and curates presentations from these holdings; Registrar, Joan Knudsen, in conjunction with Head of Research and Information Systems, Michael Black, will assist with ensuring that the collections move is properly tracked on TMS during the

project; finally Facilities Manager, John Horton will oversee the security at Regatta while installation is in progress.

Timothy Vitale is a conservator and consultant with over 30 years of treatment, research, imaging, management and consulting experience. Vitale has a Master's of Science in Art Conservation from the University of Delaware (1977). Institutional venues include: Winterthur Museum; Museum of Fine Arts, Boston; Pierpont Morgan Library; National Archives and Smithsonian Institution. Now in private practice, Preservation Associates, he works out of his Emeryville, CA, imaging studio and the Oakland Museum of California conservation lab (Oakland, CA).

Budget

The budget request to the IMLS will primarily pay for staff/consultant, freezers and supplies. The Museum will meet the 1:1 match by contributing salaries totaling just over $69,000. In addition, the campus has committed a cost-share cash contribution of $20,000 towards the electrical and seismic upgrade of the Regatta site. Costs for electrical and seismic upgrades, equipment and equipment installation are based upon contractor's estimates provided by the University's Capital Projects Manager working to a brief created by the Museum conservator and Head of Collections.

IMPACT

This project will safeguard the media collections until such times as the Museum can afford to scan, digitize and comprehensively document the collections. Due to the large volume of images involved in this phase of the project we estimate that they will take a number of years to scan and process. Therefore, because of their vulnerability, we decided to remove them to safe, frozen storage and thaw sections for scanning as resources become available. It is our intention to thaw the film once, for digitization, and then return them to long-term frozen storage. In the meantime, freezing will extend their life and the process of sorting and re-housing will in fact increase safe access to the collections for our constituents to research and study. Without this preventative work the collections will deteriorate beyond repair.

The project will provide the Museum with an accurate assessment of the nitrates in the collections and facilitates their safe storage. Consolidation of the collections to one site where conditions are controlled will provide ample space for staff to complete further work. Finally, this project will enable us to embark upon identifying sources of funding for Phase III and to begin plans to roll it out. Phase III will make the collections truly accessible and will enable us to upload the data to our online collections database – Delphi - http://pahma.berkeley.edu/delphi/– and ultimately to make it accessible to am open-source collective museums' resource such as *Collections Space*.

Schedule of Completion, Hearst Museum Media Collections Project

Year 1

Activity	**2011** (June)	July	Aug.	Sept.	Oct.	Nov.	Dec.	**2012** Jan.	Feb.	Mar.	Apr.	May	June
Advertise for Collections Asst. and Interns and work study students													
Arrange for Environmental Upgrades, Freezer Purchases, etc.													
Oversee Capital Projects work at Regatta													
Acetate and Nitrate Films													
Collections Assistant, Collections Intern and Work-Study type info. on Film Envelopes into database and record old locations. Print out information onto new envelopes													
Collections Assistant and Media Collections Manager begins systematically going through neg./pos. film collections, separating prints from film, and testing for nitrate as necessary													
Collections Assistant and Media Collections Manager begins re-housing and boxing film for freezer storage													
Film negatives and positives moved to Regatta, bagged for freezer storage their, put into freezers													
Conservation Intern enters new film locations in database													
Conservation Assistant and Interns move Nitrates to Bancroft freezer													
Color Slides													
Color Slides placed in pp sheet holders, inventory sheets made up, and sheets boxed for freezing													
Color Slide Collections Moved to Regatta where bagged and put into freezer													
Collections Intern and Work-Study enter inventory information and new locations in database													
Motion Picture Film													
Motion Picture Film moved from Kroeber and M276 to M180													
Collections Intern and Work-study record old/new locations in database													
Motion Picture Film inspected, if necessary bagged in sealed Marvelseal and put into freezers													
Collections Assistant and Interns record new locations													

BUDGET FORM - PAGE FOUR

Section B: Summary Budget

	$ IMLS	$ Cost Share	$ TOTAL COSTS
1. Salaries and Wages		86,156.00	86,156.00
2. Fringe Benefits		24,985.24	24,985.24
3. Consultant Fees		30,730.00	30,730.00
4. Travel		4,665.00	4,665.00
5. Supplies and Materials		19,212.00	19,212.00
6. Services		4,000.00	4,000.00
7. Student Support			0.00
8. Other Costs			0.00
TOTAL DIRECT COSTS (1—8)	0.00	169,748.24	169,748.24
9. Indirect Costs			0.00
TOTAL COSTS (Direct and Indirect)	0.00	169,748.24	169,748.24

Project Funding for the Entire Grant Period

1. Grant Funds Requested from IMLS	58,607.00
2. Cost Sharing:	
a. Cash Contribution	
b. In-Kind Contribution	111,141.24
c. Other Federal Agencies*	
d. TOTAL COST SHARING	111,141.24
3. TOTAL PROJECT FUNDING (1+2d)	169,748.24
% of Total Costs Requested from IMLS	34.00%

* If funding has been requested from another federal agency, indicate the agency's name:

Enhancing elephant collections care through environmental improvements

1. STATEMENT OF NEED

The Memphis Zoological Society (MZS) is requesting $140,000 from IMLS to upgrade its current African elephant facility, the focal piece of our African safari exhibit and home to our three cows, Asali, Tyranza and Gina. We are also expecting to receive a fourth cow, a rescued circus animal named Dumbo, sometime in 2011. The Memphis Zoo has invested nearly 10 years of resources into a breeding program for our cycling females and the institution was finally rewarded with a calf on July 6, 2009; this was the first time an elephant baby had ever been born at the MZS. While this was one of the most significant conservation and breeding achievements in the Zoo's history, tragedy struck just two days after its birth when the calf tripped on uneven footing, trumpeted, and the nervous mother (Asali) accidentally killed the newborn with its tusk while trying to assist it back to its feet. The MZS learned a great deal from this misfortune and thus our immediate primary concerns are environmental improvements to the indoor facility that will promote the health, safety and well being of a future calf. In addition, our environmental upgrades would also create more social and safe interactions between the matriarch (Tyranza) and potential mother (Asali) in order to reduce maternal anxiety during and after parturition. Our specific goals for the improvements include: (1) installing a resilient composite flooring system in all the elephant stalls for safety of a calf and better foot/knee/ joint health of all animals; (2) upgrading the stall shift doors so the elephants have more open access for visualization and tactile communication; (3) modifications to a stall for mother and calf; and (4) professional training for elephant keepers so that the highest standards of collections care are offered by our staff. Providing health and safety upgrades to our elephant facility will support the institution's highest conservation goals and help us exceed the elephant husbandry standards required by the American Association of Zoo and Aquariums (AZA). We utilized the IMLS on-line "Shaping Outcomes" logic model to show the links between our audience needs, program activities, expected outcomes, and how those outcomes will be evaluated (Figure 1).

How the project supports the museum's long range conservation plan, priorities and strategic goals: The Memphis Zoo celebrated its 100 year anniversary in 2006 and just completed an aggressive 10 year strategic master plan that renovated and upgraded a large portion of the Zoo's campus including construction of seven new exhibits (Cat Country, Once Upon a Farm, Primate Canyon, Animals of the Night, China, Northwest Passage, and Teton Trek), a new veterinary hospital, front entrance and education center. This completed master plan and exceptional service helped the Memphis Zoo secure the #1 rated Zoo in the country by Trip Advisor® in 2008. The pachyderm building is one of the few remaining older structures on the Zoo's campus and in need of modernization. The Zoo's 2009 strategic master plan focuses our mission of "connecting people with wildlife" with our vision to preserve wildlife through education, conservation and research (see attached Strategic Plan). We are currently developing a facilities master plan (attached) charting the vision for our institution through 2025. We are in the process of a formal needs assessment of the old facilities and the elephant exhibit upgrades have been ranked as the #1 priority. MZS is an AZA accredited institution, hence every five years we are intensely evaluated by an outside committee of animal collections care conservators (e.g. veterinarians, directors, curators and biologists). Although we received high marks in nearly every category and were re-accredited in 2008, the elephant complex was highlighted as needing upgrades (removal of dry moat, open shift doors and new flooring) to meet current AZA standards.

Why this project is among the museum's highest collections care priorities at this time: The MZS African elephant facility was completed and opened in 1972 and at the time was designed to house large pachyderms and ungulates. Shortly after completion the exhibit won several local architecture awards in the Memphis area but is now a 38-year-old building that is in need of modernization. The following list provides explanations on why the environmental improvements to the elephant facility are our highest collections care priority at this time: (1) formal recommendations by AZA conservators during our accreditation that we upgrade our aging elephant facility to meet modern exhibit requirements; (2) the tragic loss of our two day old calf in 2009 brought to light facility changes that would be necessary in the future as we prepare for subsequent artificial inseminations and births; (3) the North American captive population of African elephants is rapidly aging with few cycling animals and the prospect of no longer having elephants in the U.S. is quickly becoming a reality [Olson and Wiese, 2000] unless more zoos are committed to reproducing their cows and providing modern facilities; (4) African elephants are threatened in the wild and a captive population provides a hedge against their extinction and connects people to wild animals; (5) MZS is committed to meeting the benchmark our visitors, donors and colleagues expect in elephant management; and (6) the intensive financial nature of the capital campaign for

major renovations to the elephants' outside yard means alternative funding sources for upgrading the **indoor** facilities is necessary to meet our target goal as a leader in elephant conservation.

Figure 1: Audience Needs, Activities and Outcomes **Audience 1:** *The African elephants*		
Needs: Facility improvements are needed to address the safety, welfare and complex social interactions of our African elephants. Specifically we need: (1) new flooring material that will prevent injury of a calf and promote foot and knee health of older adult animals; (2) upgraded shift doors that allow tactile and visual stimulation between animals; and (3) creation of a creep stall for the safety of the calf and to allow weaning when necessary.	**Activities:** To address these needs we propose to: (1) install a revolutionary flooring material, over the current concrete slab, that is considerably softer and will remove uneven footing; (2) replace the old solid metal shift doors with open diagonal steel bar doors that allow social interaction; and (3) install additional steel walls between two stalls that will create more space for the mother and calf, along with a shift or creep stall so the infant can quickly separate itself from the mother.	**Outcomes:** The following short- and long-term outcomes will be achieved: (1) safer conditions for the calf may prevent injury from falling; improved health status by pro-actively addressing foot and joint pain; improved sleeping patterns; better sanitary conditions; (2) change in behavior from more social interactions; assist animal introductions; reduce anxiety during stressful events such as parturition; (3) more indoor stall space and a creep stall will reduce safety concerns.
Audience 2: *The keeper staff*		
Needs: Professional training of staff is needed to make sure we are providing expert collections care of our elephants in a safe work environment. Specifically, staff members would benefit from AZA training on animal welfare issues, enrichment, facility design, problem solving, medical management, elephant foot care, elephant reproduction and birth management of a calf.	**Activities:** To address this need we propose to send one keeper to an AZA professional training course on Principles of Elephant Management. The rest of the keeper staff has already attended this course.	**Outcomes:** We anticipate that the keeper staff member will leave the professional training course with an improved skill set that they can actively call upon during collections care; a change in attitude regarding the importance of addressing elephant welfare, health and well-being; and improved knowledge on elephant biology, sociology, and reproduction which will improve captive management of the animals under their supervision.
Audience 3: *The Memphis Zoo visitors and benefactors*		
Needs: It is critically important that our institution convey to our visitors how we address and manage the welfare of the animals in our trust. Moreover, we need to highlight to our donors and benefactors how we utilize capital support or grant funding for improving the environmental conditions of our elephants and how these changes will improve reproduction, nutrition and health.	**Activities:** Although the zoo has good signage regarding the conservation status of the elephant in the wild, we plan to create new adaptive signage discussing the purpose of our environmental improvements and how they will impact the elephants' health and well-being. Two scrolling picture frame signs will be added in the visitor area discussing the project through a series of scrolling messages, stories and pictures.	**Outcomes:** Our visitors will have: a greater appreciation for how we manage elephants in captivity; a change in knowledge on how we prepare for an elephant calf; a change in attitude with regard to how captive elephants are an educational link connecting wild animals and people. We are also being proactive and highlighting how MZS is addressing the welfare and health of our animals as well as soliciting future donations and leveraging foundation or grant support for conservation projects.

