NATIONAL ENDOWMENT FOR THE
Humanities

DIVISION OF **PRESERVATION AND ACCESS**

Narrative Section of a Successful Application

The attached document contains the grant narrative and selected portions of a previously funded grant application. It is not intended to serve as a model, but to give you a sense of how a successful application may be crafted. Every successful application is different, and each applicant is urged to prepare a proposal that reflects its unique project and aspirations. Prospective applicants should consult the Preservation and Access Programs application guidelines at http://www.neh.gov/grants/guidelines/pet.html for instructions. Applicants are also strongly encouraged to consult with the NEH Division of Preservation and Access Programs staff well before a grant deadline.

Note: The attachment only contains the grant narrative and selected portions, not the entire funded application. In addition, certain portions may have been redacted to protect the privacy interests of an individual and/or to protect confidential commercial and financial information and/or to protect copyrighted materials.

Project Title: Sustainable Preservation Practices for Managing Storage Environments

Institution: Rochester Institute of Technology

Project Director: James M. Reilly

Grant Program: Preservation and Access Education and Training

PROJECT NARRATIVE

1. SIGNIFICANCE AND IMPACT

1.1 Overview

One of the most important areas where sustainable practices intersect with preservation of cultural heritage is in the management of collection storage and display conditions. Through a series of regional workshops and webinars, the Image Permanence Institute (IPI) will convey the latest knowledge and techniques for managing the preservation environment in sustainable ways. Directed at a national audience of collection care, preservation, and facility management staff from cultural institutions, this project will provide instruction and guidance derived from the latest research and field practice in leading US and European museums and libraries. The workshops and webinars will enable the participants to assess the preservation quality of environmental conditions, understand the impacts of local climate, and match the environment to the specific needs of collection objects. Through this training project, participants will be able to understand the basics of HVAC operations, locate the largest opportunities for more efficient system operation, and design a protocol to manage voluntary or mandated changes in temperature settings or shutdowns during unoccupied hours.

Providing a tightly controlled climate for collection storage can be costly and energy-intensive. For budgetary reasons and because of concern for climate change, collecting institutions are searching for ways to responsibly lower energy consumption. The staff responsible for the long-term care of collections needs to be prepared to make informed decisions based on current research, reliable data, and a factual understanding on the relationship between environment and material decay. They need specific guidelines and methods that allow them to understand and avoid potential risks to collections while taking advantage of opportunities for cost reductions and sustainability gains. New approaches to monitoring and managing preservation environments have resulted from research over the last few decades and these new approaches can be used to enhance sustainability.

The essential goal for sustainable preservation environmental management is to regulate the storage environment to achieve an optimal balance of preservation quality, energy cost, and consumption of fossil fuels. A major barrier to optimizing storage climates is the lack of understanding on the part of facilities, as well as preservation staffs, of what variations in climate are tolerable and which are detrimental to collections. A second major barrier is the lack of understanding on the part of preservation staff of the capabilities and limitations of the climate control (HVAC) systems operated by the facilities staff. For these two parties to negotiate the best possible sustainable climate in their institutions they must achieve a shared understanding of these key topics. The standard model for managing the environment—characterized as 'flat lining'—is inherently unsustainable. The more holistic approaches to be presented in this project are sustainable in that they allow for an adjustable allocation of resources and a method for determining the minimum necessary harm to both collections and the global environment.

1.2 Project Goals

- Educate collections and facilities staff simultaneously so that together they receive the training they need to define and achieve their own optimal and sustainable storage climates.
- Provide a greater understanding of mechanical system functions, and identify areas where responsible energy saving strategies are possible.
- Suggest guidelines and methods which will enable participants to design a protocol for managing voluntary or mandated changes in temperature and relative humidity settings that affect collection storage and display environments.
- Reach the widest number of interested individuals at a minimal cost by offering presentations in five different locations around the country, charging no fee to participate, taking advantage of the ease of access available through the web, and providing useful and informative documentation both in print and on-line.
- Provide participants with the latest research and field study regarding the role of environment on material decay and long-term preservation.
- Present the latest tools and practices available for analyzing environmental data and quantifying preservation quality and collection deterioration risks.

1.3 Assessment of Need

Collecting institutions face very difficult choices as they respond to apparently conflicting mandates to lower operating costs, achieve sustainability goals, and preserve collections. The need for this project arises from the lack of established guidelines and management methods to reconcile the competing demands of responsible collections stewardship with the desire for sustainability through a reduction in both energy use and costs.

One of the most expensive elements in collection institution budgets is the cost of energy to operate heating, ventilation, and air conditioning systems. Although oil prices continue to fluctuate, the cost of natural gas and electricity (the forms of energy most often used by cultural institutions to heat, cool, and dehumidify) remains a formidable drain on institutional budgets. Institutions large and small are feeling the financial strain. Museums, libraries and archives contain the information and objects that form the essential basis for humanities scholarship and the preservation of our humanistic culture. If collections deteriorate due to improper environmental conditions it would be a significant loss to the humanities and to society in general.

Areas dedicated to collection storage typically receive conditioned air twenty-four hours a day, seven days a week, and are maintained at more stringent temperature and humidity conditions than other spaces. As a result, these spaces consume more energy than other areas. Performance measurements by the energy consulting firm Herzog/Wheeler & Associates (IPI's partner in this project) indicate that a 10,000 square foot collection storage area costs between $20,000 and $50,000 per year to condition. As a result, cultural institution facility managers and administrators are asking collection care staff to consider energy-saving alterations to the operation of storage area HVAC systems.

