



Preservation of Audiovisual Collections at the National Diet Library

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Meeting:

161 — "The media is the message!" The convergence of media in rapidly changing societies from a user perspective as well as the demand for preservation — Audiovisual and Multimedia Section with Preservation and Conservation

1 Abstract and Introduction:

2010 in Japan saw a big breakthrough in e-books, some of which may be viewed as multi-media. Whilst the rise of digital media such as e-books has been drawing more attention as a means of boosting information services at libraries and all other kinds of information service institutions, new issues have arisen involved in rule setting for use and long term preservation of these media. There is also much thinking required about preservation of the analogue audiovisual collections which still play quite a large part in library collections.

The National Diet Library (NDL) has collected a wide variety of audiovisual materials in tangible form, including so-called "packaged" electronic materials, by the legal deposit system, and the collections continue to grow by approximately several tens of thousands of items each year. Providing backup copies, replacing the protective sleeves, repairing and cleaning the damaged tapes and other efforts to physically preserve the analogue materials for the long term have been made so far. In addition to this, digital conversion and migration are becoming an integral part of protecting and preserving our audiovisual collections from deterioration and obsolescence.

This paper outlines NDL's recent research in the preservation of analogue audiovisual collections with media conversion and some related activities the IFLA/PAC Regional Centre for Asia has been undertaking. It also presents an overview of ongoing conversion projects on the Political Discourse Recording Collections and other oral history materials. In Japan there have been very active projects going on to preserve early made-in-Japan records containing popular songs of the first half of the 20th century, in which the NDL has been involved.

2 NDL Audiovisual collections - Facts and Figures

The NDL is the sole national deposit library in Japan, and as such is responsible for developing a comprehensive collection of publications issued in Japan and preserving them as valuable cultural property for future generations. In 1949, a year after its opening, the NDL initiated the acquisition of Audio materials (National Diet Library Law, Law No. 5, 1948, Article 24. 7)¹ and Visual materials (Article 24. 6)² under the legal deposit system. In 2000, an amendment to the NDL Law to collect packaged digital publications (Article 24. 9)³ such as CDs, DVDs and domestically produced software under the legal deposit system was promulgated and came into force.

As of March 2010, there are approximately 650,000 audio materials housed at the NDL. As for visual materials, approximately 260,000 items and approximately 100,000 items of electronic materials are housed. The NDL receives approximately 15,000 items of audio materials, 16,000 visual materials, and 10,000 electronic materials annually and the number of items continues to grow each year.

Table 1 Number of audiovisual materials housed at the NDL (as of March 2010)

AUDIO MATERIALS (647,177 ITEMS)	Records (598,176 items) •Analogue Records [SP records (Standard Playing Record) •LP records (Long Playing Record) •EP records (Extended Playing Record)] •Phonosheets •Filmons (Filmon Endless Sound-Belt) •CDs (Compact Disc) •MDs (Mini Disc), etc.
	Cassette Tapes (25,797 items)
	Open-Reel Tapes (23,204 items)
VISUAL MATERIALS (259,604 ITEMS)	Video Discs (87,468 items) •LDs (Laser Disc) •DVDs (Digital Versatile Disc) •Blu-ray Discs, etc.
	Video Cassettes (14,954 items) •VHSs (Video Home System) •Betamax •U-matics, etc.
	Slides (157,182 items)

¹ Records and other publications which the sound sources were recorded in mechanically replayable medium

² Publications produced by filming technology. However, a supplementary provision states the interim exemption of collecting such materials

³ Texts, images, sounds, or programs recorded by electronic, magnetic, or other methods which cannot be directly perceived by human senses

The library users access most of the audiovisual materials the NDL houses via reading rooms such as the Audio-Visual Materials Room and the Electronic Resources Room⁴. Table 2 lists the outline of services provided in the Audio-Visual Materials Room and the annual number of visitors.