How the project ties into the museum's previous and current collections care activities: The proposed environmental improvement project ties together previous, current and future upgrades to the elephant facility by helping us exceed the collection care standards required for AZA accredited facilities. In 2005, an expansion project was initiated to create more outdoor living space (7200 sq ft.) for the herd and also allow for an area that could be separated off from the rest of the compound to protect a mother and calf. This increased outdoor area allowed the keeper staff to exercise Asali during her pregnancy which is critically important to maintaining the health of an expectant mother as increased weight gain has been shown to impact fetal health [Taylor and Poole, 1998]. During this renovation a larger outdoor pool was created and a new pump room added for improved water filtration. This renovation cost $1.1 million. Currently, the zoo is expanding the elephant yard even further to include an additional 43,560 sq ft. of outdoor space. The cost of this renovation project will exceed $1.5 million. Furthermore, we will be removing the dry moat that separates the animals from the public and replacing it with an AZA-approved post and cable fencing at a cost of $750,000. This new barrier is safer for the animals, especially a calf that might accidentally harm itself by falling into a dry moat. This proposed project will allow the Zoo to extend renovations into the indoor elephant facility.

Collections Care Research: The MZS Conservation and Research Department is conducting several studies with our captive elephants including: (1) pioneering the use of digital infrared thermography (DITI) for use in captive elephant foot care and monitoring [PhD dissertation] that is now required (in lieu of an X-ray) for each AZA accredited institution to have on file; (2) understanding the effect of heat load, stress and heat dissipation and how ear flapping regulates body temperature [MS thesis]; and (3) use of near infrared reflectance spectroscopy for fecal profiling gender, pregnancy status and individual identification in the field [post-doctoral project]. Moreover, we participate in numerous outside projects that require biological samples from our animals to study genetics, disease, reproduction and nutrition. The MZS has never received an IMLS conservation project support (CPS) grant for environmental improvements; however, we have received a CPS (2004) and National Leadership (2009) research grant from IMLS for amphibian conservation. These previous IMLS grants have greatly benefited captive breeding of critically endangered amphibians (cumulatively more than 20,000 endangered amphibians released into the wild, all produced by assisted reproductive technologies; a conservation milestone) and have provided us experience necessary for managing IMLS awards.

The museum's overall financial commitment to elephant conservation: As outlined above, the MZS has committed a substantial amount of finances to capital projects related to the renovation of the MZS elephant facility to increase space for our growing herd which is annually one of our most expensive exhibits to maintain. In addition to these capital expenditures, the Zoo also commits each year more than $5,000 in laboratory supplies (antibodies, hormones, reagents, assay plates, etc.) for monitoring the reproductive profiles of our cows at the MZS endocrinology lab and initially spent nearly $100,000 fully equipping the endocrinology lab for elephant monitoring. We employ a research technician who spends at least 25% of her time committed to tracking elephant hormone profiles as part of her normal job responsibilities. The MZS is one of just a handful of zoos in the country that operates a large endocrinology lab dedicated to elephant conservation. We are able to monitor the elephants' hormone profiles in near real-time without having to send blood samples off to a service lab for analysis. We also act as a service lab if requested by other zoos monitoring their elephant's reproductive cycle. This rapid data analysis of serum samples allows for the precise timing of artificial insemination (AI). Moreover, we have invested significant finances into six separate AI attempts, each one in excess of $10,000, to bring in reproductive specialists (Dr. Thomas Hildebrant and Dr. Frank Goeritz of Germany or Dennis Schmidt, US) who conduct these elephant AI procedures worldwide. The Zoo's board of directors and CEO, Dr. Chuck Brady, are strongly committed to the preservation of African elephants in the North American captive population, in particular, as educational ambassadors for the conservation of their wild counterparts and as a hedge against extinction in the wild due to poaching, human-elephant conflict, or disease. MZS is a founding member of the AZA National Elephant Center for the conservation of Asian and African elephants and annually contributes funds to the International Elephant Foundation (IEF) that awards grants to both *in-situ* and *ex-situ* projects.

2. PROJECT DESIGN

Project goals and objectives: The Memphis Zoo's goal is to improve the indoor environmental living conditions for its African elephant herd, thus improving their quality of life and also providing a safe environment for a calf. Furthermore, providing professional training to our staff and an enjoyable learning environment for our visitors will alter the knowledge and attitudes of those that work with and appreciate these majestic and charismatic species. This CPS grant will allow MZS to achieve the following four objectives:

Objective 1: Install a soft composite resilient flooring system in all the elephant stalls for safety of a calf and better foot/knee/joint health of geriatric animals. We will start by prepping the area, using MZS staff, and relocating machine equipment and husbandry materials to a temporary storage unit on Zoo grounds. Once prepped, Specialty Coating Solutions (SCS) will lay down a self leveling concrete resin to smooth out and fill in existing holes or corrugations. Once completed, the new floor will be poured, which is a specially formulated two composite system that has (1) a light weight, soft, low density elastomer on the bottom, followed by (2) an integral tough density elastomer membrane chemically bonded to the top of the low density elastomer. These two components comprise the resilient soft flooring system. This composite flooring will be put in all five elephant stalls, while the two shift areas will have a new non-skid rigid flooring system that will integrate with the stalls (4,381 ft^2; see attached SCS bid). The estimated time for completion of the project is 14 days. We anticipate this soft, comfortable flooring system will meet the day-to-day needs of the animals, be more sanitary due to ease of cleaning, harbor less bacteria and mold, encourage more play behavior, promote better sleeping habits, reduce injuries to foot pads, and maintain the long term health of the animals by reducing arthritic symptoms such

as joint pain commonly found in older animals. Foot problems are the number one cause of illness in captive elephants [Lewis et al., 2010]. Moreover, the new flooring will provide a softer area for calving, reduce the risk of tripping and injury, and be more sanitary while the calf is building its immune system.

Objective 2: Upgrade the stall shift doors to include diagonal steel bars for increased tactile, visual and vocal communication between animals that will relieve anxiety. We propose to remove the four existing solid core metal shift doors and replace them with open diagonal steel bar doors. MZS has a contract with the city of Memphis and receives a significant discount on city services, including welders. The city of Memphis has provided a bid (attached) for the removal of the existing doors, framing and welding of the new diagonal sliding doors and installation. Removal of the existing doors and installation of the new ones will take approximately 5 days for each project. The new doors will be welded together off-site in three individual sections and reassembled on location. The new diagonal shift doors will take 2 months to complete. Elephants have an incredibly complex social structure that requires significant affiliative behaviors for optimal well-being [Schulte, 2000; Wilson et al., 2006]. By opening up the doors and allowing for more tactile, visual and vocal communication between the elephants we believe improved behaviors will be observed in our elephants. The younger animals will be more relaxed due to interactions with the matriarch Tyranza, show increased play behaviors, sleep more comfortably and pose less injury to themselves. Unrestricted social access during the night is an important factor for maintaining normal elephant behaviors [Wilson et al., 2006]. Lastly, we believe that by not having social access to Tyranza during her first few days of motherhood, Asali was under intense stress that led to her accidental killing of the calf even though she had been displaying otherwise excellent mothering skills and behaviors until the incident.

Objective 3: Create a new birthing stall and creep stall for the calf that will increase safety, promote better nutrition and facilitate weaning of the calf. The largest stall in the pachyderm building is the old rhino area. We propose to box this area in with reinforced steel bars similar to the protected contact situation for the existing elephant stalls. Presently there is a low concrete wall at the incorrect height for elephant care (5' tall) that would present a danger to the keeper staff under requirements for protected contact and would endanger the calf from con-specifics. The steel bars would be laid on top of the concrete wall (up to 12' tall). Next to this stall is a smaller shift area that we will turn into a creep stall for the calf. A 5' tall opening, along with sliding door, would be provided in the new boxed in area allowing for movement by the calf but not allow the mother into this adjacent shift stall. Similar to Objective 2, the city of Memphis welders will be completing all of the metal work for this upgraded mother-infant birth stall. The new reinforced metal will be constructed off-site and assembled in pieces back at the elephant barn. City of Memphis employees estimate the steel bars and creep stall will take 1 month to complete and about 2 weeks to install. A creep stall will allow the calf to run away from the mother if it feels threatened and allows veterinary and keeper staff to separate the calf for physical exams. Moreover, creep feeding assists the weaning process so the separation from mother and calf is more complete. The birthing process can be quite vigorous and the larger stall would provide more space for the mother to pace and initiate contractions.

Objective 4: Provide professional training experience to our keeper staff. We propose to send one of our elephant keepers to the AZA Principles of Elephant Management professional training course (see attached) to be held in February at Oglebay Resort, Wheeling, WV. The training curriculum includes learning about animal welfare issues, enrichment tools, equipment/facility design, problem solving, medical management, elephant foot care, elephant reproduction, birth management/calf introductions, and successful elephant program components, Species Survival Plan (SSP) data entry, standards and protocols, training theory and terminology, conflict resolution, system definitions, behavioral components, and public/media relations.

Project evaluation. Our overarching goal is to improve the status and life condition of our elephants, ensure the safety of newborn calves, and create more affiliative behaviors through unrestricted social access that reduces anxiety in the younger animals. By providing professional training to our staff and creating an interactive learning environment for our visitors we anticipate a change in skills (staff), knowledge (staff and visitors) and attitudes (staff and visitors). To evaluate the impacts of the project on our elephants we plan to: (1) examine *health parameters* prior to and following the environmental changes, and (2) quantify the *behavioral response* of the animals prior to and following the upgrades, (3) evaluate *professional training* provided to staff, and (4) evaluate *visitor response* to the project. *Baseline health parameters* will include cortisol levels as a measure of stress, blood parameters to evaluate the immune system, and foot X-rays or thermograms. A surviving calf past one year would be a measure of success for our flooring and shift stall door modifications. To evaluate the *behavioral activity budgets* of the animals, a behavioral ethogram will be designed using

previously published studies and baseline data collected prior to the modifications and subsequently once a week for a year following the completion of the upgrades. *Observational data* will be collected first-hand by keepers during the day while data collected at night through closed circuit cameras will be evaluated later by trained behavioral docents and college interns. The impact of professional training to our keeper staff will be *anecdotal via communications* with senior staff, work productivity, and attitude after the curriculum is put into practice. By creating an active learning environment for our visitors through adaptive signage and interactive learning environments via keeper chats, we will demonstrate accountability for the animals' welfare and communicate the benefits of our project to Zoo visitors. To measure whether we had an impact on knowledge or attitude of our visitors, we will compare historical elephant exhibit *survey data* or *feedback forms* to the same questionnaire in subsequent years. Annually, MZS provides surveys to visitors upon leaving which ask specific questions about exhibits, services, welfare of the animals etc. By comparing historical data relative to our visitors' impression of the exhibit and care we provide elephants, to what they perceive following the changes, we will have some measure of our success.