Energy-saving strategies under consideration may include raising chilled water temperatures or lowering chilled water pressures. They may include reducing the quantity of outside air or the quantity of the total conditioned air during periods when the spaces are unoccupied. Another strategy may suggest reductions in the amount of sub-cooling and reheating during periods when the outside air dew point temperature is low. It may also be suggested that temperature and RH set points be altered during certain seasons of the year. Most energy-saving alterations to HVAC systems, their control, or their method of operation will result in some change in the space temperature and/or RH. Some of these changes can be seriously detrimental to collections and should be avoided, while others will be inconsequential and justified by the resulting energy savings.

Determining if these or any other energy-saving strategies are viable requires thoughtful consideration of the architectural characteristics of the storage area and the mechanical characteristics of the HVAC system that serves the storage space. While some facilities present no viable savings opportunities, experience has demonstrated that many could reduce their energy consumption by 10% to 30% through alterations in the operating schedules of existing HVAC systems, and do so without posing significant risk to collection preservation. In those cases, institutions could potentially realize significant dollar savings annually, depending on climate, system configuration, local energy costs, and building design.

Beyond the strain on budgets from energy costs, concern has grown over the fact that burning fossil fuels to power HVAC systems adds significantly to the production of atmospheric carbon dioxide. Actions taken toward climate neutrality involve aggressively reducing greenhouse gas emissions with the long-term goal of net zero emissions. Many institutions are committed to integrating sustainable practices into all major operations. In cultural institutions these goals need to be balanced with responsibility for long-term care and preservation of collections. Maintaining a proper storage environment is widely recognized as the single most important element of collections preservation. Collection care staff needs to manage the intersection of sustainable energy management and long-term collection preservation.

The problem for collecting institutions is that neither the facilities staff nor the preservation staff feels they have the expertise or tools to properly evaluate the impact on preservation of energy reduction strategies such as night and weekend setbacks, AHU shutdowns, or significant changes in temperature and relative humidity settings. Preservation managers fear that arbitrary changes in storage environment settings will undo years of hard-won gains, and they are very anxious to avoid the perception that controlled conditions are frivolous and unnecessary. For their part, facilities managers are convinced that opportunities for substantial operational savings exist. They know that the systems serving fully conditioned

> *For more than 50 years conservators around the world have sought to prevent damage to the varied objects in their collections by observing a uniform climate-control mantra: Keep everything in the museum at approximately 70 degrees Fahrenheit and 55 percent relative humidity. Since the 1970s that goal has increasingly been achieved with the help of mechanical HVAC systems, which typically cope with unforeseen events by working overtime. But as museum budgets shrink, energy costs spiral, and gradual climate changes make the traditional HVAC system more costly to maintain, conservators and other museum experts are rethinking this model.*
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> *Carol Kino, "Keeping Art, and Climate, Under Control," http://www.nytimes.com/2009/04/05/*

spaces are the most costly and therefore offer the fastest route to dollar savings and major progress toward sustainability goals. The lack of specific guidelines and methods to avoid risks to collections while taking advantage of opportunities for cost reductions and sustainability gains defines the need for this project.

1.4 A New Approach

A great deal has been learned in recent years about managing the storage environment in collecting institutions. The accepted norm—that temperatures should be steady and unwavering at human comfort levels, and that short-term fluctuations in relative humidity matter more than long-term trends—is now regarded by preservation scientists as outmoded and counter-productive. Environments are complicated. The simple notion of setting targets for an 'ideal' environment and watching for daily or weekly excursions is the wrong approach. Even the greenest of buildings can't make flat lining at 70°F and 50% RH sustainable. As the current economic situation and related budgetary problems force cost reductions, institutional staffs need a new management approach in order to navigate between fiscal realities and effective preservation strategies.

A close reading of the literature of conservation will reveal that the creators of the unwavering 70° F/50% RH recommendations regarded their suggestions as provisional pending closer study. The evolution away from such simple ideas and toward a more modern view began with research over the last twenty-five years. Modern thinking holds that all environments are compromises among various agencies of decay. Thanks to research, we know more about the specifics of these agencies. The Smithsonian's Museum Conservation Institute has done much to clarify how moisture content affects the mechanical properties of cultural heritage objects. Their work shows that extremes of dryness and dampness pose the greatest risk of physical damage. And that statement contains one of the most significant differences between old thinking and new thinking. We're now concerned much more with what poses the greatest threat (that is, in identifying the circumstances we need to avoid) than we are with articulating an ideal.