Table 2 Audio-Visual Materials Room – Services & Annual number of visitors (as of May 2010)

COLLECTIONS	Audio materials: SP records (15,000 items), LP records (175,000 items), EP records (1000,000 items) ,CDs(292,000 items) (approx.) Visual materials: LDs, DVDs, VHSs, etc.(91,000 items) (approx.)
ACCESS TO MATERIALS	Most items (except approx. 9,000 audio materials) can be searched online. For analogue records, keyword search can only access Serial numbers, Publishers and Album titles (Song titles, Composers, Performers are not in the search options)
FACILITIES	Audiovisual booths: 20 Playback machines for: Record (4), Cassette tape (1), CD (5), MD (1), SACD & DVD-Audio (1), Visual materials (VHS, LD, DVD, Blu-ray Disc etc.) (8) (20 in total)
USE OF FACILITIES & REQUEST FOR RETRIEVALS	Use of facilities : pre-registration required Request for retrievals: up to 3 times/day 3 Records, 2 Cassette Tapes or 1 DVD-Audio, SACD, DVD, LD, VHS can be retrieved at one time. 10 original jackets without actual sounds or images can be retrieved at one time.
COPYING	Actual sounds or images cannot be copied. Original jackets can be photocopied with the permission of the rights holder.
NUMBER OF VISITORS & RETRIEVALS (FY2009)	Visitors: approx.17,400 Items retrieved: approx.8,200

3 Preservation of audiovisual collections - From past to present

Preservation of audiovisual collections at the NDL was already taking place 30 years ago by means of media conversion. One example was that of SP records which are fragile and easily scratched. SP records were re-recorded onto Cassette Tapes so that the original discs could be preserved in good condition for a long time while the Cassette Tapes could provide access to users. The project started in 1975 and nearly 10,000 items of SP records were chosen to be re-recorded. The contents of these SP records were mainly Japanese traditional music, local folk music and pop music. The library collection of Filmons was also re-recorded onto new media in 1984. This time it was from 18 Open-Reel Tapes (previously produced copies of original Filmons) to 9 Cassette Tapes and 18 LP records. Filmon was developed and sold in Japan in the

⁴ A special reading room for packaged digital publications, books with companion CDs, CD-ROMs and some audio materials (music Cassette Tapes, Phonosheets). Analogue record players, DVD-VHS players, CD Audio players, cassette players are provided

late 1930s. Unlike disc-shaped analogue records, it has a long ring-like form and is capable of recording for over 30 minutes. The collection includes traditional Japanese music such as Gidayu, Kiyomoto, Nagauta and storytelling such as Naniwabushi and Kodan.

In 1983, a cross-sectional ad-hoc board for preservation of library materials was set up as the number of deteriorating materials was increasing for many reasons. The board was sorted into seven teams for different types of materials (forms, media and usage). Each team worked to take measures to improve the condition of the particular types of library materials and prevent them from further damage. Teams for “Magnetic tapes” and “Records” were among the seven. The outcomes of their activities were reported from each team the following year at the library’s executive meeting. The reports of the Magnetic Tape Team and the Record Team are as follows. From the Magnetic Tape Team: (1) It is ideal to keep the storage area air conditioned 24 hours a day, 365 days a year, (2) Custom built shelves, cabinets should be installed, (3) Tapes should be rewound regularly. From the Record Team: (1) For a heavy weight of records, durable shelf boards should be chosen to avoid warping, (2) Gloves should be worn to protect the discs from grease and dust, (3) Adhesives used for labeling should be archival quality. The Record Team also gave recommendations such as (1) Implementation of regular checking of the physical condition of materials, (2) Employment of an audio delivery system which allows users to listen without handling the materials, (3) Continuing program of Record-to-Cassette Tape conversion.

These remarks and recommendations gave direction for measures to preserve the audiovisual collections at the NDL and the library wishes to continue these activities to this day. The following is the current status of the preservation of audiovisual collections.

3-1 Storage environment

Audiovisual collections are stored in the stacks located on the 6th basement floor of the annex building. The annex building has 8 stories below the ground, which is all dedicated to storage. The temperature of the stacks is set to about 22°C and the relative humidity (RH) is 55%. Automatic dated logs for temperature and RH monitoring are placed on each floor. Although the air conditioning system stops when the library is closed, any possible alteration of temperature and RH is considered to be mild. This is because the bottom floor of the basement stacks lies 30 meters below ground and the light well stretches up to the 2nd floor. The light well and thick clay walls of the stacks produce a well heated insulation throughout the year.

Figure 1 Basement stacks

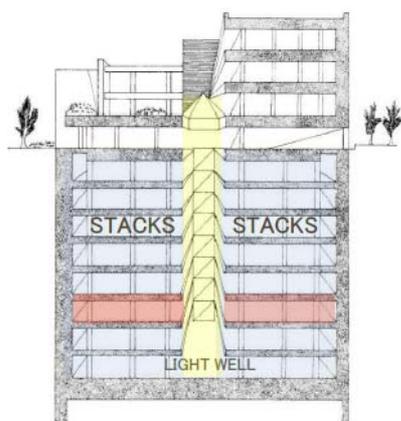


Figure 2 The stacks seen from the top



Table 3 shows sample temperature and RH measured at the storage and access sites for audiovisual materials.

