Sample Application

2009 National Leadership Grants for Museums

Advancing Digital Resources Category

Philadelphia Museum of Art Philadelphia, PA

Raman Revealed: A Shared Internet Resource for the Cultural Heritage Community

Applicant Philadelphia Museum of Art (PMA) requests $239,650 for a 2-year project to create the first publicly-accessible, comprehensive online Raman spectroscopic database of cultural heritage materials, in partnership with the Infrared and Raman Users Group (IRUG) http://www.irug.org/). No such database exists for this scientific information critical to the preservation and study of our nation's cultural heritage. This project builds on a 2002 National Center for Preservation Technology & Training (NCPTT) grant.

Background: Raman spectroscopy is a powerful technique for analyzing cultural heritage materials (supportingdoc1.pdf). A material can be identified with a high level of confidence when its Raman data matches that of a known substance. Few affordable analytical techniques provide identification on micro-samples as small as 20 μm^2. However, Raman use in the museum and related fields has been limited severely by the lack of readily-available, relevant reference spectra. Collecting and sharing high-quality scientific data is the mission of IRUG. Its 118 institutional members have strongly appealed for a centralized Raman database (supportingdoc2.pdf). They are eager to contribute their data that remain scattered in various laboratories. In 2002, IRUG and PMA jointly created a different online database. This seminal infrared database is used regularly in museums worldwide. Similarly, the Raman database will become a fundamental resource for generations of scientists, engineers, architects, conservators, curators, teachers, students in public, private, and government settings.

Major Activities: A project development team will construct the database and bibliographic library in overlapping stages using open-source code (e.g. Drupal, DotNetNuke). Activities include building: 1) the database; 2) an interface to upload data; 3) a translator to transform the native data into JCAMP-DX (ASCII) files for universal access (supportingdoc3.prf); 4) a software tool for peer-review and approved data transfer into the database; 5) a searchable library for citations and open-source papers with user interface; and 7) interface for online searches, data download and spectra printing from laboratory computers. Illustrative flowcharts are in supportingdoc4.pdf. IRUG participants will submit initial data and citations to a review committee of Raman experts (supportingdoc5.pdf). Products will be beta tested before launch onto the IRUG website (www.irug.org). Constructed under the 2002 NCPTT grant, its infrastructure will be upgraded for the Raman database to meet best practice and security standards.

Anticipated Products: A project development team will ensure specifications and timely products; test and QC deliverables; create a shared meeting and training workspace. Two surveys will assess impact on the museum field. Products will be: 1) a novel, open, free, online Raman database and library for museums, 2) 700 peer-reviewed spectra, 3) 300 literature citations, 4) system for ongoing collection, review and distribution of Raman data and citations (electronic download/PDF) and 5) database searching software

Anticipated Outcomes: The project will 1) change on global scale, the way scientists access and share data, 2) increase use of Raman technology in museum field, 2) provide access to information not available previously, 3) save time and funds in analyzing artifacts/materials, 4) improve conservation of nation's cultural heritage by higher-quality Raman analysis, and 5) help students, teachers become better trained in Raman.

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Narrative

NARRATIVE

Assessment of Need

As stated in the abstract, there is an urgent need for a readily accessible, centralized Raman spectroscopic database specific to cultural heritage materials for the museum and library community. Reliable reference data are essential for scientists to identify the wide range of materials commonly that encountered in cultural heritage objects (see Figure 1). These identifications serve conservators in the treatment and preservation of our nation's cultural heritage, and others who study these works. Although Raman use in the museum field has grown in recent years, compared to other analytical techniques, it suffers from a lack of reference spectra and supporting information. The consequence is that while some materials are identified properly, laboratories generally are not able to identify a large number of other materials. Mischaracterization or inability to characterize these materials can be very costly to museums entrusted with the care of our cultural heritage. The proposed database's intended audience is large and comprises scientists, conservators, curators, engineers, architects, students, and teachers, who work in public, private and government museums and libraries, and other settings for purposes ranging from art conservation and historic preservation to chemistry education, and even forensics.