> *An examination of the history and development of recommendations for the climate in museums reveals that there was minimal scientific support for the values and ranges that were selected. The small basis of research that existed was often extended to materials or objects to which it did not apply; decisions that were merely best guesses based on minimal evidence became set in stone; and the rationale for many decisions seems to have been forgotten or twisted around. ... It is only relatively recently that research has provided a general scientific basis for determining appropriate values for the museum climate, especially the range in which temperature and relative humidity can be safely allowed to vary. Because the results of this research differed from what had become climatic dogma, it was criticized by some in the field. However, the results have stood up, with no substantive challenge to the data or conclusions, and are increasingly widely accepted.*
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> *David Erhardt, Charles s. Tumosa and Marion F. Mecklenburg, "Applying Science to the Question of Museum Climate," Proceedings from Museum Microclimates, T. Padfield & K. Borchersen (eds.) National Museum of Denmark, 2007 ISBN 978-87-7602-080-4*

Through years of massive accelerated aging projects, including research at the Library of Congress and IPI, preservation science laboratories have explored and clarified how materials such as plastics, dyes, paper, leather, and textiles are at risk due to spontaneous chemical change—decay that we might generalize and call 'natural aging.' This kind of deterioration is

long-term and depends on the integral over time of temperature (thermal energy) and RH (moisture content of the objects). It is really a form of applied kinetics (the study of reaction rates) similar to the way the worldwide pharmaceutical industry ensures that drugs retain their efficacy through changing environmental circumstances during storage and distribution.

Much of IPI's research on environmental management, such as accelerated aging, moisture and temperature equilibration, and the impact of cycling temperature and relative humidity conditions, has been funded by NEH. The development of IPI's *Preservation Metrics*, indispensible algorithms that analyze and model environments, evaluating the impact of the observed conditions on collections for each specific modality of deterioration, was also made possible by NEH support. Preservation metrics allow a radically different approach to managing the environment for preservation (see Appendix 1- IPI's Preservation Metrics). Crucial to their value in practice is that they are standardized and quantitative, so in fact the relative quality of environments can be analyzed. The metrics have proven their value in practice in such diverse institutions as the Library of Congress, the Museum of Fine Arts, Boston, and the National Museum of Denmark. Understanding how preservation metrics work will help participants assess and compare the preservation quality of their storage and display environments and match the environment to the specific needs of materials in their collection.

> *Museums urgent need to reduce their carbon footprint would need to be balanced against their strong duty to preserve their collections. But in fact such tightly controlled ambient conditions are rarely required to preserve collections. Different objects have different requirements and it would be rational for other museums to follow the good example of the British Museum, which requires conditions appropriate for the loan in question rather than imposing blanket requirements.*
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> *Mark Jones, Director, Victoria & Albert Museum, UK, Museums and Climate Change, November 2008*

1.5 Preservation Metrics

Monitoring temperature and relative humidity in storage areas is not sufficient to fully understand if the storage climate is as benign as possible, or if the climate is causing avoidable damage to specific collections. Preservation metrics transform temperature and humidity data into numerical estimates of collection decay risk and allow cultural institutions to assess the preservation quality of the storage environment. Each metric integrates spans of time into a single value representing how the environment is likely to affect one particular form of deterioration, taking into account all the ups and downs of temperature and relative humidity over time. Each metric measures a specific form of collection decay, including spontaneous chemical change in organic materials (natural aging), the risk of mold growth, metal corrosion, as well as mechanical decay based on excessive dryness, excessive dampness, and wide or frequent fluctuations in moisture that result in dimensional change.

Unlike targets and set points, preservation metrics can quantify both the risks and benefits posed by any set of conditions over any period of time. The ability to integrate all the data you normally see on a chart or graph into a single numerical estimate of decay rate is a significant advance for the field of preventive conservation. Using metrics, collection care staff can easily assess the risk of collection deterioration and make appropriate changes to improve the

preservation quality of the storage environment. Because the preservation metrics are standardized, consistent evaluations, they also serve as a good comparison tool to chart progress or monitor changes to environments over time. In the context of system adjustments made in the name of sustainability, preservation metrics provide an invaluable record of the environmental quality "before and after" the changes.

1.6 Optimizing Collection Life and Energy Costs

IPI has taken its experience with material decay mechanisms and environmental assessment into the field, working in partnership with the energy management consulting firm Herzog/Wheeler & Associates to explore and develop the all-important cross-disciplinary practice between building engineers, facilities managers, collection staff, and preservation specialists. In 1997 the Mellon Foundation funded a project entitled *Optimizing Collection Life and Energy Costs in Cultural Institutions*. IPI and energy management consultants at Herzog/Wheeler & Associates partnered with the Library of Congress and the New York Public Library to measure and evaluate HVAC systems, make improvements in storage conditions, and lower operating costs. Related work, funded by Mellon, the Library of Congress, and NEH, continued over several years at each institution. James M. Reilly, IPI Director, and Peter Herzog have also been contracted to review proposed climate conditions and general design for storage facilities at the Library of Congress, the National Archives, Loyola Marymount University Library, and the California Historical Society.

IPI has found that effective environmental management requires a process by which the preservation staff can know what their environments are, as well as how good or bad the environments are for the collections (that's where the metrics come in). However, the process doesn't stop there. To make a difference, the process has to build a mutual awareness among the creators and consumers of environmental conditions: why they are the way they are, what range of opportunities exists to modify them, and what the energy implications are of various possible courses of action.

IPI has called this process 'optimization'—meaning that human comfort, energy and fossil fuel consumption, and preservation quality are all measured, brokered and discussed, and ultimately, an optimal combination of all is slowly achieved. This vision can work, but it cannot be fully realized unless the participants in the process have a clear and accurate understanding of the building envelope and basic functions of their mechanical system, the realities of their storage environments, and the role of their local climate. No one is a master of every aspect, but collection managers and preservation specialists should be able to articulate their concerns about collection longevity and the role that the environment plays. Learning how temperature, RH and dew point interact, how mechanical systems work, and deciding which mechanisms of decay are of prime importance to their collections are the minimum necessary requirements.