Museum's plan to ensure that normal museum operations are not disrupted: All of the work proposed here will take place off exhibit and will not disrupt normal museum operations. The project implementation will be shared with the public but the work will not be visible to the visitors. The improvements will be conducted over a 12-week period between September-November 2011 and is timed with pleasant weather (50-80^{0}F) so that the elephants can be left outside at night. In the off chance of violent weather, only half the building will be worked on at any time so that animals can be shifted in should an emergency arise. A removable sound barrier will be constructed over the exit to the existing barn so that noise is minimized to reduce stress as previous experience with construction projects has shown the benefits of this sound barrier. The staff time committed to this project is within the normal operating duties of each key employee and will not disrupt their normal job responsibilities.

Conditions to which the specimen(s) are currently exposed and why they merit attention at this time: The concrete flooring in the elephant stalls is nearly 40 years old and most of the top layer of concrete has eroded leaving mostly aggregate material behind (see attached pictures). This creates a non-sanitary top layer where mold and bacteria can build up and infect the footpads of the cows. The remaining concrete is also very hard and uncomfortable to elephants weighing in excess of 8,000 lbs. The uneven flooring could also cause a small calf just learning to walk to fall and hurt itself leading to an unpredictable response from the mother. In addition, the shift stall doors are solid pieces of metal that are also nearly 40 years old and do not provide tactile or visual communication between the animals. The attached pictures of the shift doors show where the females have been banging their tusks against the stall doors attempting to socialize with each other, especially during periods of high stress (e.g. calf birth or rearing). Moreover, the birthing stall critically needs a creep area for calf safety and weaning and would necessitate adding some additional steel to retrofit this area.

A description of the specimen(s) that is the focus of the project: The three female African elephants that are the focus of this project include Tyranza (age 46), Asali (age 25) and Gina (age 27); all three cows are managed through protected contact. Tyranza and Gina were both wild caught; however, Asali was born at the Gladys Porter Zoo in Brownsville, TX. Tyranza was in the Ringling Brothers Circus for several years but tended to bolt mid-show and was retired to MZS, while Gina was owned by a private family that used her as a ride and show elephant until we acquired her in 2009. Although Tyranza is no longer cycling, Asali and Gina are still of reproductive age and we are planning artificial inseminations for both cows in the fall of 2010. Unfortunately, 43% of African elephant cows are either acyclic or show irregular cycles [Proctor et al., 2010]; hence, our two cycling females are critically important to the captive breeding program. African elephants are categorized as threatened by the IUCN red-list and the captive population in the U.S. is in jeopardy of no longer being sustainable due to a lack of reproduction, an aging population, poor calf rearing and small percentage of breeding males [Olson and Weise, 2000]. For example, between 1978 and 2007 only 55 calves were produced, many of them not surviving past one year of age [Olson, 2008]. Fortunately, this trend is reversing with 30% (n=16) of the births happening over the last three years of the study (2005-2007). With international restrictions on the importation of African elephants from 'range countries' it is imperative that U.S. zoos commit to a sustainable elephant breeding program. MZS is dedicated to the conservation of this species and we are dedicating past, current and future resources to being an active participant in the AZA species survival program for African elephants.

Conservation methods in terms of efficiency, reliability, and safety: The conservation methods listed herein are *standard* facility design components for the care and husbandry of elephants. Most new facilities incorporate these design elements into their buildings per AZA recommendations found in the "Elephant Exhibit Design Resource Guide". In the last six years, Specialty Coating Solutions LLC has installed the softer composite flooring in over 13 zoos and 75 elephant stalls. The first use of this innovative flooring material was actually pioneered by IMLS grant funding to the Oregon Zoo in 2003. A press release at the conclusion of the study indicated that, "the elephants are already showing preference for the new floor, playing, exercising and sleeping more easily on the soft surface compared to the old concrete floor". This groundbreaking work, supported by IMLS, has 'softly' paved the way for a nation-wide change in how zoological institutions care for their elephants.

3. PROJECT RESOURCES: TIME, PERSONNEL, AND BUDGET

Time allocated to complete project: The proposed project will be completed over a 12-week period, between September – November 2011. The weather in Memphis TN is pleasant during this time and the animals are normally left outside at night so there will not be a break in their normal routine. Work on the stall shift doors and birthing stall will proceed first, followed by the flooring. The annual AZA Principles of Elephant Management professional training course is held in February at the Ogle Bay Resort, Wheeling, WV.

Key staff: ***Dr. Andy Kouba*** is the Director of Conservation and Research for the Memphis Zoo and will be committing 5% of his time to the project. Dr. Kouba will co-supervise the project with Mammal Curator Matt Thompson. With over 12 years of animal husbandry experience, a Ph.D. in Animal Science, and two previous IMLS grants, Andy is well qualified to co-lead this effort and will be responsible for organization and management of the project, designing the study, running necessary hormone assays, reporting to IMLS and evaluating the project.
Matt Thompson the Mammal Curator for the Memphis Zoo, will co-lead the project with Andy and will be committing 5% of his time to the upgrades. Matt has evaluated and prioritized our most urgent elephant care collection needs and developed the current project plan and timeline. Moreover, Matt will be responsible for supervising the installation work. With over 15 years of animal husbandry experience, a B.A. in organizational management, and experience leading several major renovations and capital building projects, Matt is uniquely qualified to supervise the upgrades to our facility.
Houston Winbigler is the Assistant Curator for the Memphis Zoo and will be providing 5% of his time to the project. Houston has 38 years of animal husbandry experience at the MZS including the design and construction of exhibits and regularly supervises more than 20 keeper staff. Houston will assist with prep work (e.g. removal of old water troughs, removal of storage material, relocation of equipment) needed in the area prior to the upgrades, and assist with supervision of the project and construction of the sound barrier between the outside yard and indoor facilities.
Andrew Smith is the Lead Elephant Keeper at the Memphis Zoo as well as team leader for hoof stock and will contribute 15% of his time to the project. Andrew has 16 years of elephant management experience and is the current elected board of directors' president of the Elephant Managers Association. Andrew will assist with prep work of the area and will assist Houston in this regard. Andrew will also assist with supervision of the contractors, work with Dr. Kouba on the evaluation of the project, collection of behavioral data, and commit a significant amount of time to the educational messages regarding the project that will be shared with visitors.
Dr. Chuck Brady is the CEO and President of the Memphis Zoo and will contribute 1% of his time. Dr. Brady has a Ph.D. in animal behavior and over 30 years of animal husbandry, research and management experience. Dr. Brady is responsible for leading all major environmental improvements on our campus. Dr. Brady will be responsible for review and acceptance of bids, contracts, financial reporting, sharing the collections care improvements with media, our board and visitors and leveraging the grant for further conservation projects.

Budget allocation to accomplish project activities: Even though the last two years have been some of the most difficult economic times in decades, the Zoo is financially sound and has been fiscally responsible with an operating budget surplus for FY2009 and FY2010. We are largely self-sufficient for day-to-day operations. However, city support is diminishing due to budget cuts, and philanthropy is difficult for our donors due to poorly performing markets; thus, we are finding it necessary to seek outside funding to support large collections care improvements to our facilities that will exceed industry standards and provide our community with environmental and educational services. MZS has received bids for the proposed upgrades that amount to $248,645 (see attached quotes from Specialty Coating Solutions, LLC and the City of Memphis in the addendum). In addition, are costs related to the in-kind staff support, professional training, and

signage that we are covering as a match. We are requesting $140,000 from IMLS for these collection care improvements and the remaining $147,246 will be covered by the Memphis Zoo as a Match; MZS will be shouldering 52% of the financial commitment. The matching funds have already been set-aside in our capital improvements account in the event this grant is awarded.

4. IMPACT

How the project activities and results will be assessed and their significance if known: The project's impact will be assessed through the evaluation phase discussed under Project Design (anecdotes, feedback forms and observations) We have defined our outputs as successful if we have changed the behavior and life condition of the elephants and whether we have increased the knowledge, skills or attitudes of our visitors, donors or employees. The outputs of this project include soft composite flooring set up in five stalls, four new open framed shift doors, one stall modification for mother and calf, two new adaptive signs for visitor learning, and one professionally trained keeper staff. We believe the short-term impacts to our elephants will be a change in their behavior; specifically, the animals will be more relaxed at night due to increased visual and tactile stimulation between these social animals along with more exercise and better sleeping habits from the softer flooring. Middle term impacts (2-3 yrs) will be a safer environment for rearing a calf due to better flooring (less potential injury from falling), more sanitary conditions, and a creep stall for the calf to escape dangerous situations, allow independent movement and facilitate weaning. Furthermore, first time mothers will remain in visual and tactile communication with the Matriarch and will be less anxious pre- and post-childbirth. Ultimately, these changes should culminate in a successfully raised elephant calf. Long-term outputs will be a change in the status and life condition of the elephants' health with a focus on foot health. We also anticipate that the professional training of our keeper staff will result in new knowledge and skills that will allow them to prepare for an elephant birth, handle dangerous situations, design environmental enrichment programs, assist with quick decision making and provide for the safety of the animals in their care. Short- and long-term impacts on our visitors might be a change in knowledge or attitude regarding how we are addressing the quality of life for our elephants, how we prepare for an elephant calf, why it is important to save these majestic creatures, and the quality of our signage and keeper chats. Most importantly, visitors should have a positive learning experience in front of the exhibit. Lastly, a long-term impact of our improvements will be the ability to leverage additional funding from donors or board members that could lead to additional support for capital enhancements towards creating a world-class zoo.

Dissemination and Products: The Memphis Zoo will use a variety of media and other means to share project activities with visitors/guests, donors, and professional colleagues. ***Visitors***: MZS will create a series of adaptive signs in the visitor area that utilize rotating picture frames. This new form of scrolling signage allows us to put large amounts of pictures and text for visitors to read allowing them to determine how much knowledge they would like to accumulate. We will share with our visitors' information about our elephants' conservation status, breeding program, how we are addressing elephant welfare and how the IMLS grant will improve their quality of life. Elephant keeper chats with the public occur twice a day and are an excellent interactive way for visitors to learn about the IMLS supported project. Keeper staff will interact, discuss, and answer questions related to the importance of the upgrades and how they will improve the elephants' safety, welfare and health of a calf. Visitors will also be directed through the signage and keeper chats to the Zoo's website which will provide more information on our conservation programs for elephants and the project activities. In addition, we will share the results of our project with nearly 27,000 members through several stories and conservation updates in our newsletter *Exzooberance*. Lastly, we will also approach local and national media outlets (newspaper, radio, television) to discuss the improvements occurring within the elephant facility to reach a broader audience than just our visitors and members. ***Donors***: Senior staff involved with the project will present power point slide shows to our current donors highlighting how we are improving the elephants care and quality of life through facility improvements and expansion. We will be proactive and meet with foundations, charitable organizations, and other professional societies (e.g. rotary clubs, Kiwanis) in the Memphis metropolitan area to share our conservation message. The Memphis Zoo board of directors will be provided a behind the scenes tour of the facility once completed which will allow IMLS funds to leverage additional support for future facility improvements. ***Professional Colleagues***: The results of our upgrades will be shared with our peers at AZA conferences and the annual Elephant Managers Association meeting, incorporated into the AZA nationally distributed "Elephant Exhibit Design Resource Guide" and future husbandry manuals, and presented at the AZA directors retreat and in notes in popular press magazines such as AZA's Connect.