Table 3 Air Temperatures(°C) and Relative Humidity(%) of the storage and access sites (sample)

	AUGUST 2010	AVERAGE	MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM
STORAGE	Stacks (6BF)	22.0°C	22.2°C	21.7°C	58.5%	61.0%	56.0%
ACCESS	Reading room ⁵	28.2°C	29.1°C	26.6°C	59.5%	68.0%	52.0%
	JANUARY 2011	AVERAGE	MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM
STORAGE	Stacks (6BF)	22.1°C	22.2°C	21.7°C	50.0%	55.0%	43.0%
ACCESS	Reading room	18.0°C	23.3°C	15.9°C	26.0%	31.0%	22.0%

Ultraviolet (UV) filters are installed in the lighting system of the stacks to prevent materials from being exposed to UV rays. The stacks are kept dark all the time and lights are only turned on in the area needed by motion sensors when a staff member works in the stacks.

3-2 Stack management

Audiovisual materials are stored in high-density mobile shelving units or steel cabinets in the stacks. SP records, LP records, LDs, VHDs and other materials which could be distorted by being shelved upright angle are shelved horizontally, up to 10 layers high. EP records, Phonosheets, Cassette Tapes, CDs, DVDs, VHSs and other materials which are light in weight or attached to books are shelved vertically.

3-3 Handling and use

Library staffs are in charge of handling audiovisual materials in the reading room. They put materials into the correct players at the request of users. Users can operate the audio delivery systems with touch panel

⁵ the Electronic Resources Room

screens. For the use of LP records and EP records, laser turntables are available. This device uses a laser beam instead of a stylus to avoid direct contact with the record medium during playback. Backup copies of deteriorating SP records or Filmsons have been made in Cassette Tape form and are provided for service. The originals of such materials would only be used when it is absolutely necessary.

3-4 Preventive measures and others

Preventive measures for the audiovisual collections carried out at the NDL include: replacing the PVC-made inner sleeves with other enclosures which have better quality for preservation, and regular cleaning of SP records and LP records. About 150 items a week are expected to be cleaned. Damaged original jackets are also repaired.

4 Preservation of audiovisual collections-Challenges

Despite above-mentioned efforts, there remain unsolved issues in ensuring the long-term preservation of the NDL's audiovisual collections. To begin with, the library has not had special storage with a suitable environment for audiovisual materials. However, commonly advised temperature and humidity levels for storage of audiovisual materials⁶ are too cold and dry for areas where many staff members are working all the time. It is also an issue that a temperature rise in reading rooms during summer is inevitable due to the requirement of energy saving measures. To minimize the temperature difference between storage and access sites, the air temperature of the stacks needs to be kept more or less the same as it is now. In addition, the collections await further measures such as comprehensive condition survey, tape rewinding and other regular checkups, but none of these have been carried out yet.

Despite all the efforts to maintain an acceptable storage environment, materials will eventually become deteriorated over many years and damaged by repeated use. Table 4 lists the examples of damage the NDL has found in its collections of audio materials.

Table 4 Examples of damage found in audio materials at the NDL

CASSETTE TAPE	ANALOGUE RECORD (SP,LP,EP)	PHONOSHEET	CD
<ul style="list-style-type: none"> •Unstuck splicing tape •Loose clamp •Creased and bent tape 	<ul style="list-style-type: none"> •Breakage, Scratch •Mould, Dirt •Deteriorated PVC inner sleeve caused damage on the disc surface •Distortion, Warping 	<ul style="list-style-type: none"> •Image on the sleeve is transferred to the sheet surface •Distortion, Warping •Book that the sheet is bound- in is damaged 	<ul style="list-style-type: none"> •Deteriorated pad stuck on the disc surface •Click and pop noise

⁶ "IFLA Principles for the Care and Handling of Library Material- Audiovisual Carriers" (1998) states the environmental recommendations for storage of audiovisual materials as follows; Audio disk recordings: 18°C, 40%RH. Magnetic media: 15±3°C, 30-40%RH. Optical media: 20°C ,40%RH.