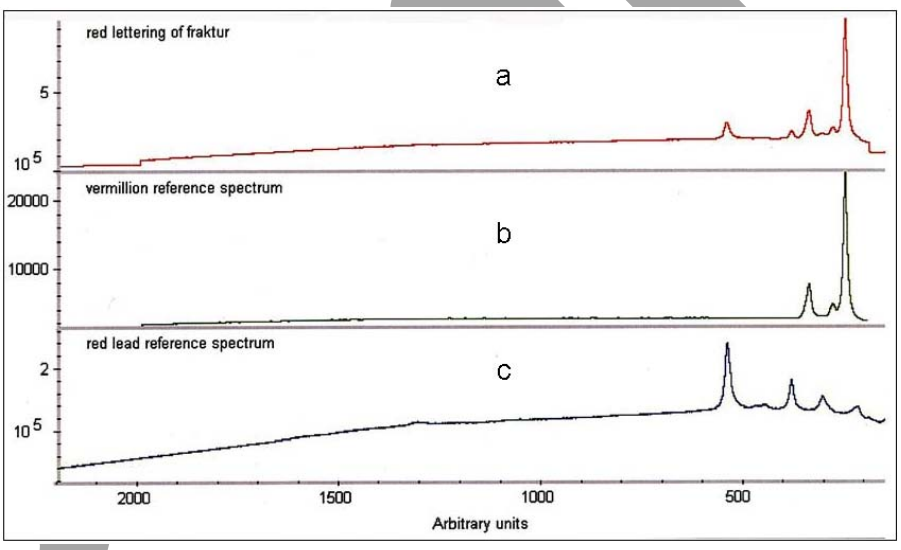

Figure 1. High-quality Raman reference data (b, c) are necessary to identify by Raman spectroscopy the substances in cultural heritage artifacts as illustrated by the data from a red 19th C. fraktur paint sample (a), which contains vermilion and red lead pigments (Courtesy of the Winterthur Museum and Library).

Raman Has Become Popular In Museums but Reliable Reference Data Are Not Readily-Accessible

The rising importance of Raman is reflected by a rising number of published papers, as

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illustrated in Figure 2, and the example list literature references in supportingdoc1.pdf[1]. Because of this widespread use, there is a growing call within the museum community for an openly accessible, comprehensive Raman database. Although some small sets of Raman data already have been posted on the web (for links see http://www.irug.org/links.asp), they are not comprehensive and most have not been peer-reviewed by museum scientists or are not downloadable. The few commercial databases available are prohibitively expensive for not-for-profits, costing thousands of dollars or requiring annual license fees. These databases are limited in scope because they do not contain data for aged materials specific to cultural heritage. Their data cannot be shared freely because it is proprietary. Moreover, it is sometimes erroneous and therefore misleading.

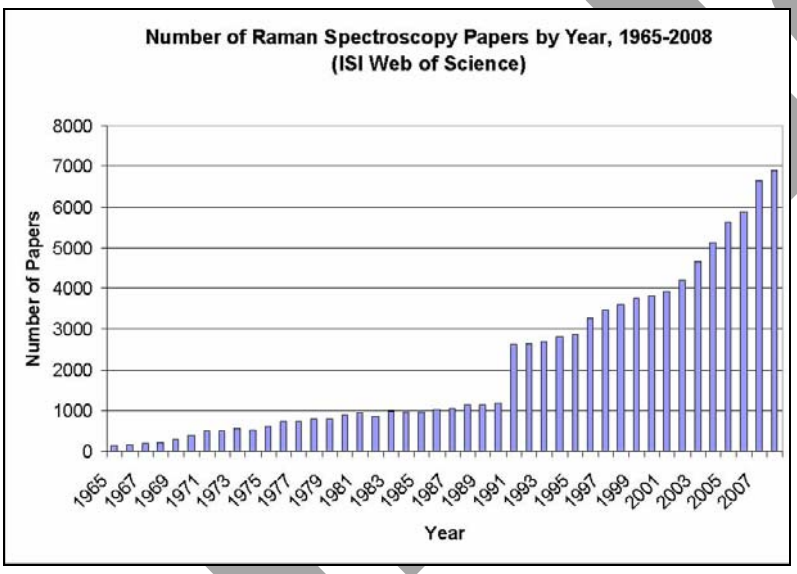

Figure 2 – The need for an online Raman Database is reflected in the increasing number of Raman papers published yearly (Survey Web of Science, 24 January 2009).

Raman Data Scattered In Labs Throughout the U.S. and Elsewhere Need To Be Centrally Archived For Web Distribution

Considerable Raman reference data exists scattered and sequestered in various laboratories. Many institutions have long awaited a viable mechanism like the proposed database to centrally archive and freely share their Raman data as broadly as possible (see letters in supportingdoc6.pdf). This sentiment has been expressed widely within the large network of U.S. scientists who are IRUG members. They are eager to share their data and engage in dialogue stimulated by this project. Global sharing of data among institutions

[1] For an overview of Raman's utility in cultural heritage see, G.D. Smith, R.J.H. Clark, Raman microscopy in art history and conservation science, Reviews in Conservation 2 (2001) 92–106. G.D. Smith, R.J.H. Clark, Raman microscopy in archeological science, Review Article, Raman microscopy in archeological science, Journal of Archeological Science 31 (2004) 1137-1160.

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will save time and funds - vital considerations in the current economic climate. Our experience with the 2002 NCPTT funded online infrared database has shown that such collaborative projects promote a sense of community and common purpose facilitating further exchange of ideas and information.

We have not found any other efforts to create the centralized Raman database described herein. Because most of the museum community's laboratories are members of IRUG, they look to this organization as the logical vehicle for undertaking this project. Its various institutional members (supportingdoc2.pdf or http://www.irug.org/ed2k/institutions.asp) have strongly encouraged this undertaking.

By using open source code and ASCII data for this project, others will be able to build upon or adapt the database for their particular use. An example of one such beneficiary will be the User's Group for Mass Spectrometry and Chromatography (http://www.mascgroup.com/), which has adopted the JCAMP file formatting instituted by IRUG for its data. The design and progress of the proposed Raman database will be presented at conferences for the benefit of scientists and IT professionals, who may wish to adopt a similar model for the review and sharing of technical information.

National Impact and Intended Results

The Raman database will serve the nation's largest existing network of museum scientists, as well as other institutions, via IRUG. Success of the project will have a far-reaching impact by:

1. changing, on global scale, the way scientists communicate to access and share data
2. improving the quality of scientific analysis of our nation's cultural heritage by enabling accurate Raman analysis;
3. saving time to do scientific analysis by eliminating the need to obtain reference spectra;
4. eliminating costly duplication of data collection by individual institutions;
5. spurring intellectual and research output of the cultural heritage and academic communities;
6. enhancing diversity of Raman data available to US museums through international exchange
7. promoting a sense of community, common purpose and knowledge-sharing among participants;
8. reallocating valuable resources spent on obtaining Raman reference data to other creative uses;
9. facilitating the education and development of new researchers and students by providing free access to a Raman database, bibliography and open source papers.

The project's impact will extend beyond its two-year period since the proposed database and software allows for ongoing collection and distribution of Raman data. We estimate that the data generated will be viable for at least fifty years (probably longer) based on

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historical precedence for other types of scientific data. The JCAMP-DX (ASCII) format (see pages 6-13, 15 in supportingdoc3.pdf) is expected to translate to future formats so that data will not become obsolete or expire, remaining available for generations of new users.

Ultimately, the Raman database will help improve the preservation and study of our cultural heritage, especially in a period when museums are struggling to accomplish these goals with scarce resources.

Project Design and Evaluation Plan

The PMA and IRUG propose a two-year project to develop and populate a centralized Raman spectral database and bibliographic library that will be freely accessible on the internet at www.irug.org. The PMA and IRUG successfully developed an online infrared database previously.

Project oversight by a project director at the PMA and a technical development team – drawn from NPower PA (http://www.npowerpa.org) and Rohm and Haas, Company, Information Technology Department, Philadelphia (http://www.rohmhaas.com) - will guide day-to-day activities to develop, test and implement the web-based application, database, bibliography library and associated software interfaces to complete the full collection, review and publication of RAMAN spectra files. NPower has developed an initial work plan (IRUG Project Plan, and Design and Evaluation Plan) for the project (supportingdoc7.pdf).

A review committee of Raman experts from the museum field (see supportingdoc5.pdf) will oversee the collection, quality control, peer-review, and universal (JCAMP-DX) formatting of the data.

At launch, the database will contain 700 high-quality peer-reviewed reference spectra and 300 library citations. These contributions will come initially from IRUG's large network of participating members and, after the project ends, from others as well as IRUG members. The review committee and participating members will rigorously beta test the database, library and user interfaces to insure they warrant release to the wider community.

The project will take place in four overlapping stages:

First, the developer will enhance the existing website (www.irug.org) infrastructure for new Raman features and construct the Raman database using an open-source framework (e.g. Drupal, DotNetNuke) to provide programmed processes to seamlessly handle the new Raman data.

Second, a robust, user-friendly Raman spectra submission process will be developed to enable participants to electronically upload (contribute) and save their native data to the website. An online data formatter will be constructed to transform the submitted data,

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with supporting material sample and information, into IRUG's extended fully-described JCAMP-DX files to enable universal access (http://www.irug.org/ed2k/jcamp.asp).

Software for peer-review will be created to enable the review committee to receive, review, format, annotate and approve/disapprove Raman data submissions. After approval, the data will be parsed into the database for safe storage and dissemination via the IRUG website. The web-based user interface will be developed for online searches, and downloads of data and printed Raman spectra (see supportingdoc4.pdf).

In the ***third*** stage, a Raman bibliographic library will be constructed with an interface for users to upload citations and open source papers for peer-review and approval by committees similar to the spectra approval process to insure pertinent, high-quality reference works.

The ***fourth and final*** stage is a full beta testing involving the numerous users and review committee of Raman experts, followed by launch and training for IRUG users.

Project Evaluation
Progress will be evaluated at the conclusion of each project stage. The project director will work with the development team to develop surveys to evaluate the success of the database, library and user interfaces as they are beta tested by the review committee. Modifications will be made to the systems, if needed, and the products retested and committee resurveyed. The effectiveness of the products to deliver usable Raman data and information will be evaluated by an independent reviewer from outside the museum community who is in no way connected to the project.

Use of Raman reference spectra in the population of scientists working in U.S. museums and libraries will be surveyed at the conclusion of the project and then resurveyed one year afterward to assess long term impact. The results will be reported to IRUG members and the IMLS.

Project Resources: Budget, Personnel, and Management

The Philadelphia Museum of Art requests $239,650 funding from IMLS and will match with $179,375, which is roughly 43% of the total project cost or 4:3 IMLS:PMA.

Personnel and Management

Project Director:
Beth Price, **Senior Scientist, Section Head, Scientific Research and Analysis Laboratory**, **Philadelphia Museum of Art,** will serve as project director for management and technical implementation of the grant. She will work directly with the project development team. Ms. Price is an IRUG Board Member, Chair of the Americas and past president. Ms. Price successfully managed a 2002 NCPTT grant to construct the IRUG website, online infrared database and bibliographic library. She has over 15 years experience developing infrared spectral databases and reviewing spectra for IRUG. She

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helped design the JCAMP-DX file format protocol adopted by IRUG. She enjoys long standing professional relationships with many of the museum scientists who will participate in the project. She has authored papers on the analysis of works of art by spectroscopic and other methods. She also will be a member of the Raman Review Committee.

Project Conservation Scientist

Dr. Ken Sutherland, Conservation Scientist, Scientific Research and Analysis Laboratory, Philadelphia Museum of Art, will aid Ms. Price in the development of the project. Dr. Sutherland has experience in the collection and review of infrared and mass spectral data, and database development for the Users Group Mass Spectrometry. He has over 10 years experience in the scientific analysis of cultural heritage materials.

Project Management Team comprises Linda Widdop, Rosemary Conroy Hughes, and Dean Graham of NPower Pennsylvania, and Charles Davis, Rohm and Haas Company, Philadelphia, PA.

Linda Widdop (Technology Services Director, NPower PA, Philadelphia, PA) will supervise all aspects of the requirements gathering and technical development of the project and act as the Project Supervisor for any issue escalation during NPower's involvement in the project. As Director of Technology Services at NPower PA, Linda manages project plan and budget development, implementation oversight, and resource allocation. Linda has been in the computer field since 1983 in manufacturing, corporate and retail settings on her way to the not-for-profit world. She has trained thousands of users and provided IT consulting and implementation services to hundreds of individuals and organizations

Rosemary Conroy Hughes (Senior Project Manager, NPower, Philadelphia) will be the lead consultant throughout the project. As Project Manager she will act as a liaison between all project constituents including the Project Director (Beth Price), Raman Review Committee (Chair, Suzanne Lomax) and its members, Database Administration Manager (Charles Davis), and NPower developers and programmers. Rosemary will lead the Requirements Gathering and develop documentation needed to move into the "build" phase of the project. This documentation will provide the basis for all application programming, testing and training.

Dean Graham (**Senior Technical Consultant, NPower, Philadelphia)** will work with database and web developers to analyze existing code website and develop technical specifications for the new Raman web application. Dean will work with the project team to solidify user interface attributes and research connections to the backend data structures that will provide the translation, data storage, and data presentation within the new Raman system. Dean will work with the developers to create technical and user documentation of the application.

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Database Administration Manager

Charles Davis (Database Administration Manager, Rohm and Haas Company,

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Philadelphia) will be the Database Administration Manager for the project (see letter of commitment). He has over twenty years experience overseeing databases, defining and monitoring application databases, designing backup and recovery procedures, supervising database enhancements, enforcing security, and planning and participating in data recovery tests. Mr. Davis has worked with IRUG for the past three years as a part of Rohm and Haas' community outreach program. He is knowledgeable about the IRUG website and online infrared database. The Rohm and Haas Company has provided similar technical and scientific support through its long-standing partnership (over 12 years) with the Museum.

Raman Review Committee, Chair:
Dr. Suzanne Quillen Lomax (Organic Chemist, Scientific Research Department, National Gallery of Art (NGA), Washington, D.C.) has been the investigating the identification and aging behavior of artists' materials for twenty-three years and is an expert on the identification of synthetic organic pigments by a variety of analytical techniques, including Raman. Dr. Lomax is a long standing IRUG Board Member and has served as a spectral reviewer for that organization. She also has been a devoted tour speaker for the American Chemical Society Speaker Service since 1991.

Review Committee of Raman Experts:
Members: Dr. Glenn Gates (Detroit Institute of the Arts), Dr. Karen Trentleman (Getty Museum), Mr. Richard Newman (MFA Boston), and Dr. Silvia Centeno (Metropolitan Museum of Art), Ms. Beth Price (Philadelphia Museum of Art), Dr. Greg Smith (SUNY College at Buffalo), Mr. Boris Pretzel (Victoria and Albert Museum), Mr. Marcello Picollo, IFAC-CNR (Florence), and Dr. Jennifer Mass (Winterthur Museum).

IRUG Institution Participants:
Members (see supportingdoc2.pdf or http://www.irug.org/ed2k/institutions.asp) will contribute initial Raman spectra.

Independent Reviewer:
Dr. Georgia Arbuckle, Professor of Chemistry, Chair - Graduate Program in Chemistry, Chemistry Department, Rutgers, The State University of New Jersey, Camden, N.J. Dr. Arbuckle is an innovator in conductive polymer research and will act as the project's independent reviewer at the conclusion of the project. She will evaluate the overall utility of the database, library, and the quality of the spectra at the conclusion of the project.

PMA Project Support Personnel, in-kind
Chris Wasson, Conservation Department Administrator, who has extensive records and database administration experience, and **Andrew Lins, Conservation Department Chair**, an accomplished scientist and administrator will oversee the progress of the project and financial reporting. Conservation technician will help input data and aid in collection of surveys.

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Dissemination

Details of the project will be well-publicized throughout and after the two-year project ends. If awarded, the grant will be announced in the following: AIC Newsletter, Conservation DistList (Stanford University Libraries, cool-palimpsest.stanford.edu/byform/mailing-lists/cdl/aboutcdl.shtml), Chemical and Engineering News, APT Newsletter and on the IRUG website. A broadcast e-mail will go out to all IRUG institutions and participants.

There will be featured talks describing the project at the next IRUG biennial conference scheduled for March, 2010 in Buenos Aires, where we will solicit participation and have Raman Review Committee meetings. Presentations will be made at one or more of the following professional conferences (e.g., ACS, AIC, APT, IIC) to disseminate information regarding access to and use of the Raman database and library, and to provide periodic updates.

All Raman data and bibliographic citations will be disseminated directly via the website (www.irug.org). The data will be downloadable as JCAMP-DX files, and hardcopy spectra and papers will be printable as PDF files. An online help manual and glossary will assist users. As new features are added, they will be highlighted in appropriate science and conservation journals (e.g., ACS, AIC, APT) to make the public further aware of the database capabilities.

Sustainability

The PMA and IRUG are committed to maintaining the Raman database and library as they have in the past for the IRUG website and infrared database. This support includes web hosting and domain registration. Monitoring of the website and planning for maintenance is an ongoing process undertaken by IRUG Chairs, the Philadelphia Museum of Art, and Rohm and Haas Company, IT, Philadelphia.

Periodic technical audits of the IRUG site will be conducted to determine compliance with accepted best practices for programming tools, database technology, changes in industry standards, security requirements and internet technologies.

We estimate that the Raman data will be viable for at least 50 years based on historical precedence for other scientific data types. The JCAMP.DX (ASCII) format has existed for over 20 years, is extensible, has been adopted as the standard data exchange method by spectra instrument manufacturers, and the data is expected to translate easily to future format changes as the need arises.

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BUDGET FORM - PAGE FOUR

Section B: Summary Budget

	$ IMLS	$ Cost Share	$ TOTAL COSTS
1. Salaries and Wages		75,000.00	75,000.00
2. Fringe Benefits		18,000.00	18,000.00
3. Consultant Fees	1,000.00	25,000.00	26,000.00
4. Travel	4,000.00	3,375.00	7,375.00
5. Supplies and Materials		8,000.00	8,000.00
6. Services	234,650.00	50,000.00	284,650.00
7. Student Support			0.00
8. Other Costs			0.00
TOTAL DIRECT COSTS (1—8)	239,650.00	179,375.00	419,025.00
9. Indirect Costs			0.00
TOTAL COSTS (Direct and Indirect)	239,650.00	179,375.00	419,025.00

Project Funding for the Entire Grant Period

1. Grant Funds Requested from IMLS	239,650.00
2. Cost Sharing:	
a. Cash Contribution	
b. In-Kind Contribution	179,375.00
c. Other Federal Agencies*	
d. TOTAL COST SHARING	179,375.00
3. TOTAL PROJECT FUNDING (1+2d)	419,025.00
% of Total Costs Requested from IMLS	57.20%

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

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IMLS-NLG PMA Research Project

Schedule of Completion

2 February 2009

	Oct 09–Jan 10	Feb 10–May 10	Jun 10–Sep 10	Oct 10–Jan 11	Feb 11–May 11	Jun 11–Sep 11
Activity/Tasks						
Initiation/Requirements	**$27,600 IMLS**					
Database and Library Design and Construction			**$160,700 IMLS**			
Database Implementation					**$15,200 IMLS**	
Reviewers' Participation		**$15,000 PMA**			**$25,000 PMA**	
Project Management	**$46,400 IMLS / $108,000 PMA**					
Addition of Spectra					**$20,000 PMA**	
Final Report						

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Specifications for
Projects that Develop Digital Products

Part I. Complete the appropriate sections:

A. Converting Non-Digital Material to Digital Format

A1. Describe types and original formats of materials to be selected for digitization and quantity of each.

A2. Identify copyright issues and other potential restrictions with regard to the original non-digital material.

☐ Public domain: % of total

☐ Permissions have been obtained: % of total

☐ Permissions to be requested: % of total
Plan to address:

☐ Privacy concerns: % of total.
Plan to address:

☐ Other: % of total. Explain:

A3. Describe how the newly digitized material will be made available to the public. Explain the terms of access and conditions of use. Identify and explain any restrictions that will apply to digitized material, and specify what percentage if any of the total material will be subject to restrictions.

A4. List the equipment and software, with specifications, whether purchased, leased or outsourced, that will be used (e.g., camera, scanner, server, A/D audio or video converter):

B. Repurposing Existing Digital Content

B1. Describe types and original formats of digital materials to be selected for repurposing and quantity of each.

B2. Identify copyright issues and other potential restrictions with regard to the original digital material.

☐ Public domain % of total

☐ Permissions have been obtained: % of total

☐ Permissions to be requested: % of total
Plan to address:

☐ Privacy concerns: % of total.
Plan to address:

☐ Other: % of total. Explain:

B3. Describe how the repurposed material will be made available to the public. Explain the terms of access and conditions of use. Identify and explain any restrictions that will apply to repurposed material, and specify what percentage if any of the total material will be subject to restrictions.

B4. List the equipment and software, with specifications, whether purchased, leased or outsourced, that will be used (e.g. MPEG encoder, non-linear editing system, GIS software).

C. Creating New Digital Content

C1. Describe types of materials to be created in digital form and quantity of each.
Keyword Searchable Raman spectroscopic database
700 Raman spectrosopic data files initially, in JCAMP.DX (ASCII), stored in a structured SQL Server database.
Keyword Searchable Raman bibliographic library
300 Raman literature citations.
Document repository for author-approved distribution of cited papers

C2. Describe plan to obtain releases/permissions from project content creators and subjects.
Using a procedure already established. Raman spectra will be contributed under a license agreement that gives project partners permission to collect, format and distribute the data. All contributors sign a hardcopy license agreement kept on file at the PMA.

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C3. Describe disposition of ownership and use rights of new product. Describe how the new product will be made available to the public. Explain the terms of access and conditions of use. Identify and explain any restrictions that will apply to new content and specify what percentage if any of the total material will be subject to restrictions.
The public will have access to the data developed, which will be available via the publicly accessible website, www.irug.org The data will be freely available provided users agree to acknowledge IRUG and the contributor as the sources of the data in all publication of the data.

C4. List the equipment and software, with specifications, whether purchased, leased or outsourced, that will be used (e.g., camera, audio recording equipment, video recording equipment, encoding software, server).
The database will be Microsoft SQL Server and the web application code will be created within an open source framework (e.g. DotNetNuke or Drupal) using ".NET" programming language. Web hosting services will be used for the project. This will be the same host used currently for the IRUG website. NO special equipment is necessary for the projects other than computers.

Part II. Answer all questions:

5. Specify each type of file format (e.g., TIFF, JPEG, MPEG) to be produced and anticipated quality (e.g. minimum resolution, depth, tone, pixel dimensions, file size, sampling rate) of each.

Master: Raman spectra, generated on-demand from sampling data stored in a structure SQL Server database, will be displayed as a PNG file sized at ~750 x 380 pixels.

Access: Raman spectra will be viewed.

Thumbnail: Raman spectra as thumbnails are planned to be generated on-demand as a PNG file sized at ~260x180 pixels.

6. Describe the delivery medium that will be used (e.g. Internet, broadcast, DVD).
Web pages will display spectra JCAMP files in ASCII format, and JCAMP file downloads to user workstations will be in ASCII format compliant with the IRUG JCAMP standard, including IRUG extensions.

7. Describe the underlying software to manage and/or present the content (e.g. DSpace, Fedora, ContentDM).
Microsoft SQL Server will be used a the database management software to store Raman spectra JCAMP data. ".NET" programming language for web-site development will be provide the presentation layer to retrieve, format, and display the Raman JCAMP spectra and file downloads.

8. Describe the quality control plan.
Data will be QC'd by an established committee of Raman experts from the museum field using standards previously established and utilized by IRUG.

9. Explain how descriptive and administrative metadata will be produced and used to describe and manage the content. Include the standards that will be used for data structure, content (e.g. thesauri), protocols, preservation and administrative information and communication of the content (e.g., MARC, EAD, Dublin Core, PBCore, VRA Core Categories, or Categories for the Description of Works of Art).
The Raman database deisgn will follow standard database data normalization practices and include metadata stored along with the data within the SQL Server database. The IRUG JCAMP standards document will describe the JCAMP database fields in detail.

10. Describe plans for preservation and maintenance of the digital files during and after the expiration of the grant period (i.e., storage systems, migration plans and commitment of institutional funding).
Data produced will have a life of 50+ years based on precedence of other types scientific data. However, the data is not stored in ASCII format but can be recomposed back to ASCII data in the future if necessary. The data will reside in the database on the host's server and the database contents and the web-site source code will be backed up regularly by the site's hosting company with a minimum 30-day retention period. PMA reserved the right to request special backups as required. Multiple backup copies of JCAMP files are available since users download and save them as files on their computers. The website and database are maintained by the PMA and will continue to be sustained after the grant period.

11. If content will be provided on the Internet, indicate agreement to submit collection level records for digital products to the IMLS Digital Collections Registry. State reasons for selecting alternative approaches.
Agreed

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12. Provide URL(s) for applicant's previous digital products, if applicable.
www.irug.org

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PARTNERSHIP STATEMENT

Complete one of these forms for each formal partner.

Legal name of applicant organization (5a from Face Sheet): Philadelphia Museum of Art (PMA)

1. Legal name of partner organization: Infrared and Raman Users Group (IRUG)
2. Partner DUNS number: 804715733
3. Mailing address

   Street1: Box 7646 Street2:

   City: Philadelphia State: PA Zip+4: 19101-7646
4. Partner Web address: http://www.irug.org
5. Partner project contact name: Beth Price

   Title: North and South Americas Chairperson

   Telephone number: 215-684-7552 E-mail: bprice@philamuseum.org
6. Governing control of partner (choose one):

- ❑ State Government
- ❑ County Government
- ❑ City or Township Government
- ❑ Special District Government
- ❑ Regional Organization
- ❑ U.S. Territory or Possession
- ❑ Independent School District
- ❑ Public/State-Controlled Institution of Higher Education
- ❑ Indian/Native American Tribal Government (Federally Recognized)
- ❑ Indian/Native American Tribal Government (Other than Federally Recognized)
- ❑ Indian/Native American Tribally Designated Organization
- ❑ Public/Indian Housing Authority
- ☑ Nonprofit with 501(c)3 IRS Status (Other than Institution of Higher Education)
- ❑ Nonprofit without 501(c)3 IRS Status (Other than Institution of Higher Education)
- ❑ Private Institution of Higher Education
- ❑ Individual
- ❑ For-Profit Organization (Other than Small Business)
- ❑ Small Business
- ❑ Hispanic-serving Institution
- ❑ Historically Black Colleges and Universities (HBCUs)
- ❑ Tribally Controlled Colleges and Universities (TCCUs)
- ❑ Alaska Native and Native Hawaiian Serving Institutions
- ❑ Nondomestic (non-U.S.) Entity
- ❑ Other (specify) _____

7. What is the partner organization's mission? [500 characters]

The Infrared and Raman Users Group (IRUG) is dedicated to its members professional development by providing a forum for exchange IR and Raman spectroscopic information, reference spectra and materials. IRUG comprises individuals using IR & Raman spectroscopy to study the world's cultural heritage. At biennial conferences, members & speakers present papers to sustain the IRUG initiative. A primary goal of IRUG is to improve & expand data generated and shared through a collaborative database.

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8. Describe the partner organization's service area (audience served, including size, demographic characteristics, and geographic area). [500 characters]

IRUG, a 501 (C) 3 organization was begun in the U.S. in 1993. It's audience comprises scientists, conservators, curators, engineers, architects, students, and teachers. They work in public, private and government museums, and other settings for purposes ranging from art conservation and historic preservation to chemistry education, and even forensics. Today it has grown to large network of 118 international institutions of which 52 are located in the U.S. See website (www.irug.org).

9. List the partner's key roles and responsibilities in the project. [1000 characters]

IRUG will help the PMA develop the project's electronic products, the first publicly-available, searchable, online, comprehensive Raman spectroscopic database of cultural heritage materials, bibliographic library and associated software for the exchange and sharing of free Raman data in museums and elsewhere. Its Raman expert members will help develop the database and software, and evaluate, format, test, and distribute the data via its website (www.irug.org), where the database and software will reside. The partner will help maintain the database and website, train users, and publicize the project and products within the museum community and beyond.

Sample

Please note:

A. Submission of this application by the authorized representative of the applicant organization reflects the partner organization's agreement with the following statements:
   - We will carry out the activities described above and in the application narrative.
   - We will use any federal funds we receive from the applicant organization in accordance with applicable federal laws and regulations as set forth in the program guidelines and the terms and conditions of the grant award.
   - We assure that our facilities and programs comply with the applicable federal requirements and laws as set forth in the program guidelines.

B. Prior to submission of the application, the applicant will ensure that the partner organization has provided to the applicant a signed original of this Partnership Statement for the applicant's records. Such original will be made available to IMLS, if requested by IMLS.

SUPPORTING DOCUMENT 1

LIST OF EXAMPLE RAMAN PAPERS

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