

Sound Directions
Digital Preservation and Access for Global Audio Heritage
Preservation Phase

I. Introduction

Sound archives have reached a critical point in their history marked by the simultaneous rapid deterioration of unique original materials, the development of expensive and powerful new digital technologies, and the consequent decline of analog formats and media. It is clear to most sound archivists that our old analog-based preservation methods are no longer viable and that new strategies must be developed in the digital domain. Motivated by these concerns, in February 2005 the Indiana University Archives of Traditional Music (ATM) and the Archive of World Music (AWM) at Harvard University began Phase I of *Sound Directions: Digital Preservation and Access for Global Audio Heritage*—a joint technical archiving project with funding from the NEH Preservation and Access Research and Development grant program. The goals of Phase I of *Sound Directions* were to a) create best practices and test emerging standards for digital preservation; b) establish, at each university, programs for digital audio preservation that will enable us to continue this work into the future; and c) preserve critically endangered, highly valuable, unique field recordings of extraordinary national interest. Though we are still several months from the completion of Phase I, we are extremely pleased with the results thus far and are ready to begin thinking about next steps for the project. We are thus proposing an 18-month “Preservation Phase” of *Sound Directions*, through which we will realize the results of our research and development in this area by putting our new digital preservation systems to work preserving and making accessible a substantial number of highly endangered field recordings representing unique cultural heritage.

As in Phase I, the *Sound Directions* Preservation Phase will continue to focus on field recordings—carriers of unique, irreplaceable and historically significant cultural heritage. As caretakers of these collections we must solve the problem of preserving audio resources accurately, reliably, and for the very long term; at the same time we must make our resources readily accessible to those who most need them. These issues have been the subject of work, discussion and study at a number of national agencies and institutional archives, including the Council on Library and Information Resources, the American Folklife Center, the Library of Congress Audio-Visual Prototyping Project, and, as stated above, *Sound Directions* Phase I. Most of us are now approaching audio digitization in similar, deliberately cooperative ways. One key contribution of Phase I of *Sound Directions* has been the creation of interoperable digital audio preservation packages. That archives at Harvard and Indiana will now be able to read each other’s preservation packages will ensure that true preservation has taken place. During the proposed Preservation Phase, we will ramp up production and digitally preserve as much of our threatened cultural heritage as possible. The large body of digitized collections that will result from the Preservation Phase will position us for a future access-centered phase of *Sound Directions*, during which we will develop an online access system that will take advantage of the dramatic expansions of access that digitization and the Internet afford.

This proposed Preservation Phase of *Sound Directions* will pursue the following goals:

- Preserve a large number of unique, deteriorating audio field collections carrying historical and cultural content of vital importance to the humanities;
- Provide improved and, in some cases, initial access to these materials, repatriating some to the communities from which they were originally recorded;
- Create, further develop, and/or make available both data and software tools to support the preservation process. This will aid other humanities archives with audio content as well as the wider audio preservation community;

- Provide a model for the employment of digital technologies—an area of special focus for NEH—for the preservation of audio field collections, furthering the work of Phase I of the *Sound Directions* project.

II. Significance

A. Institution Overview

In *Folk Heritage Collections in Crisis*, published by CLIR following a Library of Congress-sponsored conference, sound preservation consultant Elizabeth Cohen writes, “the development of successful preservation strategies will require the cooperation of computer scientists, data storage experts, data distribution experts, fieldworkers, librarians, and folklorists.”¹ Indiana and Harvard bring together a powerful combination of leaders in all of the above fields. Our specialists are in constant demand for consultations with other institutions. Each institution has preservation repositories built on mass digital data storage systems and extensively developed digital library programs led by recognized leaders in digital access and web delivery. Both Harvard and Indiana are charter members of Internet2, which provides the advanced networking that will deliver high quality digital audio to classrooms, conference rooms, and desktop computers around the world. Each institution features leaders in ethnographic fields including folklore, ethnomusicology and anthropology. We are well positioned to share the results of our work widely. In short, given the particular resources available to us at our institutions, and the extent to which we are actively engaged with other institutions and leaders in the sound archiving community, we are well positioned to take on this challenge. The ATM and AWM will again be partners in the Preservation Phase, though the nature of their relationship will be slightly different than it was during Phase I; the AWM, which has already secured private funding for the proposed time period, will participate in the Preservation Phase as an unfunded, technical partner, collaborating fully on the technical and workflow areas of the project and contributing to write-up of results.

1. Indiana University

The Archives of Traditional Music (ATM) <http://www.indiana.edu/~libarchm/> is one of the largest university-based ethnographic sound archives in the United States. Its holdings cover a wide range of cultural and geographical areas, and include commercial and field recordings of vocal and instrumental music, folktales, interviews, and oral history, as well as videotapes, photographs, and manuscripts. For over fifty years, the ATM has been a recognized leader in the sound archiving community, developing in step with technological and theoretical advances in ethnographic research and recorded sound. Proof of the ATM’s leadership in this domain can be demonstrated through the numerous major grants it has received over the years, from federal agencies such as NEH and private foundations such as Mellon.

The ATM has ample experience both in preservation work and increasingly in digital audio and video projects. In the 1980s, for example, the National Science Foundation funded the transfer of ATM’s famous cylinder collection onto 1/4” open reel tape. In more recent years, ATM has made several forays into digitization. One project, funded by NEH, resulted in the interactive CD-ROM publication *Music and Culture of West Africa: The Straus Expedition* (Gibson and Reed 2002). With funding from the Institute of Museum and Library Services and the Library Services and Technologies Act (LSTA), and in collaboration with IU’s Digital Library Program (DLP), ATM has created on-line access to Hoagy Carmichael materials <http://www.dlib.indiana.edu/collections/hoagy/>. Recently, as ethnographic methods have begun increasingly to include video, the ATM has taken on the challenges of video preservation and access through the EVIA Digital Archive project (EVIADA), a project funded by the Mellon Foundation <http://www.indiana.edu/~eviada/>. This project, which also involves the DLP and participants from Harvard, helped prepare IU for *Sound Directions* by strengthening relationships and collaborative workflows between ATM and DLP, establishing a strong working relationship with IU’s mass storage system, and by testing the Fedora repository system. Phase I of *Sound Directions*, detailed in the History, Scope and Duration section below, has been both the culmination of the ATM’s past work on audio preservation and digital technologies and the fundamental building block upon which the present proposal

is based. Clearly, Phase I of *Sound Directions* has further solidified the ATM's reputation as a national and international leader among audiovisual archives.

ATM's partner in this project, the IU Digital Library Program <http://www.dlib.indiana.edu/>, is dedicated to the selection, production, and maintenance of a wide range of high quality networked resources for scholars and students at Indiana University and elsewhere, and supports digital library infrastructure for the university. The DLP is a collaborative effort of the Indiana University Libraries, the Office of the Vice President for Information Technology, and IU's research faculty with leadership from the School of Library and Information Science and the School of Informatics. The DLP's current facilities include the Digital Media and Image Center (containing equipment for image, audio, and video capture), the Library Electronic Text Resource Service (supporting creation of scholarly electronic texts), and an extensive server infrastructure for support of digital projects, with life-cycle replacement funding for hardware and software. DLP staff provides expertise in planning, creating, and maintaining digital projects. DLP's Variations2 digital music library project <http://variations2.indiana.edu/> received a \$3 million grant from the National Science Foundation to create an integrated digital library that presents users with access to sound recordings, musical scores, and video in a variety of formats. A recent \$768,000 grant from the Institute of Museum and Library Services for the Variations3 project is extending this digital music library to institutions beyond IU. Former DLP Director Kristine Brancolini and Associate Director for Technology Jon Dunn have worked extensively with ATM staff on several projects, including Phase I of *Sound Directions*, and have been actively involved in the planning of the Preservation Phase as well.

The Massive Data Storage System (MDSS) <http://storage.iu.edu/mdss.html> is a distributed storage service offered by Indiana University's University Information Technology Services (UITS). This system is based on a consortium-developed software product known as High Performance Storage System (HPSS) and consists of nearly 1.6 petabytes of disk and automated tape storage. Through use of the State of Indiana's I-Light optical fiber network, MDSS supports automatic mirroring of data between servers on IU's Bloomington and Indianapolis campuses for added disaster- and fault-tolerance. In summer 2006, the MDSS system will be expanded with new tape technology and disk capacity.

2. Harvard University

The Archive of World Music and its technological partner, Harvard College Library Audio Preservation Services, are both units of the Loeb Music Library (<http://hcl.harvard.edu/loebmusic/>) which, in turn, is a component of the Harvard College Library that serves the Faculty of Arts and Sciences and visiting scholars at Harvard. The Archive of World Music, established in 1976, is devoted to the acquisition, preservation, and use of archival field recordings of musics world-wide as well as to commercial sound recordings, videos, and DVDs of ethnomusicological interest. Among its major collections are the James Rubin Collection of Indian Classical Music (probably the largest collection of Indian classical music in the U.S.), the Kay Kaufman Shelemay Collection of Ethiopic Musics, the Sema Vakf Collection of Turkish Classical Music (probably the largest outside of Turkey), and the Laura Boulton Collection of Byzantine and Eastern Orthodox Chant. Collection development has focused primarily on the Middle East, Asia (broadly understood) and Africa.

The Archive developed the Harvard College Library Audio Preservation Services (HCL APS), a state-of-the-art facility managed by an internationally known engineer. Over the past five years HCL APS has moved toward joining its counterpart, the HCL DIG (Harvard College Library Digital Imaging Group) in providing top quality service and advice for digitizing media. Both work closely with the Harvard University Library Office for Information Systems on matters of building robust infrastructure and sustainable tools for creating and preserving digital objects via the Digital Repository Service.

Substantial grant funding from The Laura Boulton Foundation, the Sema Vakf Foundation and the Harvard University Library Digital Initiative have provided funds for preservation and access to the

AWM's collections and for building substantial infrastructure to support long-term digital preservation. Phase I of *Sound Directions* has advanced Harvard's significant accomplishments developing audio preservation technologies.