SCHEDULE OF COMPLETION – shaded areas are when the objectives will occur

Objective	2011-2012											
	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Objective 1: Install a soft composite resilient flooring system in all the elephant stalls for safety of a calf and better foot/knee/joint health of geriatric animals												
Objective 2: Upgrade the stall shift doors to include diagonal steel bars for increased tactile, visual and vocal communication between animals that will relieve anxiety												
Objective 3: Create a new birthing stall and creep stall for the calf that will increase safety, promote better nutrition and facilitate weaning of the calf												
Objective 4: Provide professional training experience to our keeper staff.												

BUDGET FORM: Section B, Summary Budget

	$ IMLS	$ Cost Share	$ TOTAL COSTS
1. Salaries and Wages	$0.00	$13,069.00	$13,069.00
2. Fringe Benefits	$0.00	$2,805.00	$2,805.00
3. Consultant Fees	$0.00	$0.00	$0.00
4. Travel	$0.00	$1,671.00	$1,671.00
5. Supplies and Materials	$0.00	$900.00	$900.00
6. Services	$140,000.00	$108,645.00	$248,645.00
7. Student Support	$0.00	$0.00	$0.00
8. Other Costs	$0.00	$950.00	$950.00
TOTAL DIRECT COSTS (1-8)	$140,000.00	$128,040.00	$268,040.00
9. Indirect Costs	$0.00	$19,206.00	$19,206.00
TOTAL COSTS (Direct and Indirect)	$140,000.00	$147,246.00	$287,246.00

Project Funding for the Entire Grant Period

1. Grant Funds Requested from IMLS	**$140,000.00**
2. Cost Sharing:	
a. Applicant's Contribution	**$112,166.00**
b. Kind Contribution	**$35,080.00**
c. Other Federal Agencies*	
d. TOTAL COST SHARING	**$147,246.00**
3. TOTAL PROJECT FUNDING (1+2d)	$287,246.00
Percentage of total project costs requested from IMLS	**48 %**

*If funding has been requested from another federal agency, indicate the agency's name:

1. Statement of Need. Many living museums such as nature centers, botanical gardens, arboreta, and zoos include natural areas as a central feature of their collections. In the case of the State Botanical Garden of Georgia (SBG), more than three-quarters of our 313 acres remain in a natural state, and many visitors value our institution as much for these forested landscapes as for our horticultural displays. SBG's forests need to be actively managed to protect them from a variety of threats including erosion, nitrate run-off from adjacent agricultural lands, and over-browsing by deer. Our greatest conservation concern by far is degradation of habitat due to invasion by exotic pest plant species. The primary culprit is Chinese privet, *Ligustrum sinense,* a shrub native to China that was introduced to the United States in the 1850s for its horticultural value. This introduced species now dominates many riparian zones in the Georgia piedmont, including the Middle Oconee River which borders SBG. It has taken over the understory of the forests that comprise some of our most scenic and ecologically valuable floodplain habitats. Privet grows in tall, impenetrable thickets, casting a dense shade that chokes out other shrub and herb species, as well as seedlings of canopy trees.

This proposal presents a strategy to restore species diversity to an important and valued component of our natural areas — five acres of floodplain habitat — and to develop a collections care infrastructure that will enable us to expand this restoration in subsequent years to an additional 27 acres of our floodplain. The project includes several integrated steps: physical removal of existing privet populations; propagation of appropriate understory species from local, genetically appropriate material; out-planting of propagated material; and long-term, active management of the restored site.

This is an opportune time to undertake the proposed treatment of Chinese privet at SBG because we will be able to dovetail our efforts with recent and on-going research studies. Geographer Ronald Ward completed a Ph.D. dissertation at the University of Georgia (UGA) in 2003 that analyzed Chinese privet invasion in the upper Middle Oconee River watershed. The State Botanical Garden of Georgia was one of his three field sites. He included the following assessment in his management recommendations: "While inaction is always a policy option for landscape management, the consequences of inaction will lead to a monotypic stand of Chinese privet on the most heavily invaded floodplains. *Of foremost importance is the development of long-term management strategies to achieve the most effective removal, reforestation, and ongoing monitoring of privet invaded floodplains*" [our italics] (p. 48; R. Ward. Biogeographic effects of *Ligustrum sinense* (privet) invasion of the Oconee River floodplain, north Georgia. Athens, GA: University of Georgia; 2002. Dissertation).

In 2005, Dr. Jim Hanula, a research scientist at the USDA-Forest Service Southern Research Station in Athens, Georgia, began a ten-year study of privet removal techniques, including the floodplain of SBG as one of four experimental sites in northeast Georgia. Dr. Hanula's research team established three 5-acre plots along the SBG floodplain in areas that were heavily overgrown with privet. One plot served as the control with no privet removal. In the second plot, privet was removed using chainsaws and machetes, followed by herbicide treatment of stumps. In the third plot, privet was removed using a track-mounted mulching machine (Gyrotrac®) followed by herbicide treatment of stumps. Dr. Hanula's team is monitoring recovery of the vegetation in each plot. He estimates that privet biomass (dry weight) in his treatment plots on the SBG floodplain was approximately 20 tons per acre prior to removal treatments! However, the results of his study after the first three years were encouraging. Privet populations were reduced to about 1% of their former cover on the two treatment plots (J. Hanula et al. 2009. Chinese privet (*Ligustrum sinense*) removal and its effect on native plant communities of riparian forests. Invasive Plant Science and Management 2:292-300). Comparing the vegetation that has come up in the plots relative to his working definition of the desired future condition, Hanula states, *"I'm confident that forests where privet has been removed will recover given enough time (50*

years or more), but some form of active management will be necessary to do it more quickly" [our italics] (see letter from Dr. Hanula included in the supporting documents).

A general conservation survey of SBG's natural areas was completed in 1998 by Dr. Charles Wharton, the former State Ecologist of Georgia. His 111 page report identified the Chinese privet infestation on the floodplain as a top management priority for SBG. The report is not attached to this proposal due to its length, but a letter from our museum Director confirming the high priority of this conservation effort is included as a supporting document (see attached letter from Dr. Wilf Nichols). We were advised by IMLS staff that these sources would suffice to establish the conservation priority of this project in the absence of an overall general conservation survey of SBG's accessioned collections and natural areas.

SBG's commitment to collections care is reflected in our written policies, our horticultural and curatorial practices, physical infrastructure, staff training, and IT support. Our collections policy, created in 1995, establishes protocols for selecting, accessioning, documenting, monitoring, and accessing our living collections. Plant records are maintained in a Microsoft Access database and are shared with external organizations such as the Center for Plant Conservation and Botanic Gardens Conservation International. Each major section of the accessioned collections is maintained by a horticultural curator who conducts a formal inventory every three years and keeps plant labels up-to-date on a regular basis. Core sections of the horticultural collections have been mapped into our GIS system and coverage is expanded each year. Our staff includes a full-time IT specialist who is skilled in GIS and database management. We recently completed construction of a new Horticulture Complex with a sophisticated captured rainwater system and three state-of-the-art greenhouses (8,700 sq. ft total, utilizing the latest polycarbonate insulated panel technology). This facility will significantly enhance care of our accessioned horticultural collections. A Conservation Grant from IMLS in 1995 enabled us to improve the collections care environment and interpretation of the tropical economic plant collection in our Visitor Center and Conservatory.

2. Project Design. The long-term goals of this conservation project are: (1) to dramatically reduce the Chinese privet population along five acres of the SBG floodplain and to maintain it at acceptable levels; (2) to restore native plant species diversity to the floodplain understory that the Chinese privet has largely eliminated; (3) to use the restoration project as a service learning opportunity for undergraduate students; and (4) to develop restoration protocols that can be extended to an additional 27 acres of Chinese privet-invaded floodplain forest at SBG. This project falls under the Environmental Improvements category of the Conservation Project Support program because it is focused on the control of invasive plant species; it requires improvements to our physical environment for propagating specimens already in our collection; and it seeks to improve and stabilize conditions for displaying specimens in our exhibition (forested) areas.

Two of our most popular nature trails at SBG run for about one mile along the banks of the Middle Oconee River. A natural levee borders the river, sloping gradually down to a floodplain of bottomland forest. The width of the floodplain varies from a few dozen feet to more than 900 feet inland from the river at its widest point (see "Map of the SBG Floodplain" in supporting documents; the thin blue line labeled "Floodplain extent" indicates the inland limit of the floodplain). The forest canopy is composed of mature specimens of typical bottomland species including box elder (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), sweetgum (*Liquidambar styraciflua*), winged elm (*Ulmus alata*), sycamore (*Platanus occidentalis*), river birch (*Betula nigra*), water oak (*Quercus nigra*), bitternut hickory (*Carya cordiformis*), and eastern cottonwood (*Populus deltoides*). This rich assemblage of native species towers over a thicket of Chinese privet, which is frequently too thick to allow passage. The evergreen privet grows to a height of 10-15 feet. It spreads vegetatively by lateral growth of underground stems, and by small fleshy fruits that are dispersed by birds and floodwaters.

Where Chinese privet dominates, few other species grow beneath the forest canopy, but in less disturbed portions of our floodplain forests we find understory trees and shrubs such as hornbeam (*Carpinus caroliniana*), paw paw (*Asimina triloba*), swamp dogwood *(Cornus amomum),* possum haw (*Ilex decidua*), winterberry (*Ilex verticillata*), and spicebush (*Lindera benzoin*). Vines include muscadine (*Vitis rotundifolia*), creeping cucumber (*Melothria pendula*) **,** crossvine (*Bignonia capreolata*), Carolina jessamine (*Gelsemium sempervirens*), climbing hydrangea (*Decumaria barbara*), and trumpet creeper (*Campsis radicans*). A few examples of the many herbaceous species include jewelweed (*Impatiens capensis*), river oats (*Chasmanthium latifoilium*), river cane (*Arundinaria gigantea*), wingstem (*Verbesina alternifolia*), Lizard's tail (*Saururus cernuus*), cardinal flower (*Lobelia cardinalis*), soft rush (*Juncus effusus*), ironweed (*Vernonia gigantea*), and green-eyed Susan (*Rudbeckia laciniata*). Our intent is to remove the privet and restore this level of species diversity to the floodplain understory.

Over the course of the next decade, our goal is to restore 32 acres of floodplain forest along our border with the Middle Oconee River. This habitat is of great interest to our visitors for hiking, birding, and natural history study. UGA classes in forestry, hydrology, plant biology, ecology, wildlife biology, horticulture, and education visit the floodplain for research and field studies. Students in SBG's environmental education courses utilize the floodplain for learning and enjoyment of the riparian setting. There is no established protocol for restoring privet dominated floodplains in our region, but there is an urgent need among land managers and landowners for more information on this subject (see letter from Dr. Hanula in the supporting documents). We are in a unique position to develop and share solutions for managing floodplains for several reasons: (1) current research in our privet–dominated natural areas by the US Forest Service (Dr. Jim Hanula) and UGA geography researchers; (2) our experience as a botanical garden in propagating native plants, including many typical floodplain understory species; (3) the large pool of volunteers and undergraduate students who can assist in restoration efforts; and (4) our extensive experience in disseminating information to academic, professional, and public audiences. The activities described below will enable us to begin restoration of a five acre plot that is strategically located within the SBG floodplain. At the end of the two year grant period, we will have developed an infrastructure and protocols for propagating floodplain understory species and reestablishing native vegetation in forests that have been cleared of Chinese privet. IMLS support will be critical for preparing the initial site for restoration, improving our propagating environment (in terms of environmental conditions and security), and enabling our staff to develop propagation and management protocols.