Functional decline through time is the nature of industrial products. The audiovisual materials stored at the NDL that are way beyond their estimated life-span are at risk of losing their functions as products and it is likely that these materials will become unavailable for library service soon.

It is very difficult to recover the contents of materials once their carriers have deteriorated. To ensure access to the contents of materials, it is necessary to convert the materials onto appropriate media while they remain usable.

As well as the materials themselves, playback equipment needs to be preserved. It is sometimes difficult to obtain players for some audiovisual media, or such devices may already be out of production. Even though the devices for particular media are plentiful in the marketplace now, development of information technology is leading to rapid changes in information media. Therefore, all kinds of audiovisual media and devices could become obsolete and unavailable in future.

5 Preservation of audiovisual collections-Studies from FY2006 to FY2010

Since FY2006, the NDL has conducted a five-year study called “*Studies for ensuring long-term preservation and access of digital information*” in order to preserve and provide digital information over the long term. It includes studies on the digitization of audiovisual materials. The results from these studies listed in table 5 are expected to contribute as part of an approach to improve the current situation of the preservation of the audiovisual collections at the NDL.

Table 5 Studies on the digitization of audiovisual materials

STUDY YEAR	TARGETS & OBJECTIVES	FINDINGS
FY2006 ⁷	Cassette Tapes, Open-Reel Tapes, SP records, LP records, EP records, Phonosheets, Filmons, VHSs, LDs, U-matics, Betamaxs, VHDs •Study on specifications and playback equipment of audiovisual materials •Study on A/D conversion of audiovisual materials	•Many devices proved to be available only to a limited extent or have already become unobtainable •Digitization requires well-defined criteria for quality of digital outputs depending on the purpose of use

⁷ http://www.ndl.go.jp/en/aboutus/preservation_01_2006.html

FY2007 ⁸	<p>LP records & Cassette Tape copies of LP records, 16mm films & U-matic copies of 16mm films</p> <ul style="list-style-type: none"> •Development of guidelines for digitization of audiovisual materials •Experimental digitization of audiovisual materials in accordance with the guidelines 	<ul style="list-style-type: none"> •Procedures and methods set in the guidelines worked without major trouble •Future tasks including consideration of working hours for cleaning were identified
FY2008	<p>Cassette Tapes, Open-Reel Tapes, VHSs, Betamaxs, U-matics, LDs, VHDs, 8mm films, 16mm films</p> <ul style="list-style-type: none"> • Comparative survey on file format, sampling frequency, bit rate, etc. to identify fit for a purpose (preservation or distribution) requirements for digitization 	<ul style="list-style-type: none"> •There was no single set of standards or best practice applicable to all materials •It is essential to have an organization policy of quality control for digitization •To develop the policy, key factors for digitization such as characteristics of materials (contents, physical condition), budget, etc. should be taken carefully into account
FY2009	<p>Audiovisual materials</p> <ul style="list-style-type: none"> •Questionnaire survey on digitization of analog audiovisual materials in domestic and foreign institutions 	See 5-1
FY2010	<p>Cassette Tapes, Phonosheets</p> <ul style="list-style-type: none"> •Review of previous studies •Trial digitization, analysis of technical issues and cost evaluation 	See 5-2

The details of studies in FY2009 and FY2010 are described below.

5-1 FY2009 Study⁹

A questionnaire survey was conducted to ask about the status of digitization of analog audiovisual materials and efforts for long-term preservation of digital information in domestic and foreign institutions. Survey sheets were sent to forty domestic and foreign institutions playing a leading role such as national libraries, national archives, national film archives, university libraries and broadcasting corporations. Twenty institutions including the NDL responded to this survey.

Digitization was carried out in 19 institutions out of 20 for audio materials and 11 for visual materials.

⁸ http://www.ndl.go.jp/en/aboutus/preservation_01_2007.html

⁹ <http://www.ndl.go.jp/en/aboutus/preservation.html>
 TOP> About Us> Ensuring long-term preservation and usability of digital information
 > the "Questionnaire Survey on Digitization of Audio-Visual Materials and Long-term Preservation of Digital Information"

About one-third of the institutions mentioned the “*Guidelines on the Production and Preservation of Digital Audio Objects: standards recommended, practices and strategies. 2nd Edition*” (IASA TC04 2nd Edition) created by International Association of Sound and Audiovisual Archives (IASA) ¹⁰ as the standard they followed in the operations of digitization.