The AWM and HCL APS work in the context of an excellent overall preservation program centered in the Weissman Preservation Center (<http://preserve.harvard.edu/hul/overview.html>) directed by Jan Merrill-Oldham who won the 2004 Paul Banks & Carolyn Harris Preservation Award, given by the Association for Library Collections & Technical Services (ALCTS) in recognition of years of excellent leadership in preservation. Merrill-Oldham, with her high standards and vision, has served as a mentor and guide for the development of audio preservation at Harvard. Together they form a leading national preservation program of recognized accomplishment.

The Harvard University Office for Information Systems (<http://hul.harvard.edu/ois/>) coordinates all of the Library's online catalogs (HOLLIS, its MARC catalog, OASIS for finding aids, VIA for visual images, and so forth) as well as the highly regarded Library Digital Initiative (LDI, <http://hul.harvard.edu/ldi/>), the Digital Repository Service, and innumerable tools that sustain and support online resources. Led by Dale Flecker and Tracey Robinson, OIS is home to nationally recognized experts such as Stephen Abrams and Robin Wendler, who will advise the current project. The Library Digital Initiative in some aspects parallels IU's Digital Library Program. Its mandate is to create the technical infrastructure to support the acquisition, organization, delivery, and archiving of digital library materials, provide experts to advise the community on key issues in the digital environment and enrich the Harvard University Library collections with a significant set of digital resources.

The AWM and HCL APS have years of successful experience working with the Library Digital Initiative and OIS. Together we have created significant infrastructure in support of audio preservation including Dmart, a tool for uploading audio files and attendant metadata into the Digital Repository, and an audio processing XML editor (APXE) for the efficient collection of audio metadata.

B. Project Collections

1. Research Value

Because of the vast size of the ATM collections, a carefully designed selection process was central to our preparation for this proposal; this selection process, which evaluated the research value and preservation condition of collections, is detailed in the "Methodology and Standards" section below. In addition, we have taken into account digital repatriation opportunities by researching readily accessible and appropriate points of contact in the source communities where the recordings were made. What has resulted from our process is a body of collections (see Appendix A for a complete list¹¹) which represents some of the ATM's core strengths in terms of geographic area focus, historical depth, collector/scholar distinction and recording formats. Included are collections from around the world, with an emphasis on our geographical area strengths of Native North America and Africa. In support of NEH's "Rediscovering Afghanistan" initiative, included is a collection documenting that country's rich history and culture. The collections represent over half a century of recorded heritage, from the early 1930s through the late 1990s. Among these collections' depositors are renowned scholars Franz Boas, George Herzog, David McAllester, Louis Dupree, Willard Rhodes, Herbert Halpert and Harold Courlander. In terms of recording formats, we have systematically analyzed preservation needs with a tool ("FACET," see below) that was further developed during *Sound Directions* Phase I, and as a result, our selections include lacquer (acetate) and aluminum discs from our vast disc collection, open reel tape and cassettes exhibiting known preservation problems. In short, we are proposing a body of recorded heritage that is of great significance to the humanities and is at great risk of being lost forever if not digitally preserved soon.

In our selection process we construed research value in particular relationship to the notion of cultures in conflict, so as to enable us to continue to build a stockpile of highly valuable digitized collections for

eventual inclusion in the ATM's Cultures in Conflict Digital Archive (CCDA—see detailed description in the Preservation System Methodology section below). Collections we are proposing to digitally preserve include:

- Louis Dupree's 1969 open reel tape recordings of war songs, love songs and epics from Afghanistan. This collection documents traditional music and folklore prior to the 1979 Soviet invasion and subsequent occupation of Afghanistan, as well as musical practices that were banned outright by the Taliban regime which followed the Soviet occupation
- Franz Boas' and George Herzog's collection of Kwakiutl Chief Dan Cranmer performing songs and speech, recorded on aluminum disc in 1938. This collection includes material related to the potlatch, a ceremony that was banned in 1885 by the Canadian Parliament. In fact, a 1922 potlatch hosted by Cranmer was raided, resulting in arrests and the confiscation of 750 objects
- Harold Courlander's collection of political and protest songs and vodon rituals recorded on aluminum disc in Haiti in 1939-40. The political material in this collection was recorded five years following the end of a 19-year U.S. military occupation which was fiercely opposed by many Haitians, thousands of whom died in the conflict
- Willard Rhodes' collection of Lakota music and speech recorded on lacquer disc in 1939 on the Pine Ridge Reservation, where roughly 90% of the population still lives below the poverty line and the life expectancy is among the lowest in the western hemisphere
- Khalil Nakhleh's collection of Palestinian wedding cassette recordings made in Israel in 1971, one of just five accessible recordings of Palestinian Arab music made before 1980. The improvised sung poetry in this collection was, because of instability and travel restrictions, already rare in 1971, and is virtually non-existent today
- Mary Jo Sullivan's collection of political oral histories of Kru people recorded on cassette in Sinoe County, Liberia in 1975-76. Sinoe County was the site of Kru resistance against Americo-Liberian authority during the 1989-1996 civil war
- David Price's 1974 open reel tape recordings, including war customs and war songs, of the Nambiquara in Brazil, whose lives were severely disrupted by environmental changes and land grabs resulting from construction of the Transamazon Highway beginning in 1984

As mentioned above, repatriation possibilities figured heavily in our selection process and we have developed repatriation plans for a number of the collections we have selected for the Preservation Phase. We offer here three examples. Researcher Terrence Bech has located a repatriation site for his collections in conflict-ridden Nepal: the Madan Puraskar Pustakalaya Archives (MPP, <http://www.mpp.org.np/>) in Katmandu. MPP Director Kanak Dixit has expressed great interest in obtaining copies of Bech's recordings, explaining that the MPP "would feel proud and privileged to host the collection and make it available to researchers in music, culture, anthropology, and so on. There is a dramatically shifting landscape in Nepal when it comes to musical culture, and it is doubly important to have the Bech collection available to let us understand who we are here in Nepal and help guide the society during these relentlessly unsettling times." The phrase "unsettling times" also of course describes the situation in Afghanistan, which is recovering from years of war, systematic oppression, and ongoing conflict following the US invasion of 2002. Nancy Dupree, widow of renowned anthropologist Louis Dupree, plans to repatriate his collections to the Afghanistan Centre at Kabul University (ACKU), which "aims to collect and share all types of information, including the preservation of cultural heritage" of the country. Dupree informs us that ACKU is also exploring "e-learning...so as to facilitate interactions between Afghan students and professors with their counterparts abroad." Digital copies of Louis Dupree's collections could play an important role in this initiative. Finally, the Oglala Lakota Archives at Oglala Lakota College on the Pine Ridge Reservation would like copies of the Willard Rhodes collection for purposes of pedagogy and preservation of their cultural heritage. Once such collections are digitally

preserved making access copies on CD-Rs is a simple matter, enabling us to easily meet such repatriation requests.

2. Preservation Condition of Selected Collections

All sound recordings deteriorate over time. Sound archivists, using available research and practical experience, have targeted several formats as particularly unstable and in need of preservation treatment. For example, the International Association of Sound and AudioVisual Archives (IASA), in its document *The Safeguarding of the Audio Heritage: Ethics, Principles and Preservation Strategy*, states that cylinders, lacquer discs, acetate open reel tapes, all long/double/triple play open reel tapes [0.5 and 1.0 mil base], cassette tapes and any carrier showing actual signs of decay “can be considered to be inherently unstable and should, therefore, be copied.” As described in the Methodology section below, the ATM’s Associate Director for Recording Services has drawn upon these types of sources plus additional research to develop the Field Audio Collection Evaluation Tool (FACET) that analyzes the characteristics of, preservation problems with, and modes of deterioration of a variety of field formats. FACET was used to rank ATM field collections by preservation condition to help establish priorities for preservation transfer.

Lacquer (acetate) discs are widely considered by sound archivists as the highest priority format for preservation transfer. This is due to way in which they rapidly deteriorate: the plasticizer migrates out of the lacquer coating causing delamination (cracking) of the coating itself, resulting in loss of content. We have selected a number of key lacquer disc collections for this project, including the Willard Rhodes (54-022-F) and McAllester/Herzog (54-302-F) collections which are experiencing delamination. Once this process starts it is a race against time to save content. Aluminum discs, a field format used primarily in the 1930s, oxidize over time. This format is long obsolete and often presents serious tracking problems during transfer. For this project we have selected some of our most important aluminum disc collections. Two of them—the Boas/Herzog (54-235-F) and Herzog (54-236-F)—are currently backed up only by unstable acetate-based tapes recorded in 1955 and 1962. The best copies of several others are on off-brand acetate tape or tape afflicted with sticky shed syndrome.

Acetate-based open reel tapes are widely known to be unstable, absorbing moisture from the air at a rate 8 times greater than polyester tapes, deteriorating through a process known as hydrolysis. Thinner tapes (both acetate and polyester) with a 0.5 mil or 1 mil base are significantly less stable than 1.5 mil tape bases. Off-brand tapes (either from small manufacturers or rejects from major manufacturers) are also significantly less stable. Tapes with known documented preservation issues such as fungal growth or visible pack problems (such as curling or windowing) also present stability problems and should receive priority treatment. We have selected a number of open reel collections with these problems, such as the Price (85-352-F) collection which contains 0.5 and 1 mil tapes with fungus and severe tape pack problems. The Sapir (70-103-F) collection contains 45 year-old 0.5 and 1 mil off-brand tapes with pack problems—a particularly dangerous combination of characteristics—while the Bech (75-022-F) collection is carried completely on acetate-based tape.

Analog, audio cassette tapes are widely thought to be inherently less stable than other formats and, as stated in the IASA document quoted above, represent a priority for preservation transfer. Thinner tapes (120 minute) are particularly problematic as are specific brands. We have selected, among others, the Sullivan (76-177-F) collection for this project, which consists of 30 year-old off-brand cassettes with reported playback problems, and the Geysbeek (98-379-F) which includes many 120 minute cassettes and many off-brands.