Activity 1. Clear the Chinese privet dominated understory from five acres of the SBG floodplain adjacent to our native plant propagation facility. Due to recent construction at SBG we have the opportunity to dedicate 2.5 acres of vacated space to the development of a facility devoted exclusively to propagation and study of native plants. This vacated site is adjacent to the floodplain forest that we propose to restore (supporting documents for this section include "Native Plant Propagation Area at SBG", "Map of the SBG Floodplain", and "Photographs Illustrating Quad Greenhouse"). The site was formerly the main horticulture complex for SBG. It included two greenhouses, a headhouse, lath and plastic-covered shade houses, storage buildings, and trailers that served as office space for the horticulture staff. During the spring of 2010, the functions associated with this facility were moved to a new Horticulture Center closer to the entrance to the botanical garden. Outdoor nursery space in the new Horticulture Center is limited, while the vacated site provides ample room to expand native plant production in support of SBG's Research and Conservation programs. While most of the structures on the vacated site are scheduled to be removed or demolished, one greenhouse and its associated headhouse are in very good condition (a headhouse is a building adjacent to a greenhouse with workspace for propagating and potting-up plants, storing equipment and supplies, maintaining

records, etc.). The area also includes a 0.3-acre plot with well-spaced pine trees where SBG's Research and Conservation staff propagates endangered and other plant species, often under contract with state and federal agencies. This Outdoor Propagation Area is surrounded by a ten-foot high chain link fence to keep out deer.

The vacated horticulture complex is bordered on the south side by floodplain forest with a dense privet understory. We have defined a five acre plot of this adjacent forest as the area to be cleared during this IMLS-sponsored project (this section is labeled "Cleared Wetland" on the "Map of the SBG Floodplain" in the supporting documents). Once the privet has been removed, there should be a clear view of the nearby Middle Oconee River from the horticulture complex.

Based on the research conducted by Dr. James Hanula, and his recommendations (see letter in supporting documents), we will clear the existing Chinese privet from the five acre plot using a Gyrotrac® (photo in supporting documents). This machine is essentially a chipper mounted on rubber tracks. It converts the existing understory to wood chips, leaving behind an open forest with mature canopy trees and little or no understory vegetation (see photo). Some privet stumps will resprout in the months following the Gyrotrac® treatment, but handspraying with the herbicide glyphosate for one or two seasons is an effective control. Hanula has found that this combination of treatments reduced privet on his study plots at the botanical garden to 1% of their former cover. This is an acceptable level for our planned restoration activities. Activity 1, clearing of the Chinese privet understory, will take place during the first month of the proposed project period, June 2011.

Activity 2. Install deer fence around perimeter of Native Plant Propagation Area. From this point on we will refer to the site of the old horticulture complex as the "Native Plant Propagation Area", which describes its intended future use. The components of the site that will be central to the floodplain restoration project are the greenhouse, headhouse, pad (a flat, outdoor space for growing plants in pots; the ground is typically covered with plastic cloth to prevent the growth of weeds), and trial gardens (a large space of open ground where plants can be grown directly in soil to evaluate their growth and performance). Due to the significant deer population in the natural areas of SBG, it will be necessary to surround the perimeter of the Native Plant Propagation Area with a ten foot high wire mesh deer fence to prevent destructive browsing of young plant material (see illustration titled "Native Plant Propagation Area" in the supporting documents for the proposed location of the deer fence). The display gardens at SBG are already protected by extensive lines of deer fence that run through the surrounding forests. Activity 2, installation of the deer fence, will take place during the second and third months of the project period, July and August 2011.

Activity 3. Upgrade quad greenhouse and headhouse growth and work environments. The existing greenhouse in the Native Plant Propagation Area is structurally sound and was renovated in 1995. We refer to it as the "quad greenhouse" because it consists of four equal rooms (each 700 sq. ft.) connected by a hallway (500 sq. ft.). The growing environment within the quad house needs to be modified to provide an optimal environment for the propagation and growth of the native species that are the subject of this proposal. We will enhance control of light, temperature, and humidity by installing fog, mist, and humidity systems; a shade system; and heating lamps. We have received technical recommendations for these enhancements from colleagues at the Atlanta Botanical Garden and Dr. Matthew Chappell in the UGA Horticulture Department who specializes in greenhouse construction. We will install five rows of Netafilm 4-way overhead foggers in each quadrant of the greenhouse so that we will have automated irrigation control. We will also install Ludvig-Svennson XLS Revolux panels of shade cloth to reduce high radiation in the summer season. In addition, the gravel floor in the quad greenhouse will be replaced with poured concrete. This will provide greater protection against weeds and disease, and it will increase the useful square footage of the quad greenhouse since plant material can be stored on the floor as well as on the benches.

The second structure that needs to be upgraded to provide a better working environment is the headhouse. It is divided into two sections, each 28 x 30 ft. One section is finished. It contains sinks and tables for mixing soil, potting-up plants, cleaning used pots, and preparing plants for propagation. The second room is unfinished. It has a dirt floor and has been used for storage of pots and tools. Our plan is to convert this dirt-floored storage area to a useful workspace by pouring a cement floor and outfitting the space with potting benches. This will provide space for garden staff, volunteers, and students to clean seed, make cuttings, mix soil, pot-up plants, and carry out the many activities associated with propagating plants from seeds, cuttings, and divisions. Additional items that need to be purchased to maintain appropriate levels of care for the collection are a mechanical seed-cleaner, a computer, and a label-maker. These will be kept in the headhouse. These upgrades to the quad greenhouse and headhouse will be completed during the first six months of the project period.

Activity 4. Collect and propagate understory species from on-site populations for restoration of the cleared floodplain understory. Once the Chinese privet has been removed, the key to re-establishing a diverse floodplain flora will be active out-planting of native shrubs, herbs, grasses, and ferns into the forest understory. It is critical from an ecological standpoint that the source material for these plantings be locally obtained and genetically appropriate to the site. Many of the species we plan to return to the floodplain could be obtained from nurseries in the Southeast, but using nursery material runs the risk of contaminating local gene pools and introducing ecotypes that are ill-suited to our local environment. A key principle of our management plan is to obtain plant material for the restoration by collecting seeds and cuttings from specimens already growing in the SBG natural areas and propagating these for the restoration effort. Fortunately, the species we wish to propagate can be found in areas of the SBG floodplain that are not as heavily infested with Chinese privet. The SBG Research and Conservation staff has extensive experience in collecting seeds and cuttings of native plants from a variety of habitats and propagating them successfully, often on contract with state and federal agencies. A list of the species we will collect and propagate is included in the supporting documents ("List of Riparian and Wetland Plants to be Propagated"). The list comprises species present in our natural areas that are typical components of Piedmont floodplain forests. The 24-month project period will provide sufficient time to collect seeds and cuttings from a diversity of species, and in most cases, to grow plants to suitable size for out-planting in the adjacent forest. Our proposed time-frame for restoring the entire 32 acres of the SBG floodplain extends over 5-10 years so plants will be held in cultivation until they are sufficiently mature to establish themselves once out-planted, even if that extends beyond the period of this grant.

Activity 5. Survey mature trees and emerging vegetation in the restoration plot. One advantage we have in restoring the vegetation of the floodplain is that the mature trees on the site are typical floodplain species. In order to document the identity, size, and distribution of the canopy species and facilitate comparison of our site with other floodplain forests, we will use GIS technology to identify and map all trees on the five-acre restoration plot with a trunk diameter (dbh) $\geq$ 12 inches. We will also conduct an inventory of all vascular plant species that appear on the plot during the two-year interval following privet removal. Tree mapping and plant inventory will be carried out by UGA undergraduate students in a spring semester course taught by Dr. James Affolter. This course, titled "Conserving Native Plants", was first offered in the spring of 2010. It involves 12 students in a service-learning project at the State Botanical Garden and introduces them to principles of plant conservation in a botanical garden setting. Students in the 2010 class mapped and identified several hundred trees along the floodplain and assisted SBG staff in propagating native plants. Dr. Affolter will devote two months of the spring 2012 and 2013 courses to mapping trees and surveying vegetation on the floodplain restoration site. The class has access to several hand-held Trimble GPS units (GeoXH 2005 model)

and Ranger external antennae. Students will also assist in collecting seeds and cuttings for the restoration project, and propagating and out-planting specimens for the restored floodplain understory.

Activity 6: Plant propagated understory species in the floodplain. We believe the key to accelerating the recovery of the floodplain understory, rather than waiting 50 years or more for natural recovery, is to populate the cleared site with SBG-grown native plant material. The Georgia Piedmont is characterized by hot humid summers and the best seasons for establishing new plantings are fall and spring. We will begin moving native plants from our nursery into the adjacent floodplain understory in September, 2012. Planting will continue through the spring of 2013 depending on the size and developmental stage of individual species. Plants that are heavily browsed by deer will be protected with temporary cages. The site is sufficiently accessible that we can water delicate species with back-pack sprayers if necessary. We have used similar techniques when reintroducing rare and endangered species and their associates in habitats throughout the state. The out-planting and care of the understory species will be the responsibility of SBG Research and Conservation staff, but we will be assisted by students in the "Conserving Native Plants" course and volunteers.

Activity 7: Manage and monitor restored understory. In choosing to accelerate the recovery of the floodplain understory, we acknowledge that we will be creating a somewhat artificial landscape that will need to be actively managed for the foreseeable future. Our goal is not a complete ecological restoration but an increase in the diversity of native understory species on the site. Chinese privet will continue to colonize the floodplain, by sprouting from surviving shoots and seeding from bird-dispersed fruits. Dr. Hanula's research suggests, however, that once privet density is dramatically reduced, its spread can be held in check by occasional herbicide treatment and physical removal of individual plants. Our restoration effort will provide new and valuable information concerning which species perform well when re-introduced to the understory and how rapidly they spread. We will assess the performance of individual species in the restored floodplain plot and monitor establishment success, relative growth rates, success in flowering and fruiting, and ability to reproduce vegetatively and sexually (through establishment of seedlings). Once we have begun out-planting the understory species, SBG Research and Conservation staff will monitor plant performance in relation to light levels, soil type (sand vs. loam), hydrology, and frequency of flooding throughout the project period.