1.7 Managing the Preservation Environment – Curriculum Content and Philosophy

Environmental assessment provides the vital feedback loop for evaluating the effects of energy saving practices. In this project we will teach the participants how to monitor and evaluate their collection storage conditions and also convey a general philosophy for environmental

management on behalf of the collections. This philosophy might be expressed as follows: The most important environmental factors are the local climate and seasonal variations. Most places have a summer and a winter. As the temperature varies throughout the year so does the amount of moisture in the air, which is represented by the dew point. Collection care staff (and even many HVAC operating staff) often don't pay attention to dew point or understand its central role in environmental management. Rising summer temperatures mean that the air holds more moisture. In summer, the air is warm and has a high dew point (moisture content). A control scheme that only concerns itself with creating steady indoor temperature at about 70°F will ignore the fact that for months on end the indoor RH will be dangerously high, risking mold, metal corrosion, mechanical damage and a high rate of natural aging. In winter the opposite happens. The outdoor air is cold and therefore has very little moisture content. Heating that air to 70°F when it contains so little moisture (has a very low dew point) will cause a dangerously low indoor RH, leading to mechanical damage for many objects, for example the familiar 'North American' crack pattern for paintings that Marion Mecklenburg et. al. so elegantly described and modeled.

Moreover, a steady 70°F is too warm to prevent a rapid rate of natural aging in many organic materials. Institutions that feel that 70°F and 50 % RH is ideal have not considered the needs of the paper, leather, textiles, varnishes, plastics, or dyes in their collections. Individuals working in collection spaces may be happy with 70°F, but the lifespan of collections in the space is compromised. In deciding whether conditions are harmful to collections or not, it's the extremes of RH that are most threatening, especially if they are prolonged for the several weeks or few months that most collection objects require to fully feel the effect. The spikes in humidity that really matter are the big seasonal hump and trough of summer humidity and winter dryness.

Short-term humidity events that many people agonize over are usually meaningless because most objects are slow to equilibrate and do not 'feel' the effects of short-term variations in RH. The more extreme the seasonal averages, the greater the risk to collections. If you have organic materials whose life expectancy at room conditions is fairly short (for example, acidic wood-pulp paper) then you will be mainly concerned with the natural aging rate. That's an easy one to give advice on: keep the temperatures as low as you can without causing the RH to be more than about 55% or 60%. That becomes hard in summer when dew points are high, so the critical parameter in creating a good natural aging rate is to effectively dehumidify in summer. Combine the humidity hump issue with natural aging issue and you have a simple formulation: Provide the lowest temperature you can while maintaining RH between about 20% and 60%. Moving around within those general ranges is permissible for most collections and in fact, forms the major opportunity to reduce energy consumption without compromising the preservation quality of the environment.

1.8 Sustainability and Energy Saving Curriculum Content and Philosophy

It has been our experience that collection care staff and facilities staff know precious little about the fundamentals of each other's tasks. We feel that a joint learning experience for both is the best way to build a shared sense of direction and purpose, but each can benefit on their own from an increased understanding of the other's professional concerns. Both share many misconceptions about each other's professional practice and both share a need to manage risk

and communicate effectively with each other and with institutional leadership. Along with a general operating philosophy for regulating conditions on behalf of collections, this project will convey an approach to energy saving that emphasizes operating adjustments using existing systems. It can be summed up as a process in which one identifies the major energy-consuming devices and operations, decides what those devices and operations really need to accomplish, progressively implements changes in operating procedures to reduce energy use, measures the outcomes and collection risks, and continues to expand those efforts until the institution's goals for environmental quality and simultaneous cost savings are achieved.

Each building and each system and each institution have unique circumstances. The complexity of the systems and other challenges such as human dynamics, lack of technical expertise, and limited staff time can be daunting. We cannot be prescriptive in the instruction offered in this project, but we can offer a general framework and a range of options to pursue. It is possible to simplify and explain the most common energy saving measures (all of which basically involve doing less—less outside air, less fan energy, less chilled water, less heating and cooling) and their pitfalls and potential benefits. Some of the ways that this instruction will help is by dispelling some common misunderstandings about what collections need. For example, collections don't need to 'breathe' (have the high ventilation rates commonly provided for human occupancy spaces). Fan energy to move air around and heating and cooling simply to condition high volumes of outside air are very significant energy-wasting practices that add nothing to preservation of collections. We can recommend that participants look at the largest volume air handlers (with the biggest fans, cooling coils, etc.) first because they represent the opportunities for reducing energy consumption.

The curriculum for explaining the basics of HVAC systems, the methods to identify energy reduction opportunities, and the methods for progressive implementation of energy saving measures will be presented by Peter Herzog in ways that both collections care and facilities staff can understand together. Some of it will necessarily be technical in nature. The curriculum will include as far as possible the rudiments of temperature, RH, and dew point so that energy saving opportunities like unnecessary sub-cooling and reheating can be comprehended. Sub-cooling and reheating is the way that many systems deal with dehumidifying in summer, except that for many days in spring and fall it isn't really necessary, but is done anyway. In one large building that we have had experience with (and which will be discussed in a case study), modifying the sub-cooling and reheating control procedures presented an opportunity to save more than $500,000 each year.

2. INSTITUTIONAL PROFILE—IMAGE PERMANENCE INSTITUTE

2.1 Overview

IPI will develop, present, and document the education and training in sustainable practices for managing storage environments project. IPI (see Appendix 2 - IPI Organizational Profile) and its Director, James M. Reilly, have a worldwide reputation for preservation research with special concentration on assessment and management of storage environments. IPI has developed software, hardware, and environmental quality analysis methods currently used by several hundred archives, libraries, and museums. In addition to IPI staff, a key member of the project

team is sub-contractor Peter Herzog, author of *Energy-Efficient Operation of Commercial Buildings* (published by McGraw-Hill, 1997) and principal of Herzog/Wheeler & Associates (see Appendix 3 - Herzog/Wheeler Organizational Profile), a Minnesota-based energy management consulting firm. As noted previously in this document, IPI and Herzog/Wheeler have collaborated for more than a decade on environmental research and consultation. The project team understands the specialized storage environments found in archives, libraries, and museums; they are well versed in HVAC systems and their functions, and they know how to optimize mechanical system performance without compromising preservation quality.

2.2 IPI Preservation Research Background

IPI began with a mission of research focused on the preservation of imaging media, primarily photography, cinema, and microfilm. The first project, funded by NEH, studied the deterioration and preservation of 19th century photographic prints. Later projects examined the environmental causes of nitrate and acetate film deterioration, the fading of microfilm and color photography, and sulfiding protection for silver images, selenium for microfilm, and the preservation of safety film. IPI developed accelerated-aging test methods for determining the suitability of materials intended for use as photograph storage enclosures.

Practical tools which have had a significant impact on the field of preservation developed during this period. These include the Photographic Activity Test (PAT) in 1985 and film-based deterioration monitors (Acid Detection or A-D Strips®) in 1995—both funded by NEH.

Over the course of IPI's preservation research it became clear that heat and moisture are the primary rate-controlling factors in almost every modality of decay. Control of these factors in the storage environment is of fundamental importance in preservation and is more broadly effective than other, more limited, preservation actions. In the mid-1990s, IPI began work on computer modeling and the development of quantitative metrics to measure the effects of storage conditions on the rate of decay. This led to development of the first preservation metric, a general quantitative model of organic decay called the time-weighted preservation index (TWPI), published in *New Tools for Preservation: Assessing Long-Term Environmental Effects on Library and Archives Collections.* Based on this concept, IPI developed the Preservation Environment Monitor® (PEM) data logger specifically for use in cultural institutions and Climate Notebook® software, a utility for retrieving data from the PEM.

The next step was to apply the tools in real-life situations. NEH, IMLS, and the Mellon Foundation funded several projects including the previously mentioned optimization work with the Library of Congress, and the New York Public Library; a major field trial of the PEM data logger and Climate Notebook software which led to improvements in the technology and a greater understanding of how environmental assessment works in cultural institutions; a second field trial which introduced additional preservation metrics for biological decay, mechanical deterioration, and corrosion; additional training for collection managers and service providers, and development and testing of IPI's Environmental Analysis Service.

IPI's NEH-funded tools and practices for managing the environment for preservation have been the focus of major contracts with the National Museum of Denmark, the Library of Congress, the

New York Public Library, and the National Archives. Hundreds of other institutions in the US and abroad have purchased the tools for use on their own. Recent activities include the IMLS-funded development of *MyClimateData.com*, an on-line collection risk and data management program for institutions that need to track large of amounts of data and associated collection, mechanical system, and other information. More recently, IPI designed and created an updated PEM2 datalogger and associated *PEMdata*.com website for data storage and analysis. A very popular program for environmental management, the *Dew Point Calculator* has been updated to include preservation metrics and is now available online at www.dpcalc.org.

There is a much evidence of the effectiveness and relevance of IPI's contributions to the field of preservation. IPI is one of the few available sources of preservation research and development. Hundreds of institutions around the world including research libraries, specialized libraries, archives, museums, and historical collections use IPI's technology and preservation management tools and hundreds more rely on IPI for accurate and reliable advice, information, and services.

James Reilly and Peter Herzog have been asked to speak and consult on matters related to the preservation environment and sustainability often in recent years. They were contacted directly by Yale University and New York University for advice on their sustainability efforts within the past year. In 2007, James Reilly has given talks at *From Gray Areas to Green Areas – Developing Sustainable Practices in Preservation Environments* in Austin and the *Museum Microclimates Conference* in Copenhagen. In 2008, he gave presentations at the *Climate Change and Museum Collections Conference* organized by the International Institute for Conservation of Historic and Artistic works in London and on *Storage Strategies for Cultural Collections* at the Conservation Center for Art and Historic Artifacts Conference in Philadelphia. James Reilly and Peter Herzog have also given several presentations on the preservation environment and energy management through the Balboa Art Conservation Center and the California Preservation Program.