Project collections are presented in more detail in Appendix A. Although digitization of nearly any collection with high research value may be justified to take advantage of access possibilities, we have selected for this project collections that *must* receive preservation treatment in the near-term if their content is to survive at the highest level of quality possible or, in some cases, survive at all.

3. Level of Current Intellectual Access to Selected Collections

The ATM has long been recognized as a leader in providing intellectual access to its field collections. All but one of the collections selected for the Preservation Phase is cataloged and has electronic MARC records that are accessible to the public via Indiana University's online catalog (IUCAT; <http://www.iucat.iu.edu/>). A deeper level of intellectual access to each collection is available onsite at the ATM in the form of detailed tape index sheets, and in some cases, additional documentation such as field notes. The ATM has high standards for documentation, and requires a minimum level of documentation for collections to be eligible for accession. Collections selected for the Preservation Phase all have plentiful documentation, most in excess of the ATM's already substantial minimum requirements.

C. Project Significance

In addition to preserving and providing access to unique, deteriorating, and highly valuable field research collections as described above, this project will make significant contributions to humanities archives pursuing digital preservation of audio and to the wider audio preservation community. Phase I of *Sound Directions* resulted in the development of digital preservation systems and the establishment of best practices in using them. This proposed project provides a model by which such systems may be employed in a full audio preservation and access project using appropriate standards. Because systems and procedures for preserving audio in the digital domain are in an early stage of development, models such as this provide important measures of readiness as well as ideals for institutions following the same path. This project, which necessarily has a small research agenda as justified in the Methodology section below, will also result in both tangible data and tools that will benefit the audio preservation community, which currently lacks much of either. Specifically, this project will result in the public release of an open source software tool for collecting, storing, and transporting standardized technical metadata. This tool was created and initially tested during Phase I of *Sound Directions*. This project will also result in the creation and/or further development of additional tools to support preservation, including applications for ingesting preservation packages into a preservation repository, validating preservation packages, and disseminating information from the repository. Finally, this project will provide specific data on methods to increase throughput within a preservation system. All of these will aid the audio preservation community in its efforts to develop mature, enduring, and sustainable audio preservation systems.

III. History, Scope and Duration

A. Overview

The Preservation Phase of *Sound Directions*, while itself a discrete, stand-alone endeavor, represents just one part of a long-term collaborative project between the ATM and the AWM. Both archives are committed to the value of their long-term collaboration, and to steering *Sound Directions* through the multiple phases that will be necessary for us to meet our goals. Ultimately we see ourselves, through *Sound Directions*, moving from project to program; that is, we are working through a series of phased projects, each of which moves us further toward the establishment of permanent digital audio preservation and access programs at our respective universities. Through successive phases, we will create, test, and establish elements of our new preservation and access systems. At the end of the game, we will have reworked our systems and operations in tune with the shift to digital technologies that is so profoundly impacting our field.

B. Sound Directions Phase I

The *Sound Directions* project was born in March 2003 when Daniel Reed and Virginia Danielson were serving on the Council on Library and Information Resources committee to create a survey tool for academic libraries with audio collections. During a break, Reed and Danielson began discussing plans at their respective archives, realized they were heading in similar directions and immediately saw the potential advantages of collaboration. Points in common included:

- both were conducting digital-only pilot projects
- both were convinced of the need to move toward digital preservation
- both wanted to increase web access to collections
- both had all the resources to accomplish the above—highly valuable, unique collections with critical preservation needs; mass digital storage; exceptional personnel including national leaders in critically important areas (e.g., digital library staff, archival audio engineers)

Over a year of planning ensued. A critical point in the process was when we realized the extent to which emerging standards remained untested in real projects, how little information was available in terms of best practices for digital audio preservation, and the importance of producing interoperable preservation packages. In December 2004 we were awarded full funding for Phase I, which began in February, 2005.

1. Project Goals and Phase I Accomplishments

At this writing Phase I of the *Sound Directions* project is approximately 80% complete. The project has, or will by its end, accomplished all of its primary goals and objectives. Preliminary reports on selected research topics will begin appearing on the *Sound Directions* website in fall, 2006 as part of an early dissemination plan for reporting our findings. A full report, including a publication, is due in early 2007. Phase I of *Sound Directions* has successfully engaged critical parts of the audio preservation community. In addition to the project advisory board, we have so far led conversations with 24 institutions in the US and Canada seeking information on preserving audio in the digital domain. In most cases we have provided specific information to these institutions based on our work on the project. We have presented the Phase I project at the annual conferences of the Society of American Archivists, Music Library Association, Society for Ethnomusicology, Association for Recorded Sound Collections, Midwest Archives Conference, the New England Library Association, and the International Meeting of Electronic Imaging and the Visual Arts. In addition, the Associate Director for Recording Services at the ATM is Co-chair of the ARSC Technical Committee, and the Lead Engineer at the AWM is Chair of an Audio Engineering Society committee creating technical metadata standards, enabling us to draw upon these communities as well. Following is a list of specific project goals and results.

a. Goal: Develop best practices and test emerging standards for archival audio preservation and storage in the digital domain. *Result:* We have developed best practices in many areas including use of the Broadcast Wave file format for preservation, characteristics of preservation master files, capture and storage of technical metadata, quality control, interim storage, creation of preservation packages, the components of a SIP for field audio collections, the interchange of preservation packages between institutions, and preservation workflow, among others. In addition, we have developed practices for meeting a number of existing or emerging standards including AES31-3, AES technical metadata, Broadcast Wave file format, and METS, and have generated technical data on how to implement them.

b. Goal: Establish at each university programs for digital audio preservation that will enable us to continue this work into the future. *Result:* These programs have been successfully established at both Harvard University and Indiana University. They have both already attracted internal and/or private funding to sustain them through an interim phase of development, as described below.

c. Goal: Create compatible Submission Information Packages (SIPs) and interchange preservation packages to insure interoperability and achieve true preservation. *Result:* Sample SIPs for field collections have been created at both Harvard University and Indiana University. We have engaged the National Library of Australia, an international leader in digital preservation for over a decade, in the work of establishing a METS profile for field recording SIPs. The Harvard and Indiana teams met in Bloomington in June, 2006 and worked through many of the issues involved in the exchange of preservation packages. We are currently refining our samples and creating the first full preservation packages in advance of an initial exchange that is scheduled for early fall, 2006.

d. *Goal*: Preserve critically endangered, highly valuable, unique field recordings of extraordinary national interest. *Result*: Even though Phase I is funded as a research and development project, we have completed at IU the preservation transfer of a number of deteriorating field collections of high research value. These include a collection recorded in Afghanistan, Kashmir, and Pakistan in the early 1960s by Louis Dupree; the Alan and Barbara Merriam collection recorded in the Congo in the early 1950s; the Francis Deng collection recorded in Sudan in the 1960s and 70s; and the Henry Glassie collection recorded in Northern Ireland in the early 1970s. At this writing we are beginning transfer of the Lawrence Gellert collection of African American protest songs recorded in the American South in the 1930s. At Harvard, completed collections include Baroness Ullens de Schooten's collection of music from Iran and Iraq in the 1930s-50s; 200 hours of classical South Indian performances from the James Rubin collection; and Jonathan Bobaljik's collection of speech, tales and songs in Iteleman, a fast-disappearing language from Kamchatka, Siberia, 1994-5 as well as a small collections of performances of Turkish and Arab music in Boston and calls-to-prayer recorded by Danielson in Egypt in 1991.

C. *Sound Directions* Interim Phase

The Interim Phase of *Sound Directions* will find the ATM and AWM engaged in related but distinct developments of our respective programs, each with funding from our home institutions. For the Interim Phase, which will run from September 2006 through May 2007, the ATM has secured an \$88,000 research grant from IU's Office of the Vice President for Research while Harvard has two gifts from private donors amounting to \$66,000. The main shared goals of the Interim Phase is to research questions pertaining to preservation that have emerged from Phase I of *Sound Directions* that were not part of our NEH Phase I proposal, and to research questions related to the development of a delivery system that must be explored to enable us to gather specific data needed to provide evidence of a valid concept and solid direction for a future access-focused phase of *Sound Directions*. Further, at Indiana the ATM and the DLP will research ways to extend the Variations system—which has been designed to deliver commercial releases of classical music recordings—to accommodate archival field recording collections. The ATM has engaged a small number of faculty at IU and elsewhere who will act as a user test group to evaluate this provisional delivery system, using ATM collections they have selected for their own research. At Harvard, the AWM will continue its work with multi-media online (EAD) finding aids, submitting these to user critique. The Interim Phase thus serves as a bridge both to the Preservation Phase outlined in this proposal and to a later access-focused phase of *Sound Directions*.

D. Timing and Duration of this Proposed Project

The Preservation Phase of *Sound Directions* is by itself a self-contained, cohesive project that will be 18 months in duration, beginning June 1, 2007 and concluding November 31, 2009.

E. Collaboration between Indiana and Harvard

In the largest sense the primary, shared goal for the collaboration between Indiana University and Harvard University is for two major institutions to work together long-term, sharing as much as possible while developing systems, procedures, and products that are interoperable. Harvard University will act as an unfunded, technical partner on this project, furthering the highly-successful collaboration begun during Phase I and continuing, we expect, into the foreseeable future. Selected Harvard University staff will contribute their considerable expertise and experience in support of the project's technical goals. Achieving these goals, and resolving the research problems associated with them, is mutually advantageous as each institution continues to build robust, enduring, and sustainable preservation systems. Harvard University's contributions are detailed in the section on Methodology, below.