For both audio materials and visual materials, the highest priority reason for the digitization was “Value of materials,” followed by “Condition of materials.” In creating digital files, more than half the institutions created files both for preservation and for distribution according to usage. As for file formats of audio materials, most institutions use either WAV or BWF for files for preservation; more than half of them use MP3 for files for distribution. For visual materials, file formats such as Motion JPEG2000, JPEG2000 and MPEG2 were used for files for preservation, and MPEG2 for files for distribution.

Five institutions answered that media were stored in an environment with temperature and humidity control. Some institutions used multiple media for preservation, for example, using HDD storage together with LTO tapes or optical discs (CD-R, DVD-R, etc.). Some other institutions chose differing media depending on the purpose (for preservation/distribution). Most institutions have a policy to preserve original materials after digitization and in many institutions playback equipment was also preserved as long as possible. The extent to which the NDL can collect and preserve playback equipment will need to be discussed.

5-2 FY2010 study

Based on the results of previous studies, the status of audio materials held at the NDL was reviewed. Trial digitization, analysis of technical issues of digitization and cost evaluation were also conducted. For the trial, 100 Cassette Tapes and 50 Phonosheets were chosen as the targets because the NDL holds large quantities of both media and some deteriorated items have been identified among them. The summaries of the studies are as follows:

(1) Research on the technical specifications of the audio materials

The standards of the recording media, formats and availability of the playback equipment of the audio materials were researched. The target materials are the following: Cassette Tapes, Open-Reel Tapes, SP records, LP records, EP records, Phonosheets, Filmsons and CDs. The playback equipment of these materials, except Filmsons and Open-Reel Tapes, was easily available in the market, as of February 2011. No playback equipment of Filmsons is in the marketplace. For Open-Reel Tapes, only one manufacturer of the playback equipment remains in the market, and its product does not support all of the recording formats. Therefore, Filmsons and Open-Reel Tapes need to be digitized as soon as possible by estimating the necessary time and costs and formulating a detailed plan to prepare a sufficient amount of the playback equipment and A/D conversion tools.

(2) Research on the status of audio materials held in the NDL

The status of the audio materials in the NDL is summarized according to interviews with the NDL staff

¹⁰<http://www.iasa-web.org/>

members in charge and the observation of the storage and access sites. The target materials are the following: Cassette Tapes, Open-Reel Tapes, SP records, LP records, EP records, Phonosheets, Filmons and CDs. Although the NDL has a large amount of audio materials which are at risk of becoming obsolete, no serious problems are considered in the current storing environment and method. However, some materials stored over their estimated life-span were found to be physically deteriorated. It is necessary to consider countermeasures to ensure the availability of these materials for the future. Some of the playback equipment of these materials is no longer available in the market. Others might be also at risk of being obsolete soon. It is necessary to keep the availability of their contents over the long term by converting them to digital recording media.

(3) Research on the “Guidelines on the Production and Preservation of Digital Audio Objects 2nd Edition (IASA TC04 2nd Edition)”

Major libraries overseas often adopt the IASA TC04 2nd Edition. From the IASA Guidelines, “5.3 *Reproduction of Microgroove LP Records*” and “5.4 *Reproduction of Analogue Magnetic Tapes*” were referred to clarify the technical recommendations and issues in digitizing LP records and Cassette Tapes. While the cost and time are important factors to be considered in the digitization of a large amount of audio materials, digitization tasks in accordance with the IASA guidelines are estimated to be time-consuming, especially for media conversion of analog magnetic tapes. Therefore, it is recommended to introduce digital archiving systems using new technologies to conduct A/D conversion and to accumulate experience by using them.

(4) Research on the trial media conversions of Cassette Tapes and Phonosheets

In this research, trial media conversions were conducted targeting the physically deteriorated Cassette Tapes and Phonosheets in the NDL published in 1960s and 1970s, and related issues were clarified according to the research results.

The results of these conversions show the status of deterioration which cannot be found by only visual inspection, and the problems in the operation procedure. Examples of deterioration and problems include: the pop noises caused by dust, scratches, etc. on the surface of Phonosheets, unstuck splicing tapes as the adhesive on the tapes become dry and coarse, sticky-shed syndrome observed on Cassette Tapes. The results of the trial also raised issues to discuss the best procedures and methods to be employed in the future mass digitization of audio materials in the NDL.