3. WORK PLAN AND CURRICULUM

3.1 Overview

Through a series of varied presentations, this project will give both a theoretical framework and practical guidelines for managing any potential risk to collections that could arise from the implementation of sustainable energy management practices. We will present the latest research in the preservation field on the environment's impact on collection materials. We will provide an introduction to basic mechanical system functions and an overview of where to find the largest opportunities to reduce energy. We will discuss case studies and present options for reducing energy and show participants how to experiment with incremental changes and evaluate the results. Participants will come away with useful tools, a foundation of relevant knowledge, and the ability to initiate a successful collaboration between collections care and facilities management staff to work together to achieve their goals. Participants will be introduced to IPI's tools and methodologies but are not required to purchase them or use them to participate.

Education and training in sustainable preservation practices for managing storage environments will be achieved through workshops, webinars, print documents, on-line information, personal

guidance and technical support. Workshops will spend one day on basic background information which will be covered in more detail in the workbook provided to participants. Day two of the workshop will focus on the application of the information presented on day one, including suggestions for implementation of sustainable practices. The webinars will provide more detailed information about the practical application of sustainable preservation practices.

3.2 Project Work Plan

The basic project work plan can be broken into three phases as shown below.

Phase I: Planning ~ Six Months (January 2010 – June 2010)

- Finalize five regional workshop venues; coordinate various activities and accommodations related to each workshop.
- Promotion and outreach to potential audience for both workshops and webinars.
- Production of course materials and handouts for regional workshops.
- Development of *Sustainable Preservation Practices* workbook for participants.
- Development of presentations for a series of nine webinars.
- Consultation with Peter Herzog, Herzog/Wheeler & Associates regarding presentation schedule and content development.

Phase II: Presentations ~ Twelve Months (July 2010 – June 2011)

- Presentation of five regional workshops.
- Presentation of nine webinars.
- Creation of a project website and blog to facilitate communication.
- Ongoing technical support and advice.
- Continued development of course materials and updates to workbook as required.
- Creation of a simple survey instrument for workshop participants.

Phase III: Documentation ~ Six Months (July 2011 – December 2011)

- Creation of an online archive of course materials and webinar presentations on the project's website.
- Finalize updates to the *Sustainable Preservation Practices for Managing the Storage Environment* workbook. The workbook will be made available free online and in print form until all grant-funded printed copies are gone. After that, if additional printed copies are produced they will be sold on a cost-recovery basis.
- Creation of a detailed project survey for all participants.
- Ongoing communication through the project website and blog.
- Ongoing technical support and advice.
- Additional dissemination of project results at professional conferences and in professional publications.

3.3 Regional Workshops

James Reilly and Kristin Smith of IPI, along with energy management consultant Peter Herzog of Herzog/Wheeler and Associates, will present five two-day regional workshops. Venues will be provided at minimal cost, and no fees will be charged to attend. Participants will pay their own travel costs. The grant will fund presenters' travel costs and work time, as well as associated charges for limited refreshments and workshop handouts for participants.

We had hoped to find venues that would be available at no cost. However, all institutions we talked to had some financial obligation – ranging from rental costs and staff time reimbursements to insurance charges and parking fees. We therefore included $3,000 at each venue for local arrangements, plus $3,000 per venue for refreshments. Workshop handouts are estimated at $350 per venue for folders, agenda, contact information, etc.

We have estimated the average attendance at each workshop at 75. Often presentations that IPI and Herzog/Wheeler have presented on this topic draw 100 people or more. However, cultural institutions have had to cut money for travel and staff improvement, so there is a possibility that the audience will be limited by this restriction – especially since participants must pay their own travel and overnight expenses. We hope that the relevance of sustainability and the opportunity to acquire information that could potentially save the institution money will make up for these resource limitations. We will reach out to collection care, preservation, facility management and administrative staff and ideally will have an audience that includes representatives from each area.

We plan to present the five workshops during Phase II starting at the beginning of Phase II. We will allow a few months time for participants to work within their institutions before beginning the webinar series. All the presentation activities will take place between July 2010 and June 2011. The first day of each regional workshop will focus on what participants need to know, presented in three subject areas—mechanical system information, preservation management information, and the latest research related to sustainable practice in cultural institutions. As noted above, the workbook provided will contain additional information related to each topic covered in the workshop. The second day will concentrate on what participants need to do, also organized around mechanical system information, preservation management information, and take home suggestions for implementing sustainable preservation practices (Appendix 4 - Workshop Curriculum).

Professional colleagues and Directors of Regional Preservation Organizations have agreed to work with us to provide venues for each workshop and to publicize them to their constituents (see Appendix 5 - Letters of Commitment). We made an effort to provide venues throughout the country, in locations that were relatively easy to get to (direct flights ideally) and could provide accommodations at relatively modest cost. The five venues include:

Northeast	Yale University Library, New Haven, CT, *Roberta Pillette, Head, Preservation Department*
Southeast	Georgia Archives & Capital Museum, Morrow, GA *Christine Wiseman, Preservation Services Manager*

Midwest	Minnesota Historical Society, St. Paul, MN *Sherelyn Ogden, Head of Conservation*
South Central	Kilgarlin Center for Preservation of the Cultural Record University of Texas at Austin *Ellen Cunningham-Kruppa, Director*
West	University Library, University of California, Los Angeles, CA *Jake Nadal, Preservation Officer*

The following organizations have agreed to collaborate with IPI on reaching the widest possible audience and to promote the venues in their area to their mailing lists:

Conservation Center for Art & Historic Artifacts, Philadelphia, PA
Regional Alliance for Preservation (national)
Northeast Document Conservation Center, Andover, MA
Midwest Art Conservation Center, Minneapolis, MN
Balboa Art Conservation Center, San Diego, CA

Each workshop will present information that will allow participants to:

- Understand the basics of HVAC operations
- Assess the preservation quality of environmental conditions using preservation metrics
- Understand the impact of local climate
- Evaluate the environmental needs and specific vulnerabilities of various materials in their collections
- Match the environment to the specific needs of collections
- Locate the largest opportunities for energy savings without risk to collections
- Design a protocol to manage changes in set points or operation schedules
- Work effectively with institutional partners in collection care and facilities management

"But there are good alternatives to high specification environmental control. BS5454 states that ventilation is needed for the preservation of archives [to avoid mould]. In fact there are other ways of avoiding mould and ventilation introduces the need to dry or moisten, cool or heat incoming air so that changes in the external environment [weather] do not alter the environment indoors. If air change is kept to a minimum, as it was and is in traditional stores, relative humidity and temperature remain naturally stable. ... Reducing solar gain, using low energy light sources, insulating buildings, bringing in cool air in the early morning but not hot air in the middle of the day, can keep galleries relatively stable."

Mark Jones, Director, Victoria & Albert Museum, UK, Museums and Climate Change, November 2008

3.4 Workbook and Tools for Risk Management

Participants will receive a detailed *Sustainable Preservation Practices for Managing Storage Environments* workbook designed to help institutions maintain the best possible climate for preservation with the least consumption of energy. Additional detail organized along the same format as the workshop, will be available for reference. The workbook will include step-by-step instructions and widely applicable

forms for energy-saving experiment design, implementation, and documentation (see Appendix 6 – Workbook Outline). We plan to print 1000 copies of the workbook (estimated at c.100 pages, bound, in color) which will be provided to both workshop and webinar participants.

Workshop participants will also be introduced to some of IPI's free online tools, including the *Dew Point Calculator* (www.dpcalc.org). Previously an application only compatible with PC computers, the program is now available online. The *Dew Point Calculator* will be used in the project as a teaching tool to demonstrate the relationship between temperature, relative humidity and dew point. The calculator will also be an invaluable resource for project participates after the workshops when they plan future environmental changes. Because it allows you to plot hypothetical temperature, relative humidity, and dew point scenarios, the *Dew Point Calculator* provides a framework for determining what environmental changes could be possible given the capabilities of your mechanical systems and the nature of your local climate. Because it also calculates the preservation metrics for the hypothetical environments, the user can gauge the impact of potential changes before implementing the changes in their institution.

3.5 Webinars

A few months after the workshops begin, IPI will present a series of five regional and four broadly applicable webinars focused on the practical application of sustainable preservation practices in collecting institutions. Webinar content will be developed by IPI preservation research staff and Peter Herzog, and will be designed to be useful to both workshop participants and other interested parties. James Reilly will be the main presenter, with assistance from IPI staff. Mr. Herzog will be also participate in the webinars to provide information and address questions (he will be linked in from his office in Minnesota).

The webinars will be free and open to the public; the participants of the regional workshops will be encouraged to attend the webinars, but we hope to reach the widest possible audience. Because of the structure of the webinar, there is no limit to the number of participants and anyone with an internet connection can attend. Attendees will enter the webinar sessions the same way they navigate to a new website, by entering a URL into their internet browser. All they will need to join the webinar will be an internet connection, an internet browser with a Flash player, and the URL to the meeting.

The project team will host the webinars through the software, Adobe Connect Pro. According to Adobe, Flash is already installed on 98% of all computers connected to the internet so the participants will not need to purchase any additional software and most will not have to download any new programs. Access to the Adobe Connect Pro software is offered free to all departments of Rochester Institute of Technology, so IPI will be able to access this service without any additional cost to the project.

Individuals will be asked to register for the webinar in advance, and they will receive a copy of the *Sustainable Preservation Practices for Managing Storage Environments* workbook by mail. There will be no charge for registration or the workbook. Webinars will be scheduled approximately once a month between September 2010 and June 2011, starting with the five region-based presentations. Each presentation will be 60 to 90 minutes in length.

The regional presentations will focus on opportunities for sustainable practices based on the climate in that region (see Appendix 7 - Webinar Curriculum). The general outline will be:

- Challenges and opportunities in the [Southeast, Midwest, etc.]
    - Regional climate patterns
    - What those patterns mean for your mechanical system
    - What those patterns mean for your collections
- Steps to consider
    - What you could do and how
    - Who you should involve

We will show and analyze data from the region, and from institutions in the area, including examples where efforts have been made, whether successful or not. Though the webinars are not a two-way voice conversation, participants can ask questions or make comments by typing them in a version of instant messaging built into the webinar production software.

The remaining four webinars will cover the following broadly applicable topics:

- What Really Matters – Ignoring spikes and managing extremes, taking a long-term, holistic view of the storage environment.
- Reading Graphs – How temperature, relative humidity, and dew point data can show you exactly what your mechanical system is doing.
- Experiments in Sustainable Preservation Practices – A review of what institutions are doing, how they are doing it, and what the results are.
- Avoiding Risk – Understand the effect of environmental conditions on collections using preservation metrics and risk ratings.