F. Future Directions and Sustainability

Sound Directions has from the beginning been conceived as both a preservation *and* access project. Both aspects have already received significant interest and financial support from Harvard and IU – notably in

the installation of professional quality audio studios with top grade equipment at both institutions. Up to this point, both universities have successfully combined external and internal funding for *Sound Directions*, and each university has already invested substantially in research and development of digital audio preservation and access systems. Harvard's support for OASIS, its catalog for EAD finding aids, is one step in this direction as is IU's investment in Variations. Both institutions plan to maintain digital storage repositories that accommodate multi-media for the long term. Sustainability for the present project work rests on these existing and substantial investments from both universities.

Ideally, the step following the proposed Preservation Phase would involve further external funding for an access-focused phase during which each university would review, update or create robust online systems for accessing archival field recordings and related material in the ways that 21st-century users will need them. In the longer term, our sustainability plan involves asking each university to continue its outstanding support for this work by continuing to provide long-term data storage and repository development and maintenance and by assisting with salaries for the positions found, through grant work, to be necessary.

IV. Methodology and Standards

A. Standards and Best Practices

Formal standards in preservation-related areas are assessed and ratified by bodies such as the International Organization for Standardization (ISO), the National Information Standards Organization (NISO), the World Wide Web Consortium (W3C) and others. Standards crucial to audio preservation are also developed by organizations such as the Audio Engineering Society (AES), the European Broadcasting Union (EBU), the Library of Congress, the Digital Library Federation (DLF) and others that may not be official national or international standards organizations in the strictest sense, but are charged by various constituencies with providing leadership in this area. There are few international standards for audio preservation and even fewer solid best practices documents. Phase I of *Sound Directions* established best practices useful in meeting both existing and emerging standards. The publication of best or recommended practices provides guidance in areas where standards do not yet exist or may never be created. Best practices may also provide strategies, procedures or work plans necessary to successfully implement a standard that has been formally adopted. There are few solid published sets of best practices that address the preservation of audio recordings in the digital domain. Phase I of *Sound Directions* established best practices in several areas where standards do not yet exist.

We will continue to work to international standards and recommended practices while also using the best practice procedures established by Indiana University and Harvard University during Phase I. We are guided by the following documents:

1. IASA (International Association of Sound and AudioVisual Archives) TC-04: Guidelines on the Production and Preservation of Digital Audio Objects

IASA TC-04 is the best high-level recommended practices document available for the preservation of audio in the digital domain. As demonstrated in the section on methodology below, we are in compliance with every guideline in this document. This includes recommendations in the areas of signal extraction from analog sources, specifications for equipment in the digital preservation chain, sample rate and bit depth, characteristics of preservation master files, target preservation file format, guidelines for storage, and others. In effect, best practices developed during Phase I of *Sound Directions* put into action IASA TC-04 principles, using them to produce detailed practices and procedures.

2. Capturing Analog Sound for Digital Preservation: Report of a Roundtable Discussion of Best Practices for Transferring Analog Discs and Tapes. NRPB, CLIR, LC

This report summarized discussions and recommendations from a meeting of audio preservation engineers, including David Ackerman of Harvard, held to assess best practices for capturing sound from analog discs and tapes. Nearly all of the specific procedures discussed in this document are well-known to the audio engineers at Indiana University and Harvard University who have worked with analog media for many years. See the section on preservation transfer below for further information.

3. Broadcast Wave File Format (Bwav)

The Broadcast Wave File format, based on the Microsoft WAVE audio file format, was introduced by the EBU in 1996 to allow files to be exchanged between the increasing number of digital audio workstations used in radio and television production. Bwav is a special type of WAVE file that may contain basic metadata about the audio content that resides with the file itself. Although this is not a destination for the extensive metadata that must be collected during digital preservation projects, the format itself has become a standard in the audio world. In addition to its widespread use in Europe and Australia, it is specifically recommended by IASA, AES, and the National Academy of Recording Arts and Sciences for the archiving of audio.

4. AES (Audio Engineering Society) 31-3-1999

This file exchange standard, published by AES in 1999, is used to model the relationship between the source recording and resulting digital files. It provides a standard way to link the various files that are created, sometimes through multiple stops and starts during transfer of a deteriorating source, thereby reconstructing the source recording. Without it, future researchers are left with one engineer's interpretation of the edit points. This standard may also be used for the temporary, automated collection of marker points based on content in a digital file, depending on a manufacturer's implementation of the standard. During Phase I of *Sound Directions*, best practices for using this standard were developed.

5. AES SC-03-06 Working Group on Digital Library and Archive Systems, Task Group SC-03-06-A Metadata Harmonization

This emerging standard, developed in consultation with the Library of Congress by the AES in a working group chaired by Harvard's David Ackerman, guides the collection of technical metadata for audio objects, including the source recording and file derivatives, as well as the digitizing process. The standard was implemented during Phase I of *Sound Directions* for the first time in a real world project. Indiana University developed software for use by the project engineer during transfer and the project assistant downstream to enable precise and efficient collection of this data.

6. Open Archival Information System (OAIS)

The Open Archival Information System (OAIS) Reference Model is a conceptual framework for an archival system dedicated to preserving and maintaining access to digital information over the long term. It describes the environment in which an archive resides, the functional components of the archive itself, and the information infrastructure supporting the archive's processes. Due in part to endorsement by OCLC and RLG (Research Libraries Group), the OAIS Reference Model is being used by many libraries, archives, and other cultural heritage institutions as a means of defining their own digital preservation infrastructure. Indiana and Harvard are using OAIS concepts in implementing their digital library object repository systems.

7. METS (Metadata Encoding and Transmission Standard)

The Metadata Encoding and Transmission Standard (METS) specifies an XML document format for encoding metadata necessary for both management of digital library objects within a repository and exchange of such objects between repositories, or between repositories and their users. A METS document is capable of packaging together all of the descriptive, administrative, and structural metadata

for a digital object, plus references to the object's data files, or optionally, the data files themselves. METS is frequently used as the wrapper format for OAIS Submission Information Packages (SIPs), Archival Information Packages (AIPs), or Dissemination Information Packages (DIPs). During Phase I of *Sound Directions* we developed a METS profile for audio field collection AIPs and SIPs, which we will continue to refine during the proposed project.

B. Preservation System Methodology at Indiana University

The audio preservation system at the Archives of Traditional Music was developed during Phase I of *Sound Directions*, which was a research and development project. Key components supporting audio preservation were also put into place at the Digital Library Program. The proposed project described in this document provides an opportunity for extended testing of this system, allowing us to assess and report on its efficiency and effectiveness over a longer period of time. Below is a description of this system, which will handle all recordings preserved as part of this project. The processes described below are realizations of existing and emerging standards and best practices developed in the archival and audio engineering communities and, in some cases, by *Sound Directions* Phase I.

1. Selection for Preservation

For several years the ATM has engaged in a selection process that deeply examines both the research value and preservation condition of its field collections. Our holdings are so large that a thoughtful prioritization process is necessary. We also recognize that preservation work is expensive, and that digitization of every recording is not only financially impossible but intellectually unwise, so we endeavored to select those collections that contain critically important cultural documentation residing on at-risk carriers. To do this we developed a points-based ranking system that evaluated the research value of any given field collection along with a separate points-based ranking tool that assessed its preservation condition and level of risk. These two scales carried equal weight and were then combined to provide an overall score that enabled us to rank ATM collections for both research value and preservation condition.

a. Research value. As part of the *Sound Directions* project we are building the Cultures in Conflict Digital Archive (CCDA) which will focus on cultural practices that have been threatened or abolished as a result of conflict. Accordingly, our criteria for evaluating the research value and intellectual merit of field collections were couched in terms of conflict. Specifically, we assessed whether a collection: (1) documented a cultural practice or language that has been lost, endangered, or systematically oppressed as a result of conflict; (2) included expressive culture that was directly related to a particular conflict or was tied to a particular event or period before, during or after conflict; (3) documented traditions, practices or a language that have changed significantly as a result of conflict; (4) represented cultural practices undergoing active revival; (5) provided particularly deep or wide documentation of any tradition(s) related to the above criteria. Points were awarded in each category so that a collection would receive more than five points only in exceptional circumstances.

b. Preservation condition. Over the past two years the ATM's Associate Director for Recording Services (ADRS), Mike Casey, has developed a preservation risk assessment tool called FACET (Field Audio Collection Evaluation Tool), a points-based tool for ranking field collections for the level of deterioration they exhibit and the amount of risk they carry. FACET currently assesses the characteristics of, preservation problems with, and modes of deterioration of the following formats: open reel tape (polyester, acetate, paper, and PVC bases), analog audio cassettes, DAT (Digital Audio Tape), wire recordings, lacquer discs, and aluminum discs. This tool helps collection managers construct a prioritized list of collections by the level of risk they represent, enabling informed selection for preservation. Data for this tool came from a preservation survey conducted in 2002-03, documentation provided by collectors, and new inspections of collections as needed. FACET has been presented at the MLA and ARSC pre-conference workshops and at the Midwest Archives Conference. The tool underwent an intensive second round of development in consultation with archivists, audio preservation engineers, and

librarians as part of Phase I of *Sound Directions*. This led to the creation of a software application that is scheduled for public release in fall, 2006.

c. Selection process. Hundreds of ATM collections were assessed for research value in a process guided by the ATM Director and for preservation condition as directed by the ADRS. The ATM Archivist, with thirty-five years of institutional memory, provided further feedback from her vast knowledge of the collections that led to additional candidates. The Director and the ATM Archivist then reviewed and assessed the results in a painstaking process of comparing collections to make final choices.

2. Intellectual Access

Intellectual access to ATM collections is currently provided through a collection-level MARC record generated by the ATM Librarian. The ATM pioneered the cataloging of audio field collections using MARC in the 1980s. As a result of this work, ATM field collections are available through OCLC's WorldCat and are heavily used by researchers. All project collections but one have already been cataloged and these MARC records will be updated to conform to current cataloging and ATM practices and to incorporate new information discovered during preservation transfer, as necessary.