The NDL is currently working on drafting the ‘National Diet Library Guidelines for Digitization of Audio Materials’ based on the results of the above-mentioned studies. The guidelines will describe the criteria and several methods to be used in the future mass digitization project of the NDL.

6 The Audio Collections converted from Analogue to Digital

The NDL has been actively collecting parliamentary documents and other materials associated with the Japanese Diet, as the library itself belongs to the Diet. From 1954 to 1957, the NDL undertook an oral history project. The library interviewed the politicians who had been involved in the establishment of the Japanese Constitution and recorded the conversations with these interviewees onto Open-Reel Tapes or Cassette Tapes. There are other collections of oral history called Political Discourse Recordings featuring 10 people who took the lead roles in Japanese political history or were involved in historic events. The project, which lasted from 1961 to 1987, aimed to record information which had never been open to the public and would not have been unless recordings had been made. All the interviews were recorded onto Open-Reel Tapes and it was decided to make them available to users 30 years after production. Backup copies of many of these Open-Reel Tapes were also made in the form of records.

In 2005, the library carried out a condition survey of the oral history collections. The survey found that the tape medium was deteriorating and the sound quality of the collections had degraded. It was only a matter of time for the collections to become unavailable for services and the library decided to work on the Analogue to Digital conversion of the collections. In 2006, the contents of 113 Open-Reel Tapes were converted to digital files¹¹. The digital files were then stored on 82 CD-Rs for preservation, and another set of 82 CD-Rs were made as access copies. Additional 54 Open-Reel Tapes were converted onto 79 CD-Rs and kept as preservation copies the following year. Another set of 79 CD-Rs were, again, made for access. It was a trial digitization and CD-R was chosen as an interim medium until proper criteria of digitization for the purpose of preservation are set within the NDL. As for the use of access copies, no significant problem has been reported so far.

7 Cooperation with the Historical Records Archive Promotion Conference (HiRAC)

The HiRAC is a private body set up by the Recording Industry Association of Japan and other related associations to prevent early made-in-Japan SP records and master lacquer records made of metal from deterioration and dispersion. The projects that the HiRAC has been promoting aim to archive such sound sources in digital formats. In 2009, the NDL made a contract with the HiRAC to purchase the sound sources that the HiRAC had digitized and stored on DVD-Rs¹². The HiRAC worked on copyright issues such as public transmission for the Internet access and obtained the agreement from right holders. The library then takes responsibility to preserve and provide access to the sound sources for library users. The main contents of the sound sources are from SP records pressed in the first half of the 20th century, such as speeches, popular songs and other music. About 50,000 sound sources are to be included in the NDL'S collections by the end of 2012 as Historical Recordings. Approximately 2,500 items that the NDL already had received were released in May 2011. Library users can access the items via terminals within the library

¹¹ uncompressed wav 44.1kHz/16bit

¹² uncompressed wav 44.1kHz/16bit or 48kHz/24bit

through streaming and there are about 100 items that can be accessed via the Internet¹³.

8 IFLA/PAC Regional Centre for Asia (PAC Tokyo)¹⁴

The NDL has been engaging in a variety of efforts based on its preservation cooperation program in order to promote preservation and conservation activities in Asia as the IFLA/PAC Regional Centre for Asia. In December 2010, the PAC Tokyo participated in the Third International Preservation Conference¹⁵ hosted by the National Library of Korea. This conference has been held since 2004 with the goal of technical development of the preservation of library materials and mutual exchange between China, Korea and Japan. The theme in 2010 was “Preservation and restoration of digital medium - technology and the present condition”. The representative of the PAC Tokyo gave a report on digital preservation and the research the NDL has carried out. In the report, the outlines of the studies on digitization of audiovisual materials were referred to. Other participants from many Korean institutions and the National Library of France also reported on the current activities of each institution and a Korean private company introduced recent developments in the optical disc medium.

9 Conclusion

The NDL and the PAC Tokyo will continue research on the preservation of audiovisual materials to respond to the rapid change of media as well as to ensure access for a long time. We will also make continuous efforts in practicing the preservation activities which have been developed based on the research achievements and share our experiences with a wide range of libraries inside and outside of Japan.

¹³ <http://dl.ndl.go.jp/#classic> (only in Japanese)

¹⁴ <http://www.ndl.go.jp/en/iflapac/index.html>

¹⁵ http://www.nl.go.kr/iflapac/front/en/edu/semi_data_view.html?seq_id=521