3.6 Impact and Intended Results

This project is national in scope and impact because the applicability of results is not limited to one geographic region, type of institution, or mechanical system design. Since there are differences in environmental management strategies based on regional climates, the five workshops will take place in each region of the country—the Northeast, Southeast, Midwest, South Central and West. Five of the nine webinars will be specific to these regions. IPI will rely on partnership with the regional service providers listed previously to promote both the workshop series and the webinars. Many of these regional preservation entities offer programs that touch on environmental management—James Reilly and Peter Herzog have spoken in several of them. This project complements those efforts but goes into greater depth, especially with regard to practical energy saving measures and risk management. This project is also different in that it addresses a simultaneous audience of facilities and collections care staff.

In addition, we will advertise the presentations in several professional distribution lists, and through our own contact mailing list of c.1000 institutions. We will increase the audience of the project further through the convenience of the web. The webinar series will be open to anyone

willing to participate, and will not require travel, special software, or supplemental materials. Each webinar presentation will be archived on the IPI website and available for use by any interested party. At the close of the project the *Sustainable Preservation Practices for Managing Storage Environments* workbook will be available online and in print form for free until all grant-funded copies are gone. If there is a demand, additional printed copies will be sold on a cost-recovery basis.

The experiences of the IPI project team in working with libraries and museums on managing the environment for preservation for over a decade have provided numerous examples of how important it is to create a management team and a forum through which information can be shared. We will encourage preservation staff, facility managers and administrators to work together to develop sustainable preservation and energy use practices. The kind of environmental management envisioned in this project—where energy consumption and preservation quality are measurable and jointly optimized—is a new process involving both cultures. The national commitment to sustainable practices has forced a situation on institutions which promotes a dialogue that can be of benefit to both parties.

The impact of the project will not be temporary in nature or limited to the present fiscal crisis. If successful, these presentations and related documentation will inform management practices in collecting institutions indefinitely since the fundamental need to conserve energy and preserve collections will not go away, nor will the usefulness of quantitatively measuring how environmental conditions are affecting collections.

4. EVALUATION OF RESULTS

At the close of each workshop and webinar participants will be asked to complete a short survey providing their evaluation of the presentation as well as their thoughts on the subject of sustainable preservation practices. Their suggestions will guide any presentations that follow. We will also prepare a project website with a blog to encourage an ongoing dialogue between IPI and participants as well as among professionals in the field. All interested parties will be encouraged to post information on sustainability experiments and activities – successes and failures – to benefit their colleagues.

A final, more detailed on-line project survey (see Appendix 8 - Sample surveys) for both workshop and webinar participants will be sent out during the final phase of the project. Grant funds will be used to purchase access to an online service called Wufoo. This data collection service will be used to create online surveys, collect online registrations for workshops and webinars. The service is highly customizable and can be tailored to fit the needs of the project. In addition it will provide reports on the data collection allowing us to easily interpret survey results. The yearly charge is $300 for the service, which includes multiple users, unlimited forms and reports, SSL encryption and 500MB of storage.

5. STAFF AND CONSULTANTS

5.1 The Project Team

The project team has extensive experience with environment and preservation as well as energy issues and most have worked together for many years. Subcontractors to IPI have a pivotal role in the project, and they have been working together with IPI for more than a decade. **James M. Reilly**, Director of the Image Permanence Institute, will spend 17% of his time on the project and have overall administrative responsibility for it. He will provide overall administrative responsibility, lead both workshop and webinar presentations, provide advice to participants, and supervise content development for all documents and publications.

Subcontractor and collaborator **Peter Herzog** is the primary consultant on sustainable practices and energy management issues. Peter Herzog is an architect, engineer, author and teacher. He has a long and distinguished career in energy management process design, technical analysis of energy-consuming processes and systems, troubleshooting and energy conservation planning. His background in HVAC systems analysis and performance verification has played a major role in his work with IPI as a consultant in optimization and preservation environment monitoring and analysis projects. Mr. Herzog will devote 35 days to this project over the two years. He will receive administrative support with project details from partner June Wheeler who is budgeted for two days over the course of the project.

The following IPI staff members are slated to work on this project:

- **Patricia Ford**, IPI Senior Research Scientist, has an extensive background in museum collection and record management with over twenty years work in the field. Ms. Ford will function as day-to-day project manager; oversee project documentation, scheduling, and other organizational activities. Ms. Ford will dedicate 25% of her time to project activities.
- **Kristin Smith**, IPI Project Associate will be a presenter at each regional workshop and will assist with the webinar presentations. Ms. Smith will also contribute to content development and documentation, provide technical support, and assist with data analysis and participant support. She will spend 25% of her time on the project.
- **Lauren Parish**, IPI Web Designer, will be responsible for web content management, editing, and graphic design for both print and web publications, and assistance with presentations. She is expected to give 15% of her time to the project.
- **Lisa Cerra**, IPI Business Manager, is responsible for the financial administration of IPI's externally funded grants, contracts, special projects, and gifts. Ms. Cerra will coordinate IPI's interface with RIT administration, handle travel reimbursements and supply purchases, and ensure that all financial reports are completed on time. She will spend 10% of her time handling the grant accounting for this project.

The qualifications for the project personnel are described more fully in Appendix 9 - Key Staff and Subcontractors, and in their attached resumes (see Appendix 10).