
I D E A M A

INTERNATIONAL DIGITAL ELECTROACOUSTIC MUSIC ARCHIVE

By Jeffrey Earnest

The International Digital ElectroAcoustic Music Archive (IDEAMA) exists to identify and preserve the important compositions of electroacoustic music. Founded in December 1990, IDEAMA is a collaborative project of The Center for Computer Research in Music and Acoustics (CCRMA) at Stanford University and the Zentrum für Kunst und Medientechnologie (ZKM) in Karlsruhe Germany.

The development of an electroacoustic music technology has been one of the most important contributions of the twentieth century to the history of music. Today electroacoustic music has entered the sound vocabulary of everyday life, with its use in rock music, television, and films. The technology involved has made it possible to access, analyze, and control a variety of sound parameters in ways not conceived of before this century. Its impact on how composers think about musical structure and style is incalculable. That we should wish to preserve this music for future listeners and scholars is unquestioned.

Preservation is a topic central to the library profession today and crucial to our society as a whole. The print collections of our libraries and archives—which contain the intellectual heritage of many cultures—are rapidly deteriorating because of the acidic content of the paper used in printed books from the 19th century to the present day. The technological solutions to this problem are by now fairly well advanced, although the magnitude of the problem is immense and severely challenges the capabilities of the technology by the sheer mass of materials involved. The situation with sound recordings, on the other hand, is somewhat different. Music librarians and sound recordings collectors have been aware for years of the delicate nature of sound recordings and the need to preserve them in order to document musical culture and performance practice. This realization, however, has been long in coming to the library world at large, which has often seen sound recordings as both ephemeral and expendable. Preservation work for sound recordings by-and-large has originated with the sound recordings specialists in sound archives and music libraries who have developed successful techniques for preserving the common 78 and 33 1/3 rpm commercial discs. Unpublished materials, however—such as recordings of radio programs, recordings of concerts, and ethnomusicological field recordings—are those most truly at risk. They often exist in a single location and usually are available only on the most volatile of storage media, magnetic tape. The preservation of these materials presents many problems, two of which are especially germane to the discussion here. Preservation activities for such materials are almost exclusively organized on an institutional basis, for no comprehen-

sive preservation program to preserve all tapes in all archives and libraries has been undertaken. Therefore, they do not target for preservation classes of materials across library and national boundaries. Waiting for each library and archive to preserve its collection puts at great risk the continuing existence of the most vulnerable materials. In addition, many master tapes of electroacoustic music exist not in libraries and archives, but in radio and electronic music studios, organizations that are not in the library preservation pipeline. Secondly, preservation efforts to date have almost exclusively involved making analog tape copies. Such action is not true preservation; it merely delays deterioration. Because the transfer is to the same volatile medium, the process must be repeated periodically to insure continued viability of the medium. And even given periodic re-recording, a certain percentage of the audio fidelity is lost with each dub because of the nature of the analog recording process. The eventual result will be the loss of the content.

IDEAMA was created to solve such problems. Composers have been using electronic equipment to create music since the early 1940s. Today the term “electroacoustic music” refers to music produced or altered by electrical means such as tape recorders, synthesizers, and computers. The works to be preserved by IDEAMA are largely those whose representation is stored as sound and not as conventional notation. Electroacoustic music represents an extremely important portion of the 20th century musical repertoire, a body of materials united by a common genesis, but widely dispersed throughout the world. Its very nature—as electronically generated or manipulated sound—demands and accommodates faithful reproduction for centuries to come. Targeting materials, preserving their essential content, and making them available for research are the purposes of the project. Converting the works to the digital storage format will guard against degradation of the sound through copying and the ravages of time. It is important to emphasize that IDEAMA is a purely digital archive, and one of the first of its kind. Unlike the conventional archive—wherein the original is usually preserved in the best possible state even after a copy has been made—IDEAMA will house only the digital copies; the original analog tapes are returned to their owners after transfer into digital form. The same process will be used for any auxiliary paper materials, such as scores and program notes, preserved in the archive. They will be scanned and stored in digital format. No paper will be housed in IDEAMA.

THE SOUND ARCHIVE

Most of the early works targeted for preservation in IDEAMA exist only on the analog tapes upon which they were originally produced. Because of the deteriorating condition of the tapes and of the equipment that plays them, the very survival of the works is threatened. Transfer to a permanent digital storage medium will halt this deterioration.