3. Project Resources: Time, Personnel, Budget. The personnel that will carry out the proposed project include the Research and Conservation staff of SBG, graduate and undergraduate students at UGA, and volunteers. **Dr. James Affolter** is a Professor in the UGA Department of Horticulture and Director of Research at SBG. He supervises the SBG staff participating in this project. He received his Ph.D. in Botany from the University of Michigan (1983) and has worked in university botanical gardens for the past 30 years (University of California at Berkeley and Cornell University). Dr. Affolter's research and teaching interests include plant conservation and medicinal plants. He has served as Chair of the Georgia Plant Conservation Alliance since the organization was founded in 1995. **Jennifer Ceska** was SBG's first Conservation Coordinator and she has served in that position for the past 15 years. She received her M.S in Horticulture from UGA in 1994 and is nationally known for her role in organizing and coordinating the Georgia Plant Conservation Alliance. She received the Professional Citation Award from the American Public Gardens Association in recognition of her accomplishments in the fields of conservation and environmental education. **Heather Alley** received her M.S. from the UGA Horticulture Department in 2002. Her thesis research was an experimental reintroduction of the federally listed endangered species *Echinacea laevigata*. She coordinates a statewide network of conservation volunteers (the Botanical Guardians) and conducts externally funded research on rare and endangered species of the Southeast. **Melissa Caspary** is a Ph.D. candidate in the Odum School of Ecology at UGA. Dr. Affolter is

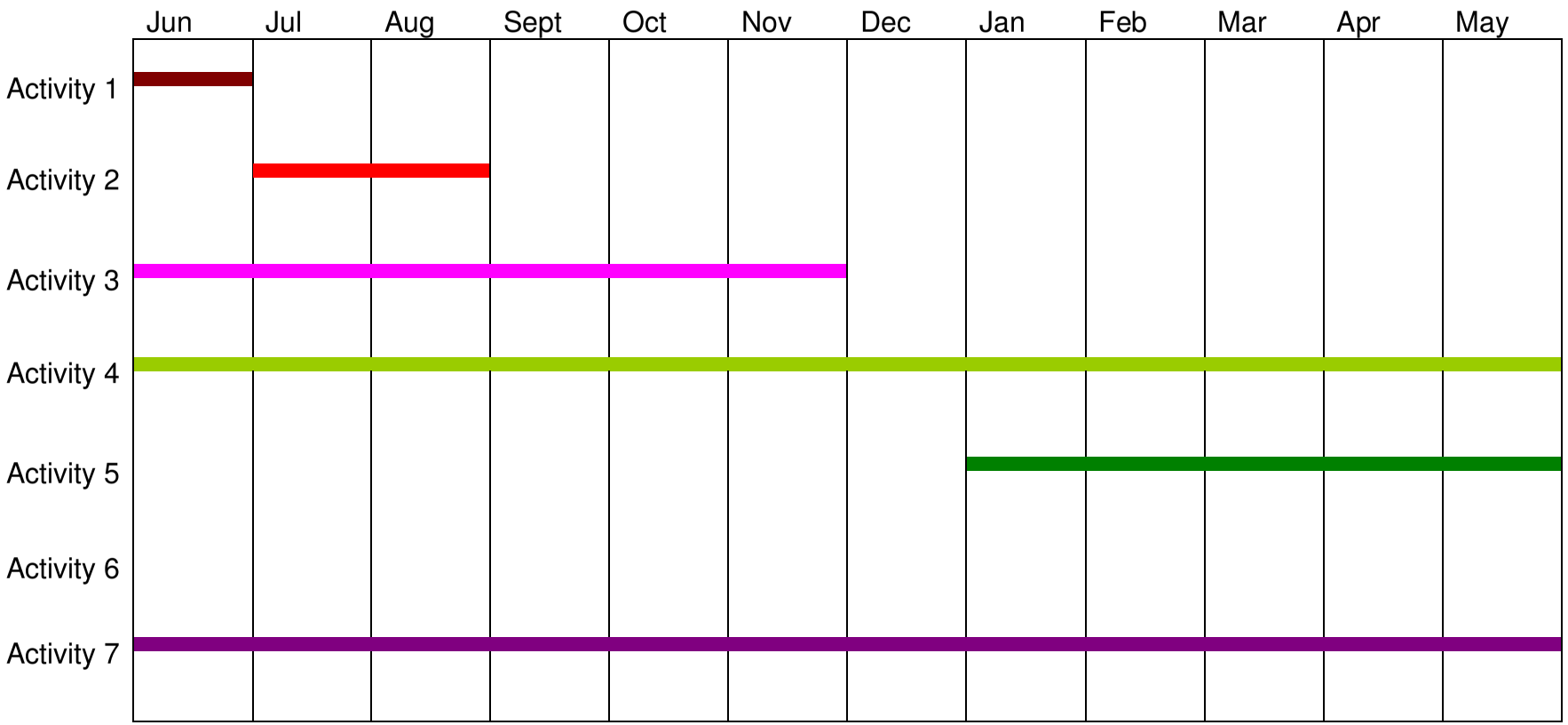
her major professor. Her dissertation topic considers the effect of invasive species such as Chinese privet on the rare flora of granite rock outcrops in the Southeast. As a graduate student, Caspary has coordinated SBG's native plant propagation program for the past five years. Caspary will complete her Ph.D. program in May 2011. At that time we anticipate she will join the permanent staff of the Research and Conservation Program.

The proposed project will be supervised by Dr. Affolter. He will participate in the detailed design and implementation of the project activities, and will devote significant time as instructor in the "Conserving Native Plants" course. Ceska, Alley, and Caspary will be involved in all phases of the project including oversight of service contractors, collection and propagation of understory plants, curation of the nursery material, design of out-planting schemes, monitoring and management of the restoration site, and supervision of volunteers. Several strategies will be employed to ensure that our normal museum operations are not disrupted. The Research and Conservation program has a dedicated and well trained staff of volunteers that will be indispensable to the proposed activities. In combination with the undergraduate students enrolled in the "Conserving Native Plants" course, they will be an important factor in enabling our staff to carry out the project activities without sacrificing other responsibilities. Both Alley and Caspary are part-time employees and IMLS funds requested in the budget will enable us to increase their percent EFT (Employed Full Time). Since they will be working additional hours, the work they currently perform will not be compromised. SBG also funds a graduate student. The student in this assistantship will devote 0.33 EFT to the project.

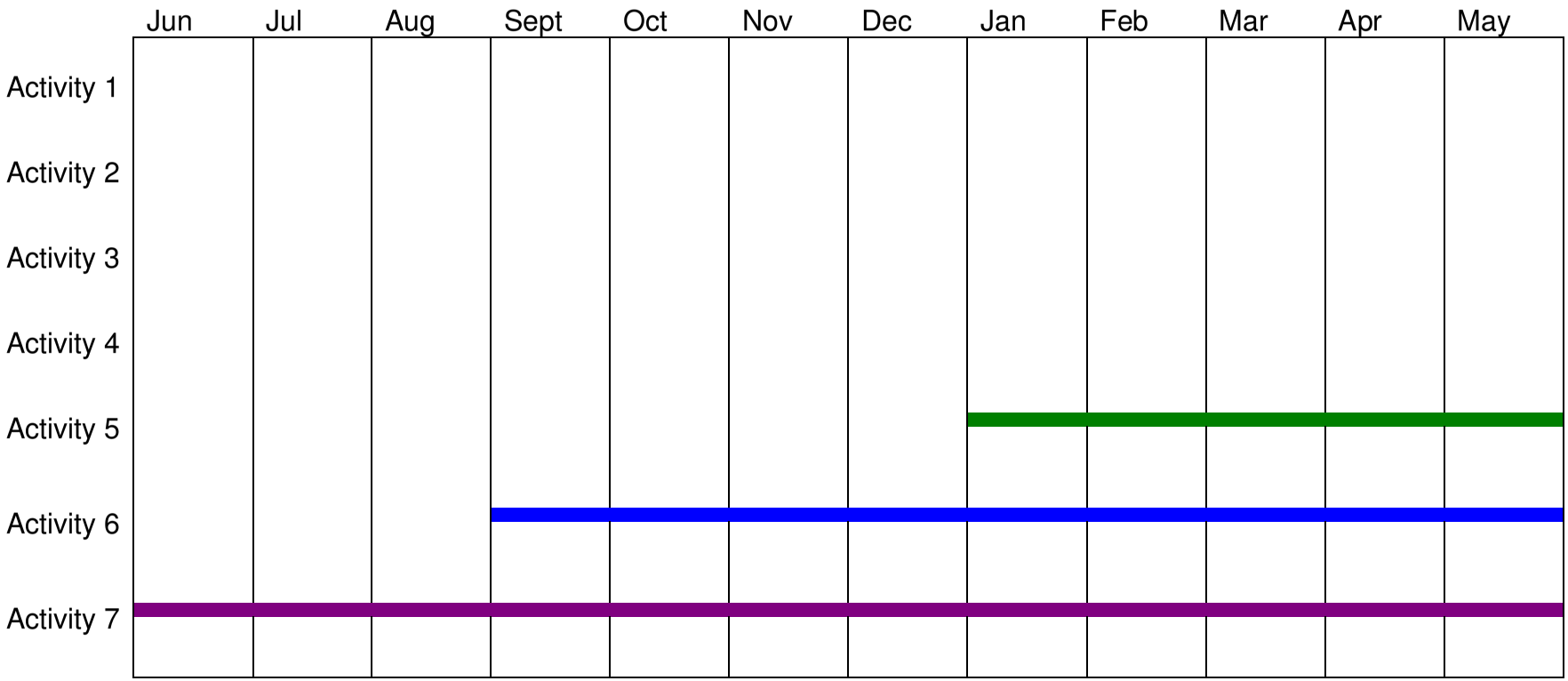
4. Impact. The immediate benefits of this project will be: a five acre section of forest along the Middle Oconee River that demonstrates that native species diversity can be restored in the most severely degraded floodplain habitats; an upgraded infrastructure for native plant propagation at SBG that will provide a platform for additional restoration activities; a service learning experience for 24 undergraduate students in plant conservation techniques in a botanical garden setting; and development of recommendations for selecting and propagating native species for floodplain restoration that will be welcomed by a large audience of landowners and land managers in the Southeast who are overwhelmed by the habitat devastation caused by Chinese privet.

Results from this project will be used to develop a restoration and management plan for the remaining 27 acres of floodplain at SBG that are privet-infested. The impact on SBG's audience will be tremendous. The trails traversing the floodplain are heavily used by garden visitors in spite of the degraded appearance of the landscape. It is no exaggeration to state that the path along the river currently passes through a green tunnel of privet (see photographs in the supporting documents). The aesthetic appeal of the restored forest will be striking and interpretive signage will inform visitors how and why the restoration was accomplished. During and following the project period we will use a variety of educational tools and media to communicate the results of the project to our visitors and a national audience of museum professionals, land managers, and environmental educators. Descriptions of the project, maps, and photographs will be posted to the garden's website (www.uga.edu/botgarden/) and included in SBG's quarterly newsletter. We will ask the webmasters of various invasive plant Internet sites to include links to this material. Results will be presented at professional meetings, and conferences open to the public such as the annual Cullowhee Native Plants Conference in North Carolina. As a land-grant university, UGA maintains a well-developed network of extension agents throughout the state of Georgia. We will enlist their assistance in communicating the results of the project and our recommendations. Dr. Hanula's letter in the supporting documents underlines the urgent need for this information. Privet infestations are so prevalent in the Piedmont that any success we can demonstrate has a high likelihood of being replicated elsewhere.