The ATM is cognizant of the strong trend towards item-level access to archival materials. Currently, under the direction of the ATM Archivist, the ATM creates word-processed "index sheets" providing basic information and navigational milestones for individual tapes within a collection. This information is derived from field notes or other material provided by the collector and represents one interpretation of the basic structure of material in the recording. Index sheets are distributed to users alongside requested copies of recordings, but they are not available for online searching by end users. At the end of the Interim Phase of *Sound Directions* we will have developed specifications for a method by which the information currently being recorded in the index sheets is stored in a machine-readable manner, so that it may be incorporated into a future online access system. This interim method will be implemented as part of this proposed project.

It is premature, however, to propose comprehensive online item-level access to field recordings as part of this phase of *Sound Directions*. Too much is still unknown about user needs for searching field recordings and for online access to contextual materials needed to make sense of a field recording without mediation by an expert archivist. Therefore, as part of the upcoming Interim Phase of *Sound Directions*, we will begin to study the discovery and delivery needs of users of field recordings. It is only with an understanding of the uses of online field recordings that we will be able to develop policies and tools for item-level description and appropriate access mechanisms for these materials in a future access phase of *Sound Directions*.

3. Intellectual Property Issues

All of the collections selected for the Preservation Phase of *Sound Directions* were recorded and deposited before the advent of digital audio systems, the Internet, and the World Wide Web. Making preservation copies, though—the central goal of the Preservation Phase—is something the ATM has always done, and present deposit contracts give us the right to continue to do this in the digital domain. The eventual dramatic expansions of access possible via digital technologies and computer networks, however, represent change of a magnitude that necessitates renegotiation of permissions with rights holders. For this reason, ATM staff recently revised our standard deposit contract to permit us, at a minimum, to offer password-protected access via local area networks on the IU campus, and we are asking rights holders of collections selected for *Sound Directions* to sign this new contract. We are also engaging in conversations with rights holders of *Sound Directions* collections about possible future expansions of access, which will guide our future decisions in this regard. However, the purpose of these conversations is to inform our thinking for the future access phase of *Sound Directions*; the access that we

will offer to these materials during the Preservation Phase is in keeping with the legal and ethical standards, norms and procedures that have always guided our decisions in this area.

In the realm of rights and permissions, however, there is one area in which the ATM will be breaking new ground during the Preservation Phase. Offering digital repatriation copies to certain collections will enable us to collect new, updated and more accurate information about our collections from informed members of the source communities where the recordings were made. Communities themselves have their own local rights customs and regimes that have often not been honored by archives holding recordings representing these communities' heritage. Repatriating materials and consulting local experts will permit us to nuance our access permissions and align them with local customs. Item-level metadata will then afford us the means to track and restrict access. The net result, then, will be dramatic expansions of access in general, and, when necessary, the adoption of ethically and legally sound access restrictions in the rare cases when such restrictions are deemed necessary and appropriate.

4. Pre-transfer Processing and Workflow

Once a collection is selected for preservation work and intellectual access and property issues are addressed, individual recordings enter a specific workflow that includes preparation for preservation transfer, transfer itself with technical metadata collection, quality control procedures, analysis and division of content, and safe interim storage. All recordings are assessed prior to transfer by the ATM Associate Director (Mike Casey), Project Engineer, and Project Assistant during weekly technical team meetings. Assessment at this stage is designed to identify cleaning or other physical restoration that is needed in advance of transfer. It is also designed to place recordings in either a high-maintenance (expert) or a low-maintenance stream depending on known or suspected preservation problems. This will guide individual recordings to preservation transfer by either the engineer or an audio student assistant, or to a simultaneous transfer procedure as appropriate and as detailed below.

Most discs are cleaned prior to transfer using procedures employed at the Library of Congress and other large sound archives. There are no standards for cleaning, but Mr. Casey has nearly 20 years of experience applying currently used procedures to a wide range of disc recordings. Physical restoration—mitigating the effects of tape pack problems such as curling, windowing, or oozing splices for example—is performed by the engineer.

The assistant is responsible for delivering recordings and associated documentation to the preservation studios for transfer at the appropriate time while also managing a workflow database that tracks the status of any given recording over time.

5. Preservation Transfer

a. Staff. Preservation transfer is conducted by an experienced audio engineer trained in both optimal playback of archival field recordings and preservation standards and best practices for digitization. In some cases transfer will be undertaken by an audio student assistant from the IU Recording Arts Department under the direct supervision of the engineer. An audio student assistant will only transfer recordings that have been directed to the low-maintenance stream as part of our research on increasing throughput as discussed below.

b. Equipment. The ATM Preservation Studio is outfitted with professional-level equipment appropriate for use in archival preservation projects including: Studer A810 open reel tape machines with full track, half track, and quarter track playback heads custom-built for the slower tape speeds typically used in field recordings, Technics SP-15 turntables, a KAB EQSMK12 preamp with a flat setting, Mytek converters, a Lynx AES16 audio interface, a variety of styli, microscope for assessing disc grooves, Genelec monitors, a laptop running Spectrafoo software for test/calibration of the studio signal chain, WaveLab 6.0. The second preservation studio that we will install as part of this project will be similarly equipped.

c. Signal chain. The signal chain employed in the ATM Preservation Studio is not only professional, but archivally-appropriate. It is characterized by direct connections from playback machines to the analog-to-digital converter, a parallel test/calibration chain that monitors the performance of the studio signal chain at all times, and the ability to monitor the signal from either the playback machine or the output of the A/D converter.

d. Transfer procedures. The Sound Directions Project Engineer has many years of experience and training as an audio engineer and employs standard, professional techniques as part of the transfer process. Procedures specific to archival work are also employed. Tape machines are aligned using MRL calibration tapes, azimuth of the playback head is adjusted, tracking configuration is assessed using a magnetic viewer, tape thickness is measured using a dial caliper, disc groove problems are assessed using a microscope, disc tracking problems are solved with a variety of techniques including adjustment of anti-skate, along with many other procedures that are employed. The success of these procedures depends in large part on the critical listening abilities of the engineer.

e. Target format. Following international standards, we use the broadcast wave file format as the target format for preservation master files. Limited, basic metadata is entered into the broadcast wave header including a description of the ownership and purpose of the file, the signal chain in use during digitizing, and the date of file creation. More extensive technical metadata is stored elsewhere as described below.

f. Preservation masters. Preservation master files contain unaltered, unmodified, and unedited transfers from the source recording. Any editing or signal processing, both of which are uncommon, is undertaken in derivative copies of the preservation master that are designated for access. These alterations in access files are carefully documented.

g. Technical metadata collection. Technical metadata about the source recording, the digitizing process and all digital files created is collected initially by the engineer during transfer, supplemented and checked downstream by the assistant. We follow the emerging AES metadata standard described in the section on standards above, extending it to include data important to our institution. This metadata is collected with a software tool—ATMC or the Audio Technical Metadata Collector—that was developed as part of Phase I of *Sound Directions*. Data is stored in an Oracle database and can be output as XML in a form that is AES-compliant. This metadata is also stored within a METS document in preservation packages for each source recording.

h. Transfer problems and AES31-3. The ATM uses the AES31-3 standard to preserve edit points resulting from the stopping and starting of the transfer process due to a preservation problem or the changing of a basic characteristic of the source recording, such as playback speed. A new preservation master file is started each time the transfer process is restarted, with appropriate overlap in content from one file to the next. A stitched-together access file is created from the many partial preservation files, and the AES31-3 audio decision list preserves the edit points so that they can be re-done later, if desirable.

i. Data integrity. An MD5 hash (a type of “checksum”) is generated immediately after a file is created to insure data integrity over time. The checksum is verified any time the file is copied to a new location. MD5 hashes are generated for all AES31-3 audio decision lists as well as audio files.

6. Interim Storage

Data from preservation transfer is captured initially on the audio drive of the Preservation Studio computer. Every evening files created during the day are uploaded to the ATM NAS (network attached storage), which is RAID-5 protected, for secure interim storage. The checksum is verified after upload.

Files are maintained on the NAS until our work with them is complete and they are ready for ingest into the preservation repository.

7. Documenting and Dividing Content

While creating the index sheet describing major navigational milestones within a recording, the assistant places markers in the file signifying the beginning or end of each section. An AES31-3 audio decision list is then created which carries the location of these markers. During the upcoming internally-funded Interim Phase of *Sound Directions* we will develop specifications for two software tools that will aid this process: the first will parse the ADL and move the file locations for these markers into the second tool, an interim application designed to provide a more flexible home for this data as described in the section on intellectual access, above. Both of these tools will be implemented during this proposed project.

8. Quality Control

During Phase I of *Sound Directions* we developed quality control protocols for work generated by the engineer and the assistant. Briefly, preservation transfers are completed by a trained audio engineer who monitors the process. Files are checked using a combination of software analysis tools, visual inspection, and spot listening. Technical metadata entry by the engineer is checked by the assistant when she begins the division of content. Her work with files naturally includes significant listening, which serves as a further check of the recording. Content division by the assistant is checked by the ATM Archivist. The Associate Director checks a percentage of the output of both the engineer and assistant, providing additional assessment from ATM permanent staff. The use of MD5 hashes insures data integrity over time. Note that we propose below to explore ways to increase throughput and plan to develop even more sophisticated QC protocols to safeguard the integrity of the files produced as a result.

9. Creation of Preservation Packages

A preservation package (Archival Information Package using OAIS terminology) consists of audio files along with associated technical and descriptive metadata. These packages are ingested into a preservation repository for long-term preservation storage and access. As part of Phase I of *Sound Directions* Indiana University and Harvard collaboratively developed specifications for a preservation package exchange format, developed methods for creating exchangeable packages from local data formats, and performed several rounds of preservation package exchange as a test of the concept. As part of this proposed project, we will develop a module for the audio technical metadata collector that will automate the creation of a preservation package, including the building of a METS document, for ingestion into the preservation repository. Preservation packages will be created for all content generated by this proposed project. After preservation packages are created, they are ingested into a preservation repository for long-term management and storage.