The exact preservation process, although still under consideration, will probably be as follows. The analog tapes will be played on high quality reel-to-reel machines and re-recorded onto an interim digital medium, probably digital audio tape (DAT) cassettes. If desirable, the sound will then be filtered and cleaned in preparation for transfer to a more permanent digital medium such as a form of WORM (write once read many times) compact disc. A professional system would include a basic software package/audio card, a PQ editing package to set track and index information, an audio hard disk (1.6 gigabytes for 90 minutes of stereo sound), at least one CD printer/writer, a Macintosh II computer, and an A-to-D converter. Although CDs have a low media cost (approximately \$0.02 per minute), they are typically available only in large volumes. The

economic and archival feasibility of CD WORM technology currently is being evaluated at ZKM. In addition, the problem presented by multi-channel works has yet to be solved. Commercial multi-track digital recording systems, for example the Alesis ADAT Digital Audio Recorder, are available, but more research must be done to determine the viability and cost effectiveness of such systems. Although some form of DAT tape will be used to capture initially the sound, it is important to note that DAT is still magnetic tape and subject to the weaknesses of that physical medium. It is intended to serve merely as a temporary capture and storage medium.

IDEAMA will allow composers' involvement in the process described above, for example to assure proper dynamic levels. No "recomposition," however, is planned for this stage. IDEAMA exists for the purpose of documenting and preserving the historic record, and while provision may be made for the storage of various versions of a piece, inclusion of "new" versions must be approved by the IDEAMA boards and selection committees.

Digital technology makes possible the indefinite storage and duplication of materials with no loss of content or sound quality, but this technology will not remain static. Since today's state-of-the-art is often tomorrow's white elephant, the entire archive is being designed to be remastered as a whole to the best technology available at any time. Stability of the storage medium will be monitored constantly by the use of the REED/SOLOMON code, an error detection method that provides an alert to the beginning of deterioration in the digital signals. The code will be run against a work every time it is played at an IDEAMA branch, and can be run against the entire database at regular intervals.

THE TARGET COLLECTION:

The most important electroacoustic music works, the target collection, form the core of the archive. CCRMA and ZKM, as founding institutions, have specific regional collecting responsibilities: CCRMA for electroacoustic music from the Americas, Asia, and Australia, and ZKM for electroacoustic music from Europe. Each founding institution has a selection committee that identifies, locates, and selects materials appropriate for inclusion in the archive. To date, they have identified approximately 800 works. The committees also assist in formulating the criteria by which works are selected for the archive, primary among these being of historical and musical significance. Important works that are at the greatest risk are to be given priority. Once the target collection is preserved, more recently composed works will be added so that the entire field from its inception to the present day is represented.

Sources of works:

The original analog tapes for target collection works reside in a number of libraries, archives, radio stations, studios, and private collections. IDEAMA is negotiating with these institutions for permission to preserve the works in IDEAMA. The following sources are the major ones for the area of the world that is CCRMA's responsibility.

Several works produced at the San Francisco Tape Music Center are now available through the Mills College Tape Music Center, Oakland, California and the University of California at San Diego Music Library. Among the composers represented are Pauline Oliveros, John Cage, and Morton Subotnick. The synthesizer created for the center by Don Buchla was one of the earliest full synthesizers.

The Columbia/Princeton Studio, Columbia University was the first major center for electroacoustic music in the United States. The target collection will include approxi-

mately 40 of the works produced there. Among the composers represented are Bulent Arel, Milton Babbitt, Mario Davidowsky, Charles Dodge, Jacob Druckman, Otto Luening, and collaborations of Luening and Vladimir Ussachevsky. The center also houses some 50 hours of taped European radio broadcasts of important works by Stockhausen, Ligeti, and others not available elsewhere. The collection was recorded by Jaap Spek, a technician who worked with Stockhausen.

The Library of Congress (LC) has acquired from the Columbia/Princeton Studio approximately 30 works by Ussachevsky. LC holds the copyright, and has given IDEAMA permission to digitize them for the target collection.

Bell Laboratories, Murray Hill, N.J. was the site of the first synthesization of sound by computers. The earliest computer programs to generate music digitally were developed there by Max Mathews. The works produced there are now in the collection of Mathews and CCRMA. Approximately 50 of the earliest examples of computer generated electroacoustic music by Mathews, Jean-Claude Risset, and James Tenney will be included in the target collection.

A number of significant works by Canadian composers, including Hugh Le Cain and István Anhalt, are available through the National Library of Canada. The Laboratorio de Investigacion y Produccion Musical (LIPM) in Buenos Aires, the first major center in Latin America, will digitize 30 works for the target collection. The National Center for Science Information Systems in Tokyo is helping to locate works by Japanese composers. Approximately 25 works by Toru Takemitsu, Yuji Takahashi, and Toshiro Mayazumi originally produced at NHK Radio and Tokyo Sony Corporation already have been targeted. Research at CCRMA has been initiated to identify Australian works for the target collection, beginning with the Australian National Film and Sound Archive. In addition to works from the electroacoustic music centers discussed above, IDEAMA will also include significant works from the personal collections of composers such as Gordon Mumma (a member of the CCRMA Selection Committee).