Schedule of Completion
Year 1: 2011-2012



Schedule of Completion
Year 2: 2012-2013



BUDGET FORM - PAGE FOUR

Section B: Summary Budget

	$ IMLS	$ Cost Share	$ TOTAL COSTS
1. Salaries and Wages	39,600.00	87,582.00	127,182.00
2. Fringe Benefits	16,632.00	16,088.28	32,720.28
3. Consultant Fees	0.00	0.00	0.00
4. Travel	0.00	0.00	0.00
5. Supplies and Materials	13,228.00	5,560.00	18,788.00
6. Services	39,875.00	1,400.00	41,275.00
7. Student Support	0.00	0.00	0.00
8. Other Costs	0.00	0.00	0.00
TOTAL DIRECT COSTS (1—8)	109,335.00	110,630.28	219,965.28
9. Indirect Costs	40,453.95	40,933.20	81,387.15
TOTAL COSTS (Direct and Indirect)	149,788.95	151,563.48	301,352.43

Project Funding for the Entire Grant Period

1. Grant Funds Requested from IMLS	149,788.95
2. Cost Sharing:	
a. Cash Contribution	6,000.00
b. In-Kind Contribution	145,563.48
c. Other Federal Agencies*	0.00
d. TOTAL COST SHARING	151,563.48
3. TOTAL PROJECT FUNDING (1+2d)	301,352.43
% of Total Costs Requested from IMLS	49.70%

* If funding has been requested from another federal agency, indicate the agency's name:

1. Statement of Need

Yale University's Peabody Museum (YPM) houses over 11 million spectacular specimens in anthropology, entomology, mineralogy, meteorites, historical scientific instruments, botany, paleobotany, vertebrate and invertebrate paleontology, and vertebrate and invertebrate zoology. These exceptional collections are the subject of research by members of Yale University and the international scientific community, and are drawn upon for University teaching. The collections also form the basis of YPM's public exhibits – the primary vehicles by which the Museum showcases its collections and its research activities about the earth, its history, and its cultures to a broad and diverse audience of over 150,000 visitors a year.

YPM takes its responsibility to care for and preserve its collections seriously and has expended considerable time and resources over the years to ensure that they are available for exhibit, education and research. A1988 IMS GOS grant provided for a general conservation survey of YPM's holdings. Using the results of this survey, YPM developed and implemented a comprehensive long-range conservation plan in 1990, establishing a two-pronged approach to address identified conservation issues: 1) implement environmental improvements in all areas where collections are housed and exhibited to arrest ongoing deterioration; and 2) undertake selected collections-based projects where specific collections are in urgent need of conservation or rehousing. Since 1990, YPM has made great strides in addressing identified problems in both categories.

Five projects in the latter category were undertaken with the help of IMLS CPS funding. These projects, involving mammals, fossil and recent invertebrate dry type specimens, microscope slides, malacology, and the Caribbean archaeology collections, rescued these collections from crisis conditions, enabling them to be rehoused with inert materials in museum-quality cabinets following accepted museum practice. A sixth project is presently in progress with IMLS CPS funding to conserve and rehouse YPM's collection of fossil fish.

YPM's overriding priority, however, has been to implement major environmental improvements in collection areas. Since 1990, many improvements have been achieved. IMS CPS funding enabled a survey of YPM's environmental systems to be undertaken. The resulting Garrison/Lull report recommended a phased program of environmental improvements to upgrade existing air handlers serving collection areas and exhibit galleries. IMS CPS funding implemented the first stage of this program, adding dehumidification equipment to the air handling system that serves seven large storerooms. Yale funding added humidification equipment to this system. In 2001 and 2005, humidifiers were installed in several anthropology storerooms to help control their environment.

In 2001, a new building was constructed adjoining the Museum to house the collections of 6 of YPM's divisions. This state-of-the-art facility, the Environmental Science Center (ESC), provides environmental controls to the exacting requirements of museum collections and quality collection housing in purpose-built Delta Designs metal cabinets and shelving units on compactor carriages. As collections were moved into the ESC, they were rehoused using containers and packing materials made of inert materials.

As building the ESC completed the 1990 long-range conservation plan, a new plan was developed in 2003, revised in 2008, that built on our previous achievements. With the majority of YPM's collections now residing in high quality storage, this new long-range conservation plan identified issues with the Vertebrate Paleontology (VP), Anthropology and Historical Scientific Instrument (HSI) collections as the Museum's most pressing conservation needs. The conservation and rehousing of the Anthropology and VP collections form a significant aspect of

the YPM capital campaign, now underway. This is a long-term project, however, as it is part of a larger University-wide effort. In the meantime, a recently acquired off-site campus in West Haven, CT (WC) has been renovated to provide vastly improved storage facilities for the entire HSI collection and portions of the Anthropology and VP collections, along with other collections. In light of the relocation of these collections in a climate controlled, secure storage facility, our long term conservation project is now to conserve and rehouse our collections to the highest conservation standard. Because the HSI collection has been boxed up and completely inaccessible for nearly 20 years, we have not been able to monitor its condition during this entire time. Since the boxes have been stored in less than ideal storage conditions, the collection has been vulnerable to deterioration. Concerns for the condition of this collection led YPM to designate the unpacking and proper rehousing of the HSI collection in museum-quality cabinets and shelving as its top conservation priority while waiting for the completion of the Capital Campaign.

YPM and the University have provided significant amounts of resources over the years to ensure that the collections are appropriately housed and cared for. Both have funded numerous projects to improve the exhibit and storage conditions of the collections. As well, both have demonstrated their commitment to the preservation of YPM's collections in the capital campaign currently underway.

The HSI collection, the focus of this proposal, consists of approximately 4000 instruments from a variety of scientific disciplines. Despite its significance, the collection has been inaccessible since 1991. At that time, due to the planned demolition of the building in which it was stored, it was necessary to pack up the collection, and a lack of storage space has forced it to remain packed over the years. It has been stored in numerous locations, all with drastically fluctuating levels of relative humidity and temperature. These conditions are potentially damaging to the metal and wood components of the instruments, but, due to its inaccessibility, it has not been possible to monitor the condition of the collection. This project will unpack, document and rehouse the collection to the highest conservation standard, bringing YPM one step closer to achieving its overarching goal of preserving and making all of its collections available for study and exhibit.

2. Project Design

The focus of this project is YPM's HSI collection that is comprised of approximately 3500 physics instruments, 100 engineering objects, 350 geology objects and a smaller number of objects from astronomy, biology, chemistry, mathematics, medicine and psychology. Several objects in the collection are unique, many are rare and others are excellent examples of their particular type of instrument.

Formed in 1960, this collection is the third largest and most important university collection of scientific instruments in North America. The instruments span six centuries and eight disciplines with the focus of the collection being a particularly fine example of 19th century physics and engineering apparatus. The oldest and most valuable object is a rare 16th century astrolabe made by Georg Hartman while the earliest Yale object is a 1734 Culpeper style microscope which was one of the first instruments purchased by Yale College. The collection also houses two of the world's only examples of double cylinder electrical machines which were made around 1740. Some other significant objects in the collection include a thermodynamic surface model for water made by the famous Cambridge physicist James Clerk Maxwell, the

vacuum chamber from Nobel Prize winner Ernest Lawrence's 27 inch cyclotron and a small saliometer used by famed Russian physiologist Ivan Pavlov.

In 1991, due to the demolition of the building in which the instruments were stored, it was necessary to pack up the HSI collection. Because the packing was not meant to be long-term, acid-free packing materials were not always used. To maximize the use of boxes, instruments were packed according to size rather than academic discipline. Smaller instruments were packed on top of and around larger ones. In addition, instruments were packed without regard to their components so wood, plastic, metal and glass are all packed together regardless of the fact that these materials all have different storage needs. Objects containing hazardous materials like mercury have been packed with non-hazardous instruments. These hazardous instruments are packed without proper leak catchments or suitable labeling which is a minimum standard requested by the University's Office of Environmental Health & Safety.

The boxes have been extensively stacked and restacked over the years, and have been moved at least three times, including the recent move of seven miles to West Campus. They have been stored in areas with uncontrolled climatic conditions and have been exposed to drastic fluctuations in temperature and relative humidity as well as minor leaks. This is of great concern because most of the instruments are comprised of brass and other metals that are vulnerable to corrosion and organic materials that are susceptible to dimensional changes as well as mold and mildew.

Uncontrolled environmental conditions have also depleted the strength of the cardboard boxes making stacking them precarious. Due to lack of proper storage furniture, at least half of the boxes remain stacked and many are now collapsing. Some objects have been damaged under the weight of stacking. A pilot project in July 2010 to unpack one pallet of objects uncovered an analytical balance which was damaged by the weight of a brass pendulum stacked on it. Other objects risk damage by not being in their proper orientation or being inadequately packed from the outset. (See Supporting Document 1)

Physical accessibility of the collection has been further compromised by the inaccuracy of the inventories undertaken at the time of packing. The current catalog contains numerous errors and many objects have no locations listed; at least 2% of the collection is classified as missing. Moreover, many accessories and parts were not cataloged and some were packed separately from their primary instrument. Among 45 objects unpacked in the pilot project, one was uncatalogued, two had parts missing and one listed object was missing from the box completely.

In 2009, the HSI collection was moved to WC and currently occupies 1200 square feet of newly renovated, secure, climate controlled storage and work space. The temperature is maintained at 68-72º F and the relative humidity at 45-55%. The space is secured with a 24 hour monitored state-of-the-art security system. For the first time ever the collection is housed in a secure, dedicated storeroom with climate control, however, the majority of the collection is still packed and stored, mostly double stacked, on pallet racking. Frequently used objects and recently accessioned material are stored in 10 Delta Designs DDLX cabinets. Oversized objects are stored on pallet racking. This project will reconfigure and furnish the storeroom with museum-quality storage furniture so that the collection finally can be unpacked and properly stored, making the entire collection readily available for monitoring, teaching and research.

The majority of the project will be undertaken by the collection manager, with the assistance of a museum assistant. Because this project is vital to the care and management of the collection, YPM sees it as part of the Division's normal operations. Therefore the Museum feels

it is appropriate for the collection manager to devote most of her time to this project as providing proper environmental conditions and care is at the core of YPM's mission. It is a normal part of all collections management and conservation activities to ensure that collections are clean, stable and given the best possible housing and environmental conditions that our resources allow. Instead of disrupting the on-going activities of the Division, this project will be an integral part of them. The project will be accomplished in the following phases:

Phase 1: Order Cabinets, Drawers and Shelves.

The collection manager will order 68 Delta Designs cabinets and 122 shelves along with 15 replacement drawers and 36 pull-out shelves for HSI's current 10 Delta DDLX cabinets. In preparation for the project, the collection manager worked with space designer Jeff Wetherston to determine a configuration of the storeroom to optimize the use of space while ensuring the collection is readily accessible. It was calculated that 68 Delta Designs cabinets, 122 shelves and 875 drawers are required to comfortably house the collection. The cabinets will be made of steel with powder-coated finishes, inert gaskets and water-tight tops. Half of the cabinets will be fitted with shelves to accommodate objects up to 15" tall and weighing up to 200 lbs while the other half will be fitted with 20" x 24" steel drawers to accommodate objects 1-10" tall. The shelves and drawers will have the same powder-coated finish as the cabinets and the drawers will be equipped with extension suspension to provide smooth movement. The cabinets will be arranged with one shelving unit securely fastened above each drawer unit. YPM will provide 875 drawers and 6 units of pallet racking with two to three racks on each as an indication of its commitment to the project. The pallet racking will house oversized objects and smaller instruments which are too heavy for cabinet storage.

Phase 2a: Evacuate the Storeroom.