10. Ingestion, Long-term Management and Storage

The IU Digital Library Program is in the process of designing and developing a new technical infrastructure for the storage and delivery of digital library collections, centered around a preservation and access repository implemented using the Fedora open source digital repository platform from Cornell University and the University of Virginia. By late 2007, the DLP will implement a bridge between Fedora and the university's Massive Data Storage Service (MDSS, described earlier) so that the repository may make use of this service for replicated storage of very large files. In addition, services for routine integrity checking of files based on checksums will be provided to ensure the files stored in the repository remain intact. Services for file format and media migration will also be developed in future phases of the infrastructure project to ensure continued availability of the content of digital objects.

In the initial months of the Preservation Phase, during which the MDSS bridge may still be under development, preservation package metadata will be ingested into the Fedora repository while the actual sound files are transferred separately to MDSS via FTP (File Transfer Protocol) for mirrored storage in

Bloomington and Indianapolis. Scripts will be developed that use checksums to ensure that file uploads to MDSS are successful, and all files will be migrated to be under the management of the Fedora repository once that is feasible.

C. Preservation System at Harvard University

At Harvard, preservation parallels the ATM in most respects with some differences in institutional context and approach. Selection proceeds from criteria very like those at IU. Intellectual access to Harvard's collections is provided by collection-level records in our online HOLLIS catalogue. These records carry links to online EAD finding aids for each collection. The finding aids present detailed inventories of the collections with links to images of field notes and audio files (when legally and ethically appropriate) and are also searchable through OASIS, the University's online catalog of electronic finding aids. As at the ATM, AWM's intellectual property decisions are made on a careful case-by-case basis with repatriation an important consideration.

The Audio Preservation Services' methodology, informed by our different perspective and by an appreciation of Indiana University's meticulous approach, focuses on the use of metadata not only as information for an unknown future but also as a vital tool in the day-to-day work of preserving audio treasures. Detailed object and processing metadata allow us to revisit a transfer exactly or to distribute the workload of a large collection of increasingly fragile objects among preservation engineers and media technicians for increased throughput without sacrificing often needed, timely, human intervention. Lead engineer, David Ackerman, has hired and directed programmer Robert La Ferla to create modular, JAVA-based software tools that streamline the collection and creation of metadata as well as enhance production of deliverable audio. This suite of specialized software will be made available to the greater archiving community and especially to archives with fewer resources. We will continue to develop and use tools and processes that eliminate repetitive tasks and apply human talents where they are most effective and least susceptible to fatigue and error, such as object assessment, transfer monitoring, intervention, editing, restoration for deliverable audio and quality control of deposit packages. The opportunity created by Sound Directions for collaborative work, steady communication, comparison of results, and decision-making informed by work at both institutions will demonstrate and document how well different approaches work and what circumstances might indicate the choice of one method over another.

D. Project Research

Systems for preserving audio in the digital domain are in an early stage of development. While it is now widely acknowledged that for both technical and economic reasons digital preservation represents the best way forward, there are currently few tools available for handling, processing, and storing preservation master files and access derivatives. At this stage it is necessary for most, if not all, solid audio preservation projects to have at least a limited research and/or development component, often employing computer programmers for the development of systems and tools. Phase I of *Sound Directions*, a research and development project, afforded us the opportunity to undertake basic research and development on preservation in the digital domain. With this project we developed a preservation transfer system along with preservation tools such as an audio technical metadata collector, as described in more detail below. While this proposed Preservation Phase of *Sound Directions* focuses on preservation transfer of, and access to, deteriorating recordings, we must still develop further tools to insure efficient and enduring long-term preservation. We also must address one critical research issue that was not anticipated and was not funded by the Phase I grant.

1. Increasing Throughput

Research archives such as the ATM—containing nearly 110,000 recordings—hold many thousands of deteriorating items that must be transferred to the digital domain for long-term preservation. Even with a precise selection plan and an efficient transfer system, not all worthy recordings will receive expensive preservation treatment in the near- or medium-term. For this reason many now believe that sound

archives must explore ways to increase throughput while still producing preservation-worthy audio files that do not exhibit a significant drop in quality. Increasing throughput entails undertaking multiple, simultaneous transfers of original recordings. It may also involve managing multiple preservation studios engaged in the same work. Broadcast archives in Europe have successfully explored this approach over the past decade, but research archives have been reluctant to pursue this due to justifiable preservation concerns. However, the recent NRPB/CLIR/LC publication “Capturing Analog Sound for Digital Preservation” recommends as its fourth priority the development of “guidelines for use of automated transfer of analog audio to digital preservation copies.”ⁱⁱⁱ Although the subject of some debate, it appears that the audio preservation engineers whose discussion provided the data for this document recognized that finding defensible ways to increase throughput is absolutely necessary given budget and staffing issues, as well as the magnitude of the audio preservation problem before us.

We are convinced, based on our work in Phase I of *Sound Directions* that a suitable multiple transfer process must be developed if we are to both preserve deteriorating originals in time and provide the content required for future delivery systems. We propose to research the use and management of both an appropriate simultaneous transfer system and multiple preservation studios within one facility engaged in on-going preservation transfer work. We will consult with George Blood’s Safe Sound Archive in Philadelphia which has mastered a multiple transfer/studio model, and with the Library of Congress, which is planning for this at their new facility in Culpeper. The *Sound Directions* project audio engineer will complete transfer work for all items selected for a high-maintenance (expert) stream due to serious preservation problems. Students from the IU Department of Recording Arts, trained and supervised by the engineer, will complete transfer work for some items selected for a low-maintenance stream. We anticipate defining and developing a robust quality control program for both the simultaneous transfer and multiple studio scenarios that addresses whether resulting files are preservation-worthy. Research questions that we propose to address include:

- Which formats are suitable for simultaneous transfer and which are not? What characteristics or preservation issues make simultaneous transfer inadvisable even when the format is suitable?
- Can a robust and precise selection/triage process be developed to identify candidates for multiple transfers while weeding out recordings for which this would be inappropriate? What should be included in a risk assessment report that assigns recordings to a high-maintenance (expert) or low-maintenance transfer stream? What constitutes “like” materials that can be transferred together?
- What monitoring protocol can be used during transfer that will foster the discovery of problems and errors? What types of viewing and listening will this entail?
- What quality control protocols can be established that will insure that preservation standards have been met? What software tools can be used to assist this effort? How much human intervention—critical listening and visual file inspection—is necessary?
- What type of post process is needed to separate audio tracks meant to be played synchronously?
- What types of management strategies are necessary to insure that the output of two studios is of the highest-quality possible? Where are the major workflow bottlenecks?

We will begin answering some of these research questions for one format only--analog audio cassettes--during the *Sound Directions* Interim Phase, funded internally at IU. We will expand this research effort to include other formats, additional questions, and multiple studios as part of this proposed project. This work will make a significant contribution to an area outlined in the NRPB/CLIR/LC report as a top priority. To accomplish this work, the ATM will establish and equip a second preservation studio.

2. Audio Technical Metadata Collector Development for Public Release

During Phase I of *Sound Directions* we developed the Audio Technical Metadata Collector (ATMC) which collects, stores, and outputs data on the source recording of a preservation transfer, the resulting digital files, and the digitizing process itself. ATMC can output AES-compliant XML (see information

on the AES standard, above) for use in preservation packages or for transport to other systems. It stores both AES metadata as well as additional information deemed important by the ATM for use both by researchers accessing digital objects and by staff charged with preservation management of the collections over time. ATMC will parse digital files to generate metadata about them, automatically creating a checksum (MD5) in the process. ATMC was demonstrated at the 2006 ARSC pre-conference workshop, and there are a number of institutions that are ready to make use of it. We will make ATMC available as open-source software, and while we could provide it to interested parties now, it would take a significant amount of technical knowledge and work to make it fully usable in a different institutional setting. We believe that this work is most efficiently done by us and propose an additional round of development for this tool to generalize, document, and configure it to be usable to a wide range of institutions engaged in digitizing their collections. This development will include such tasks as making the backend easier to install and configure, enabling it to work with different databases, and creating more robust error-checking. It will also include testing of the user interface. We have agreements with two institutions to serve as test sites for the development of ATMC—the Southern Folklife Collection in the University Library at the University of North Carolina and the Folklife Center at the University of Maine. Both of these institutions are engaged in digitizing their field collections and are eager to implement a technical metadata solution that is efficient, robust, flexible, and standards-based.

3. Additional Preservation Tools

We must refine existing preservation tools and develop several new ones to continue building a manageable, efficient, and enduring preservation system. We plan to work on the following:

- a. SIP Creation Tool.* This tool, a module of the technical metadata collector, takes audio files along with associated metadata and builds a METS document that functions as a submission information package for ingestion into the preservation repository.
- b. Ingestion Tool.* This tool takes the SIP and ingests the preservation package into the preservation repository. A prototype was developed during Phase I but we will refine it with this project.
- c. Validation Tool.* This tool provides validation for the preservation package, including verifying checksums and references to files, assuring that technical metadata matches file information, assessing whether files meet defined constraints, etc. Because work in this area is at an early stage of development, we will address and answer the question “what does it mean to validate a preservation package.”
- d. Dissemination Tools.* These are tools designed to retrieve items from the preservation repository. We will develop basic dissemination tools during this proposed project, with extended or custom tools awaiting a later phase of *Sound Directions*.

4. Research Contributions from Harvard

Harvard University, in its role as a technical partner for this project, will provide contributions in the following project research areas:

- a. Increasing Throughput.* The Harvard College Library Audio Preservation Services (HCL-APS) will hire additional audio technicians for a second shift in its two preservation studios late this year. In developing this 2-stream/high maintenance-low maintenance production workflow, throughput should increase, and they will face challenges similar to those expected at Indiana University in the areas of workflow management, quality control, and division of labor. Harvard University and Indiana University will collaborate in this area, consulting with each other and exchanging written reports as they move to develop solutions to common problems.
- b. Audio Technical Metadata Collector Development for Public Release.* David Ackerman, lead audio preservation engineer at Harvard University and manager of HCL-APS, developed and wrote the xml schemas for the two emerging technical metadata standards from the Audio Engineering Society. Because one of ATMC’s functions is to output AES-compliant technical metadata, we will make use of

Ackerman's expertise in preparing this tool for public release. At this writing, the first of the AES standards is ready to move beyond working group status with potential ratification as a standard within a year. The second is not far behind.

c. Additional Preservation Tools. Both Harvard University and Indiana University will continue to develop tools to support preservation activities after Phase I of *Sound Direction* ends. During this proposed project, the Harvard University tools will be made available to IU, who will evaluate them for potential use in its preservation system.

d. Exchange of Content. Harvard University and Indiana University hold related content that must be exchanged for reasons of both preservation and access. The following two cases exemplify the importance of the interoperable exchange capabilities being developed through *Sound Directions*. The AWM is engaged in digitally preserving the famous collection of instantaneous discs recorded by Milman Parry and Albert Lord of Serbo-Croatian epics and folk music. Certain of these discs have proved unplayable. The ATM, fortunately, has disc copies of this collection which will be digitally preserved and exchanged with Harvard during the Preservation Phase, thus saving content that would otherwise be lost, and restoring a complete version of the collection at Harvard. Additionally, the ATM digitally preserved Harvard ethnomusicologist Kay Kaufman Shelemay's collection of Falasha Jewish music from Ethiopia during Phase I. Shelemay has indicated her need for access to digital copies of her collection for purposes of research and teaching at Harvard; the ATM will provide such access during the Preservation Phase. Both the Parry/Lord and Shelemay collections will serve as excellent case studies to test our exchange systems, as both are free of rights problems, and there is a clear need for the content of each to be shared between the two institutions. Our vehicle for exchanging content, as established during Phase I of *Sound Directions*, is through preservation packages that are ingested into each other's preservation repositories. For this project we will take this interchange one step further: in addition to ingesting the packages into our respective repositories as we did in Phase I, Harvard University will also disseminate them back out in a form that can (and will) be used by a researcher. This will provide additional experience in assuring true preservation through interoperability.

V. Work Plan

A. Preservation Transfer

Appendix A presents a list of collections that we will transfer as part of this project. To estimate the time it will take to transfer a field collection we first calculate its playback time. In our experience, similar to reports from other archives, it takes 3.5 hours for the project engineer to optimally transfer and process 1 hour of a source open reel tape, 2.5 hours for a cassette, and 13 hours for a lacquer or aluminum disc. Note that a range of problems are often encountered with field discs and it can take a great deal of time to resolve them. These ratios—3.5:1, 2.5:1, and 13:1—represent the time needed to assess the recording (determine tracking configuration or examine disc grooves under the microscope, for example), resolve issues (tape pack problems or disc tracking problems), set up the playback machine and signal chain, transfer, gather technical metadata, generate checksums, parse the resulting digital files, and move files to interim storage. These ratios represent an average—collections with serious preservation problems may take much longer while those with no problems usually require less time. We have used these ratios to determine estimated transfer times for each collection as listed in Appendix A. Work in the ATM Preservation Studio is scheduled by format. For example, a number of open reel tape collections will be transferred before re-configuring for discs or cassettes, allowing for more efficient work. The Project Assistant manages workflow in the Preservation Studio. Because experienced project staff is already in place, we will begin transfer work immediately upon startup of the grant.

B. Project Research

Project research on methods to increase throughput within the preservation system will be led by the ATM's Associate Director for Recording Services, Mike Casey, with the Project Engineer and Project

Assistant. As detailed on the timeline below, a second preservation studio will be installed in the third month of the project with audio student assistants beginning work at the four month point. Research on increasing throughput will begin during the third month and will be on-going until approximately the seven month point.

Research involving the development or creation of tools to support the preservation system will be carried out by the Project Programmer working with Mr. Casey, under the supervision of the Associate Director for Technology at the Digital Library Program. The *Sound Directions* Programmer is currently employed half-time on another DLP project and we will maintain this arrangement through the first six months of the project, after which this position will become full-time. This works well with both our schedule and the total number of programming hours (less than full-time over the life of the project) that we believe is necessary for the designated work. The Programmer will begin by creating an automated SIP ingestion tool within our technical metadata tool so that preservation packages may be created for completed collections. Work will then move to developing the metadata tool for public release so that testing may begin at project test sites. Work will then begin on additional tools to support preservation work.

C. Timeline

Months 1 and 2 (June-July, 2007)

- Preservation transfer begins (Grant staff and studio already in place from previous project)
- Programmer begins creating automated SIP ingestion tool
- Equipment for second studio ordered by ATM Associate Director and Project Engineer

Month 3 (August, 2007)

- Second preservation studio installed
- Research by Associate Director and Project Engineer on increasing throughput begins

Month 4 (September, 2007)

- Audio student assistants and project student assistant begin work
- Development work on ATMC (technical metadata tool) begins
- Planning with test sites begins, coordinated by Project Assistant and supported by Programmer

Months 5 and 6 (October-November, 2007)

- Meetings with Harvard *Sound Directions* team takes place in Bloomington

Month 7 (December, 2007)

- Project Programmer position moves to full-time
- Programmer begins work on additional preservation tools
- Testing of metadata tool begins at remote sites

Month 8-13 (January, 2008)

- Planning with repatriation communities begins in Month 8, coordinated by Project Assistant
- Preliminary report on increasing throughput posted on Sound Directions website
- All other grant activities continue

Months 14-17 (June-October, 2008)

- Preservation packages exchanged with Harvard
- Delivery to repatriation communities
- Metadata tool (ATMC) released publicly as open source software

Month 18 (November, 2008)

- Reporting and wrap-up

VI. Staff

A. Indiana University

1. Principal Investigator. Daniel B. Reed, Director, ATM .15 FTE /18 months.

Ethnomusicologist Reed has experience on several digital archiving projects, including the NEH-funded CD-ROM *Music and Culture of West Africa: The Straus Expedition* (Indiana University Press 2002), the IMLS-funded Hoagy Carmichael Digitization Project, the LSTA-funded Starr-Gennett Digital Archive, the Mellon-funded Ethnomusicological Video for Instruction and Analysis Digital Archive (EVIADA), and Phase I of *Sound Directions*. Reed also served on the advisory committee for the Council on Library and Information Resources which created and evaluated the results of a survey tool to assess the state of audio collections in academic libraries around the U.S.

2. Project Manager. Mike Casey, Associate Director for Recording Services, ATM. .40 FTE /18 months.

Mike Casey will serve as project manager for the grant, guiding day-to-day work at the ATM while coordinating priorities and monitoring progress at the Digital Library Program. He will directly supervise the Project Engineer and the Project Assistant, assuming overall responsibility for quality control of preservation transfer work and post-processing. He will also lead research efforts on increasing throughput and guide the development of ATMC for public release. Mike Casey has training and experience as both an audio engineer and a sound archivist. At the ATM he manages or performs all access/preservation transfer and restoration work for its 110,000 audio recordings dating from the 1890's to the present. From 1987 to 1993 he headed the Southern Folklife Collection in the Manuscripts Department at the University of North Carolina as the Department's Sound and Image Librarian. From 1994 to 1998 he worked part-time at UNC as a preservation transfer engineer while pursuing a music career. At UNC he completed several successful analog preservation projects, gaining extensive experience in the physical restoration and playback of deteriorating discs and tapes. He is currently Co-chair of the ARSC Technical Committee and is an active member of the AES working group developing emerging standards for audio technical metadata.

3. Project Engineer. Paul Mahern, Sound Directions Project Audio Engineer, ATM. 1 FTE /18 months.

Audio engineer Paul Mahern was hired as the *Sound Directions* engineer in September, 2005, coming to this position with 23 years of experience in the audio industry. He has recorded and/or produced a number of major label artists and completed a large archiving project for the Farm Aid concert series. During Phase I of *Sound Directions* he was responsible for preservation transfer of deteriorating open reel tapes and analog audio cassettes as well as lacquer and aluminum discs. Working with the ATM's Associate Director, he also undertook research in many parts of the preservation chain to develop best practices and test emerging standards. In June, 2006, Mr. Mahern completed two days of training with disc consultant Eric Jacobs, focusing on diagnosing problems with, and developing transfer strategies for, field discs. In this proposed project Paul Mahern will again be responsible for preservation transfer work as well as project research on increasing throughput. In addition, he will train and directly supervise the audio student assistants including performing quality control for their work.

4. Project Assistant. Ronda Sewald, Sound Directions Project Assistant, ATM. 1 FTE /18 months.

Ronda Sewald was hired as the *Sound Directions* PA in September, 2005. She holds masters degrees in both Library Science and Ethnomusicology, worked in the ATM Library part-time for five years, and completed a year-long stint as a graduate assistant in Recording Services. During Phase I of *Sound Directions* she was responsible for managing workflow in the preservation studio, tracking work tasks with a workflow database, dividing content and generating item-level indexes for all digital files, creating AES31-3 ADLs for all files, and performing quality control in various areas. Her responsibilities for this proposed project will be similar but, in addition, she will train and supervise the project student assistant as well as coordinate communication with both ATMC test sites and repatriation communities.

5. Project Programmer. Jim Halliday, Sound Directions Programmer, DLP. .5 FTE for 6 months followed by 1 FTE for 12 months.

Jim Halliday was hired as the *Sound Directions* programmer in May, 2005, working half-time. Prior to this position, he worked on the IU Variations2 development team for four years to create an integrated application for searching, viewing, listening to, and interacting with music. He has extensive experience with Java, QuickTime, QuickTime for Java, XML, XSLT, HTML, and C++. He also holds a masters degree in Music from the Indiana University School of Music. During Phase I of *Sound Directions* Mr. Halliday was responsible for developing the technical metadata tool, contributing to the development of specifications for an exchangeable preservation package, constructing packages to be exchanged with Harvard, and participating in the test exchanges of these items. For this proposed project he will be responsible for programming work in the development of ATMC for public release and the creation of applications to support the preservation process including SIP creation, ingestion, validation, and beginning dissemination tools. He will also provide technical support to ATMC test sites.

6. Digital Library Program Project Coordinator. Jon Dunn, Associate Director for Technology, Digital Library Program. .08 FTE /18 months.

Jon Dunn will serve as project coordinator for the work being carried out in the Indiana University Digital Library Program and will supervise the Programmer / Database Specialist. With the Programmer and in cooperation with the Project Manager, he will be responsible for Indiana's research and development related to preservation packages and long-term storage, and for the integration of support for the technical best practices and standards choices developed in this project into Indiana University's digital repository architecture. Jon Dunn has worked in digital music libraries for the past ten years, initially as technical director of the Indiana University Music Library's Variations digital audio library system, and more recently in IU's Digital Library Program, where he oversees technical work, including software development, system administration, and standards adoption, and is leading the development of an integrated digital library infrastructure for the university. He also serves as Project Director for the IMLS-funded Variations3 digital music library project and the Mellon-funded project *Integrating Licensed Library Resources with Sakai*, chairs the Digital Library Federation Aquifer project's technology/architecture working group, and served as Executive Investigator and Lead Technical Investigator for IU's NSF-funded Variations2 digital music library research and development project.

7. Metadata Consultant. Jenn Riley, Metadata Librarian, Digital Library Program. .05 FTE /18 months.

Jenn Riley is the Metadata Librarian with the Digital Library Program at Indiana University, where she is responsible for planning metadata strategy for digital library projects and participates in the collaborative design of digital library systems. Much of her recent effort has been working towards the cost-effective creation of "shareable" metadata, promoting re-use of descriptive metadata in new and unanticipated environments. She was a major contributor to the emerging metadata guidelines Best Practices for OAI Data Provider Implementations and Shareable Metadata and Digital Library Federation MODS Implementation Guidelines for Cultural Heritage Materials. Jenn's research interests also include the incorporation of thesaurus structures into search and browse systems, music digital libraries, and FRBR. Jenn is the author of the blog *Inquiring Librarian* where her posts frequently center around improving intellectual access to library materials, and a contributor to the collaborative *Blog and Wiki TechEssence*, a technology resource for library administrators. In addition to an M.L.S from Indiana University, she holds a B.M. in Music Education from the University of Miami (FL) and an M.A. in Musicology from Indiana University.

8. ATM Archivist. Marilyn Graf. .10 FTE /18 months.

During the past fourteen years of her tenure at the ATM, Marilyn Graf has assisted in setting and maintaining standards for the documentation of collections and has approved the content of all public information about the collections. She will participate in the grant by providing instructions for the

treatment and presentation of the collectors' documentation and by checking the finished indexes and divisions of recorded content created by the Project Assistant and the Project Student Assistant.

9. ATM Librarian. Suzanne Mudge. .10 FTE /18 months.

Suzanne Mudge will participate as needed on all issues of MARC cataloging, authority work, and archival access standards. With 12 years of experience as the ATM librarian and cataloger, Mudge is an active participant in Name Authority Cooperative Program (NACO) and works extensively with other librarians and scholars to develop descriptive cataloging standards and subject access for complex field collections. She has served as author, manager, cataloger, and consultant in numerous successful Archives grant projects, including ones funded by NEH, LSTA, and IMLS. She is currently a consultant and cataloger for the EVIADA project, leading its work on controlled vocabulary for effective searching.

10. Audio Student Assistants. One assistant at 15 hours/week during fall, 2007 followed by two during spring, 2008, summer, 2008 and fall, 2008 semesters.

Student assistants will be hired on an hourly basis from the IU Department of Recording Arts in the School of Music to work in the second ATM preservation studio. These students will have achieved competence in basic audio engineering and will be trained and directly supervised by the Project Engineer. They will be responsible for preservation transfer of recordings selected for the low maintenance or non-expert stream that will be channeled into this studio.

11. Project Student Assistant. One assistant at 15 hours/week during fall, 2007, spring, 2008, summer, 2008 and fall, 2008 semesters.

One student assistant will be hired on an hourly basis to work under the Project Assistant, helping divide content for the many additional digital files that will be produced in the second preservation studio by audio student assistants and as a result of simultaneous transfer. This student will likely be hired from the IU Ethnomusicology Department and will have some demonstrated subject expertise as well as experience with audio.

B. Harvard University

1. Harvard Project Coordinator. Virginia Danielson, Richard F. French Librarian and Curator of the Archive of World Music. .10 FTE /18 months

An ethnomusicologist by training, Danielson has overseen the development of a state-of-the-art audio preservation studio at Harvard and launched the production of research-intensive multi-media documents constructed to international standards. She has served on the Board of the Association for Recorded Sound Collections and is an active member of the International Association of Sound Archives. She has authored a number of reports and articles dealing with digital access to multi-media collections, notably "Stating the Obvious: Lessons Learned Attempting Access to Archival Audio Recordings" the lead article in the collection *Folk Heritage Collections in Crisis* (Washington D.C.: Council on Library and Information Resources, 2001). As director of the Loeb Music Library at Harvard, she is responsible for a budget of \$1.5 million and supervises 22 staff members. From 1988-1992 she administered a succession of federal grants to the Music Library for the purpose of retrospective conversion of music resources.

2. Lead engineer. David Ackerman, Audio Preservation Engineer. .05 FTE /18 months.

Ackerman will guide the technological aspects of this project at Harvard. Working with Mike Casey, he will frame the research questions, plan and supervise the work, and create the reports for the project. Ackerman is internationally known for his work on audio preservation metadata. At Harvard he designed and installed a state-of-the-art audio preservation studio; he performs or oversees all audio preservation projects in the Harvard College Library. He led the project "Music from the Archive" which contributed substantially to the development of standards for audio metadata, and created software for the collection of metadata and for the deposit of audio files in the Digital Repository as well as an internal SIP for the deposit of archival audio in the Repository. He has extensive experience reformatting virtually all forms

of audio tape and discs. Ackerman chairs the Audio Engineering Society's Working Group on Digital Library and Archive Systems, Task Group SC-03-06-A Metadata Harmonization.

3. Project Engineer. Bruce Gordon. .15 FTE /18 months.

Bruce Gordon has served as *Sound Directions*' Project Engineer since June 2005. He came to the project as a seasoned professional audio engineer with 25 years experience recording, editing, mixing and restoring audio in a wide variety of formats. Having begun his career before digital audio was widely adopted, he is intimately familiar with the problems associated with analog tape and other historic formats. Gordon's background includes designing, creating and managing audio studios and maintaining high production standards. With this experience he routinely questions and challenges assumptions in a way that is productive for research in archival audio preservation.

VII. Dissemination

End results for this project fall into two categories: preservation of content and project research findings. Our dissemination plan considers both.

A. Preservation of Content

1. Repatriation

As discussed in the section on significance above, digitized versions of a number of collections will be repatriated to their respective source communities. It is likely this will be done via CD-R's, although a specific plan will be developed with each community once the project begins. This represents a highly valuable use of our materials, often leading to a re-introduction of cultural practices lost or diminished.

2. Scholars

We will publicize the availability of preserved content by developing specific publicity releases for various genres and targeting them to scholarly communities. For example, a release focused on the many Native American collections that we will preserve will be sent to the listserv of the Society for the Study of Indigenous Languages of the Americas, while collections with African content we will publicize to the listservs of the African Studies Association and H-Africa. We will also send general releases about the project to the listservs of the Society for Ethnomusicology, American Folklore Society, and the American Anthropological Association.

B. Project Research

1. *Sound Directions* Website

The results of our project research will be published on the existing *Sound Directions* website, which is already widely consulted by archivists, librarians, preservationists, and others concerned with digital preservation issues. For example, the *Sound Directions* home page was accessed 10,145 times from February, 2005 to May, 2006. We regularly receive questions and inquiries generated from the content on the website.

2. Organizations

We will formally notify various professional organizations when the project is nearing completion. We will also propose panels and talks to enable direct communication with potential users of our results. We will communicate about this project through the listservs and annual conferences of the following organizations: Association for Recorded Sound Collections (Mike Casey is Co-chair of the ARSC Technical Committee), Society of American Archivists, American Library Association, International Association of Sound Archives, Digital Library Federation, METS implementation registry at the Library of Congress, METS profile registry at the LC Network Development and MARC Standards Office, and the Joint Conference on Digital Libraries.

ⁱ Cohen, Elizabeth. "Preservation of Audio." *Folk Heritage Collections in Crisis*. Washington, D.C. Council on Library and Information Resources, 2001. Page 26.

ⁱⁱ During *Sound Directions* Phase II, Audio Preservation Services at Harvard will be working on four very large and unique collections of high value to the humanities and for which there is international demand on a weekly if not daily basis. These collections for the most part complement the selections made by IU's ATM and include

1. ***The Milman Parry Collection of Oral Literature***: the largest collection of South Slavic heroic song in the world, dating from 1935 (upon which Albert Lord's ground-breaking book on oral composition, *The Singer of Tales*, was based);
2. ***The Collections of the Woodberry Poetry Room***: consisting of thousands of hours of readings by poets visiting Harvard, dating from the 1930s, including such luminaries as T.S. Eliot and Seamus Heaney;
3. ***Iranian Oral History***: 900 recordings from the last quarter of the 20th century documenting the lives and circumstances of Iranians during a period of great socio-political change; and
4. ***Middle Eastern and Asian Collections from the Archive of World Music***: including the Stephen Blum Collection of Music from Meshed, Iran (1969-79), the Richard K. Wolf Collection featuring field recordings from India and Pakistan, and rare commercial recordings from Turkey and the Arab world dating from the early 20th century and including a number for which master recordings are long lost.

ⁱⁱⁱ *Capturing Analog Sound for Digital Preservation: Report of a Roundtable Discussion of Best Practices for Transferring Analog Discs and Tapes*. Washington D.C. Council on Library and Information Resources and Library of Congress, March 2006. Page 14.