Sources for European works include major centers such as the Groupe de Recherches Musicales de l'Institut National de l'Audiovisuel (Paris), Westdeutschen Rundfunks (Köln), and the Studio di fonologia Musicale presso la sede RAI-TV (Milan). In addition, works from the estate of Hermann Heiss will be included.

Many early electroacoustic works also were issued commercially on vinyl discs. Whenever possible, the archive will obtain the master analog tapes of these works and process them in the same way as the works that exist only in tape format. A number of works appropriate for the collection are also currently available on compact disc, including Varese's *Poeme electronique*, Babbitt's *Philomel*, and John Chowning's *Turenas*, *Stria*, *Phone*, and *Sabelithe*. These works—subject to copyright clearance—will become a part of the archive. More recently composed works now available on compact disc will be added to IDEAMA after the initial archive has been established. Toward that eventuality, IDEAMA intends to purchase them now because they quickly go out of print.

THE CATALOG DATABASE

IDEAMA is envisioned as an archive with the widest possible access. Therefore, it eventually will have a number of branches worldwide and a catalog that can be widely accessed. The catalog database for the archive is presently being designed to be consistent with international cataloging and retrieval standards. The core of this database will be machine-readable records for each work in the MARC format (Machine Readable Cataloging). MARC is an international standard for the computer encoding of

bibliographic data. Records in the MARC format are the essence of national and local library databases throughout the world, and the standard facilitates the transmission and sharing of bibliographic data across institutional and national boundaries. In the United States, libraries enter cataloging into large bibliographic databases, primarily the Online Catalog Library Center (OCLC) in Dublin, Ohio and the Research Libraries Information Network (RLIN) in Mountain View, California. These computer records are available online to libraries for use in their local catalogs and to scholars for research; the databases signal the location of materials that may not be held locally. The international standard of the MARC format has made possible the expansion of these databases outside the United States. OCLC now has a substantial presence in Europe, and the British Library recently has become a full partner in the Research Libraries Group (parent institution to RLIN).

For compositions collected by IDEAMA at CCRMA, project staff plan to create a MARC catalog database. The works will be cataloged at the Stanford University Music Library, using the Stanford University Libraries' local system. The bibliographic records, conforming to standard library cataloging conventions, will contain special fields with information on ownership of the original tape, multiple versions of works, studio production techniques, equipment, and performance history. The completed catalog records will be transmitted to both OCLC and RLIN as part of Stanford's cooperative cataloging operations. Once in these databases, the records can serve to signal the presence of the electroacoustic works in IDEAMA to individuals searching for information on IDEAMA and on the composers represented in the collection. ZKM's plans for a catalog database, although different from CCRMA's, include compatibility with MARC in order to facilitate the transfer of data. In the United States the records for the ZKM works will be distributed to OCLC and RLIN. It also is hoped that the catalog database can be made widely available to scholars through the INTERNET, a network for the sharing of electronic data, now accessible internationally.

THE IMAGE DATABASE

As mentioned above, written documentation and scores (if available) also will be stored in IDEAMA in machine-readable form. Since the MARC format is merely a storage and retrieval medium for bibliographic data *about* items, it will not accommodate such extensive textual materials. These materials will undoubtedly be housed in some type of image database. Such databases currently are undergoing rapid evolution, and IDEAMA is investigating what kind of system to use. As with the sound archive, the storage and retrieval methods used for image data will evolve with technology and undoubtedly demand periodic migrations to new systems.

THE INTEGRATED IDEAMA DATABASE

At the present state of technology¹, IDEAMA will consist of three databases: sound archive, catalog database, and image database. The most important consideration initially is the creation of the databases; integration can follow. Materials on each work in the separate databases, however, will carry linking identifiers so that a person searching one database can discover the existence of information in the others. Eventually, as technology changes, the databases will be integrated in an increasingly transparent way. The catalog data is intended to function as the heart of this integrated system at each IDEAMA site. The MARC records residing in the catalog database will point to the sound recording and to any image data available. The researcher may then bring to a single terminal all available information about each work, including the

complete text of any written material, the score, and the actual sound recording. Scholars will be able for the first time to locate in one place materials that represent the entire history of the field of electroacoustic music.

Archive materials will not circulate. IDEAMA intends to function neither as publisher nor mass disseminator of the materials preserved therein or as administrator of royalty and performance rights. As part of the collection process, however, IDEAMA does intend to research copyright ownership and request permission of the copyright owner to copy and distribute materials for private research, classroom and lecture presentation, and IDEAMA-sponsored performances.

THE STRUCTURE OF IDEAMA

As mentioned above, CCRMA and ZKM have specific regional collecting responsibilities. All works digitized by each institution will be transmitted regularly to the other. The sound archive and catalog and image databases are to be identical at each site. At Stanford University, IDEAMA will reside at the Archive of Recorded Sound, and in Karlsruhe, IDEAMA is to serve as the core of the music section at ZKM's Mediathek. Because of copyright restrictions, only the founding institutions may make duplicates for distribution to interested parties.

Branches:

Partner institutions: These branches collaborate with the founding institutions and participate in establishing the target collection by acquiring the works in their area and converting them into digital format to IDEAMA standards, if they have that capability. They will house a duplicate of the sound archive and catalog and image databases. After the target collection is established, partner institutions will continue to be clearing-houses for works from their areas chosen by the selection committees for inclusion in the growing database.

Currently, four organizations have been designated partner institutions: the New York Public Library (NYPL), the National Center for Science Information Systems (NACSIS) in Tokyo, the Groupe de Recherches Musicale de l'Institut National de l'Audiovisuel (INA/GRM) in Paris, and the Institut de Recherche et de Coordination Acoustique/Musique (IRCAM) in Paris. NYPL's initial task is the acquisition of music produced on the East Coast by composers such as Paul Lansky, Pauline Oliveros, and Charles Dodge. Its IDEAMA activities will take place within the context of NYPL's overall electroacoustic music project. In Japan, NACSIS serves as the foundation of a comprehensive science information system in the humanities and the natural and social sciences. It links university libraries, computer centers, information processing centers, and national university research institutions via telecommunications networks. NACSIS has begun to trace the location and ownership of recordings of Japanese electroacoustic works and to digitize them. NACSIS also is developing a MARC catalog database which in future should interface with the catalog at Stanford and provide the basis for the cataloging of the Japanese works. INA/GRM, formerly the Groupe de Musique Concrète at Radio-diffusion-Télévision Française, was the first major location in the world for electroacoustic music production. Approximately 125 European works will be provided by INA/GRM. IRCAM has gained international renown for interdisciplinary research in music and acoustics and computer music composition and is the European counterpart of CCRMA.

Affiliate branches: After the target collection and the catalog and image databases have been installed and tested at the founding and partner institutions, other organi-

zations may become affiliate branches by housing the target collection and integrating the archive databases into their own computer environments. Additions to any of IDEAMA's databases will be distributed to all partners and affiliates. Numerous affiliate branches throughout the world widely should disseminate the archive for the convenience of researchers.

In addition to IDEAMA staff at CCRMA and ZKM and the two selection committees, IDEAMA is guided by an International Advisory Board comprised primarily of renowned composers, many of whom were the pioneers of electroacoustic music. The board supports IDEAMA policies and promotes the international scope and reputation of the archive.

It is hoped that IDEAMA will generate and provide a forum for discussion on a variety of topics. Toward this end it will host lectures, seminars, and other events where individuals can meet to share information and discuss important issues in the field. These plans already are bearing fruit. In March 1992, Marcia Bauman (CCRMA/IDEAMA Music Research Associate) lectured at San Jose State University on early computer sound and music at Bell Labs. In May of 1992, ZKM hosted a symposium for its selection committee which included a roundtable discussion of IDEAMA issues and two concerts of early and recent electroacoustic music. At the 1992 International Computer Music Conference in San Jose, California IDEAMA provided a continuous listening room for archived materials. And planning has already begun for a symposium to be held in Karlsruhe when IDEAMA celebrates its official opening in 1994. At that time, composers of early electroacoustic music, technicians, and musicologists will discuss the philosophical, aesthetic, and technological issues surrounding the question of what constitutes the original version of an early electroacoustic tape piece. The symposium also will explore the emerging reciprocal relationships between the arts and technology, whereby each field stimulates the other to explore new directions.

Initial funding for IDEAMA in the U.S. has come from the Andrew W. Mellon Foundation. Funding for subsequent years currently is being pursued by IDEAMA staff at CCRMA. Acquisition of this funding will allow CCRMA to hire an Engineer Research Associate and a Cataloging Specialist. Support for the archive at ZKM has come from the state of Baden-Württemberg and the city of Karlsruhe.

Time-line for the American Project: It is anticipated that the target collection and the catalog database will be established in the next two years. Work will proceed during this period on the image database and the workstation system that is to access the databases. Installation and testing of the workstation at Stanford's Archive of Recorded Sound will take place in 1993. The final testing will extend into the first part of 1994, after which the archive will be run in a routine fashion with Archive of Recorded Sound personnel.

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Note:

1. Integrated systems are being developed that will contain sound, bibliographic, and image data, all accessible from one workstation. An example is the work at the Belfer Audio Laboratory and Archive at Syracuse University. IDEAMA intends to monitor the development of this project with the possibility of adapting it to IDEAMA's databases.