Prior to the delivery and installation of the cabinets, the storeroom will be evacuated. The collection will be moved to a swing space that has been allocated down the hall from the present storeroom. This area has the same climate and security system as the storeroom. The movement of objects will be tracked with a bar code system that automatically enters the data into the collections database. Pallets will be moved using electric pallet jacks that provide a safe, smooth ride. This equipment and method of moving boxes and pallets was used successfully to move over six million museum objects from the main campus to WC since 2008. First, oversized objects and large boxes stored on pallets will be moved to the swing space. These items are already bar coded and ready to move. Then, depending on weight, boxes currently on pallet racking will be either hand or mechanically loaded onto pallets and moved. These boxes are already bar coded. Each pallet will contain between four and six boxes, stacked no higher than two high. Finally, objects in cabinets will be individually wrapped, bar coded and carefully packed into boxes. The boxes will be bar coded, loaded onto pallets and then moved to the swing space. It is estimated that it will take the collection manager and a museum assistant two weeks to evacuate the storeroom.

Phase 2b: Prepare Unpacking Area.

One area of the swing space will be equipped with two complete work stations including work tables, lights, magnifiers and two computers with attached barcode printers and scanners. The swing space will also be set up with a dedicated photography area with lights, table and backdrops. Both tasks will be done by the museum assistant in consultation with the collection manager.

Phase 3a: Prepare the Storeroom.

Once emptied, the storeroom will be cleaned and the existing ten Delta DDLX cabinets will be moved to their new location. The pallet racks will be disassembled and those to be reused will be repositioned. Cleaning will be undertaken by the facilities staff and the museum assistant will disassemble and reposition the pallet racks. It is estimated that it will take one week to prepare the storeroom.

Phase 3b: Delivery and Installation of cabinets.

Delivery of the cabinets is promised for 60 days after placement of the order. The cabinets will be installed by Delta Designs with assistance from museum staff. Once the cabinets are installed, the collection manager and the museum assistant will place barcodes on each shelf, drawer and cabinet so objects can be tracked immediately once placed in the storage room.

Phase 4a: Unpack the Instruments.

As objects were packed according to size, it will not be possible to unpack them systematically according to scientific discipline. We will begin unpacking and rehousing objects known to contain hazardous materials such as mercury so they are secure and out of the way. The handling and storage of these instruments will be done under the guidance of the University's Office of Environmental Health and Safety (OEHS). Working with OEHS staff, we will establish protocols for handling and storing these materials before unpacking starts and appropriate protective clothing, spill kits and containment equipment will be available and used as necessary. Cabinets containing hazardous materials will be furnished with secondary spill containers and labeled with their contents according to the recommendations of OEHS.

The collection will then be unpacked according to box size starting with the largest. This will allow the spacing between shelves to be standardized to facilitate the speed and efficiency of rehousing the instruments. No more than three pallets of objects will be unpacked at any one time. As the instruments are unpacked they will be tagged with a barcode and placed on one of several bar-coded carts that have been allocated to a scientific discipline. The shelves on these carts will be cushioned with Ethafoam. Any object in need of a custom mount or support will have it made at this time. Mounts will be constructed by the museum assistant using inert materials such as Ethafoam, acid-free cardboard and tissue, and cotton twill tape. It is estimated that less than 1% of the collection will require storage mounts. Unpacking will be done by the collection manager and the museum assistant.

As objects are unpacked they will undergo a catalog review which will ensure that the catalog record includes an accurate description, dimensions, maker's name and origin (if any) and any serial, model or institutional numbers. If the catalog record requires significant changes or additional research, the record will be tagged for later review by the collection manager and the object will be rehoused. The collection manager will undertake the catalog review as she is most familiar with the instruments.

Any emergency treatment will be undertaken by the senior conservator. Cleaning will mostly involve dusting with soft cloths. In some instances, soft brushes and a HEPA-filtered vacuum will be used to remove more persistent dirt. Any instruments that are broken will be repaired using appropriate adhesives, such as Acryloid B72, an acrylic copolymer, polyvinyl acetate and possibly an epoxy for glass. Active corrosion of metal elements, mainly brass and other copper alloys, will be treated by mechanically removing the corrosion products and stabilizing the metal with alcoholic benzotriazole. If necessary, the metal will then be lacquered with Acryloid B72. Based on the pilot project, the number of instruments requiring conservation attention will be minimal.

The YPM is conservative in its approach to the conservation treatment of its collections, being always aware of the future research potential of the collections. Every attempt will be made to preserve physical and chemical information that may be desired for future studies and only the most easily reversible and least invasive methods possible will be used. All treatments, other than simple rehousing, will be recorded in the Museum's database.

Finally, each object will be digitally photographed and paper material like manuals or labels removed from an object will be digitally captured with either a camera or scanner. All images will be uploaded to the database and stored on an external hard drive. The photography will be done by the museum assistant under the direction of the collection manager.

Phase 5: Rehousing.

After processing, objects will be transported to the storage room on foam-cushioned carts and placed in a cabinet. To facilitate access and use, the collection will be stored according to scientific discipline. (See Supporting Document 2). If required, objects will be placed on a sheet of Ethafoam or acid-free board to prevent their sharp feet from damaging the shelf or drawer. If necessary, Ethafoam will be placed in a drawer to immobilize objects when the drawer is opened or closed. Once an object is placed in a cabinet, its barcode will be scanned immediately to that particular shelf or drawer. All rehousing will be done by the collection manager and the museum assistant.

3. Project resources; time, personnel, budget

The time required to evacuate and prepare the storeroom is estimated to take a month. This estimate is based on YPM staff's extensive experience with the recent move of approximately one half of the museum's collections, including the HSI collection, to the West Campus facility and the installation time of similar cabinetry and pallet racking at West Campus. A July 2010 pilot project enabled the collection manager to estimate the amount of time required to unpack, process and rehouse the instruments. It is estimated that two to three pallets of objects (about 80 instruments) can be processed per week, with the entire collection rehoused within 18 months. We are confident that these estimates will allow us to comfortably finish the project in the time specified.

Shae Trewin, collection manager for the Division of Historical Scientific Instruments at YPM, majored in history and philosophy of science at The University of Melbourne, Australia and has a master's degree in cultural heritage and a sub specialty in museum studies from Deakin University, Australia. She has over 5 years of collection management experience at YPM and is an active member within the scientific instrument community. Ms Trewin has published several papers on instruments in the collection and has received two research grants from the Scientific Instrument Society. She will oversee the project and direct all collections management aspects of the project, including supervising staff. The majority of her time will be spent on the project. Because this project is so pivotal to the care and maintenance of the HSI collection, YPM feels it is appropriate for Ms Trewin to devote most of her time to this project.

Ms Trewin will be assisted by a full time museum assistant, Nathan Utrup, whose time will not be part of the cost share.

Catherine Sease, senior conservator at YPM, received a graduate degree in conservation from the Institute of Archaeology, University of London. She was a conservator at the Metropolitan Museum of Art in New York and for 15 years head of the Division of Conservation at the Field Museum before joining YPM in 2000. She has extensive experience in caring for a wide variety of collections, including designing and implementing collections rehousing projects

and performing many conservation assessment surveys for natural history, anthropology and history collections. She has taught courses in collections care and preservation for the Getty Conservation Institute, the Campbell Center and Yale University. Ms. Sease will oversee the project jointly with Ms. Trewin. She will also undertake any emergency conservation treatment of objects and consult with the collection manager and museum assistant on packing and storage mounts. Approximately 14% of her time will be devoted to this project.

All costs associated with the project will contribute directly to improving the storage conditions and increasing the accessibility of the Museum's HSI collection. The project budget was developed by the collection manager and senior conservator with input from YPM's business manager. The cost of the storage furniture includes its delivery and installation. The materials required for the packing of instruments will be donated by the Museum. The materials for making storage mounts will come from reserves that remain from moving collections to WC. As part of its commitment to the project, the Museum will provide 875 cabinet drawers and six units of pallet racking.

4. Impact

The research value of the collection in regard to the history of scientific instruments and the history of science in America is almost unsurpassed. Many of these objects are directly associated with North America's most predominant 18th and 19th century scientists, along with several 20th century Nobel Prize winners. Objects in the collection also represent many eminent 19th and 20th century instrument manufacturers in Europe and America. The collection also contains some of the first x-rays taken in North America, including 40 original glass x-ray plates taken at Yale in 1895 and seven of the earliest medical x-rays taken in the U.S. in 1896.

The major result of this project will be a significant improvement in the storage conditions of YPM's HSI collection, helping to ensure its long-term preservation. For the first time in 19 years, the instruments will be accessible, no longer packed in stacked boxes where their condition cannot be monitored. They will be housed in state-of-the-art storage conditions with appropriate climate control, security and quality cabinetry. The exact location of each instrument will be known and in the database. Each instrument will be properly stored with storage mounts and supports custom-made of inert materials, such as acid-free boxes, trays, tissue, and polyethylene foam, replacing existing inappropriate materials. More importantly, for the first time instruments containing hazardous materials will be properly housed where they can be properly monitored.

The project will promote the long term preservation of the collection while also greatly improving access to individual instruments for monitoring as well as study and teaching. For the first time, the collection will be organized according to scientific discipline and will be readily accessible to students, faculty and researchers. This will enable the museum to respond to a growing demand for better access to the instruments for teaching and research.

Finally, documentation of the collection will be greatly enhanced. The information about the instruments in the database will be up-to-date and a larger, more complete digital photographic inventory of the collection will exist. An on-line digital image database will be accessible for scholars and the public to view from any location with Internet access. All of these improvements together will ensure the long term preservation of the HSI collection while drastically increasing its accessibility so that it can be used for exhibits, loans and research.

Schedule of Completion

	Year 1 (July 2011 - June 2012)													Year 2 (July 2012 - December 2012)					
	July	Aug	Sept	Oct	Nov	Dec	Jan	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Phase 1																			
Order Cabinets, Drawers and Shelves																			
Phase 2																			
Evacuate Storeroom																			
Prepare Unpacking Area																			
Phase 3																			
Prepare Storeroom																			
Delivery & Installation of Cabinets																			
Phase 4																			
Unpack Instruments																			
Phase 5																			
Rehousing																			

BUDGET FORM - PAGE FOUR

Section B: Summary Budget

	$ IMLS	$ Cost Share	$ TOTAL COSTS
1. Salaries and Wages		86,156.00	86,156.00
2. Fringe Benefits		24,985.24	24,985.24
3. Consultant Fees		30,730.00	30,730.00
4. Travel		4,665.00	4,665.00
5. Supplies and Materials		19,212.00	19,212.00
6. Services		4,000.00	4,000.00
7. Student Support			0.00
8. Other Costs			0.00
TOTAL DIRECT COSTS (1—8)	0.00	169,748.24	169,748.24
9. Indirect Costs			0.00
TOTAL COSTS (Direct and Indirect)	0.00	169,748.24	169,748.24

Project Funding for the Entire Grant Period

1. Grant Funds Requested from IMLS	58,607.00
2. Cost Sharing:	
a. Cash Contribution	
b. In-Kind Contribution	111,141.24
c. Other Federal Agencies*	
d. TOTAL COST SHARING	111,141.24
3. TOTAL PROJECT FUNDING (1+2d)	169,748.24
% of Total Costs Requested from IMLS	34.00%

* If funding has been requested from another federal agency, indicate the agency's name: