integrated into rural development programs that are consistent with the China National Action Program to Combat Desertification within the framework of the UNCCD.

Maps and Museums in the Age of Information Technologies (IT)

The Aim of the Symposium

HOSOI Shosuke,* UCHIDA Kazuko,** ASANO Toshihisa*** and YAMAMOTO Kayoko****
*Soka University
**Okayama University
***Hiroshima University
****Lake Biwa Research Institute

This symposium was organized by the Committee for Promotion of the Establishment of the National Museum for Map & GIS of the Association of Japanese Geographers. We, members of the Committee, organized this symposium in collaboration of all members of the Committee who belong to or have relations with various organizations to form and invite the panellers group.

On the establishment of the National Museum for Map & GIS (provisional name), a recommendation was presented by the Science Council of Japan to the Prime Minister in 1988. To realize this recommendation, this Committee was set up in the Association of Japanese Geographers and various promotion activities have been done. As a result, a part of the recommendation, the part of GIS research, was realized as the Center for Spacial Information Science (CSIS) at University of Tokyo in 1998.

However, the part of map museum has remained unrealized. So the Committee has continued to act to fulfill the recommendation. It has held symposia on the necessity of the National Museum for Map & GIS, and on the existing new map museums such as the Map & Survey Museum of the Geographical Survey Institute, the World Distribution Map Center of the Gifu Prefecture Library, etc. and inspecting meetings in existing various museums, besides business meetings.

Recently, the progress and diffusion of information technologies are applied to map production, preservation and distribution, and also to museum and library activities like the examples of “digital museum” or “electronic library” with internet in the Tokyo University Digital Museum or in the National Diet Library.

Therefore, we organized this symposium to recognize the current situation and future trends in these fields, listening to and discussing reports about recent activities and future trends in mapping organizations such as the Geographical Survey Institute, the Hydrographic and Oceanographic Office and Heibonsha Cartographic Publishing Co. and in research institutes such as the Center for Spacial Information Science (CSIS) and the Lake Biwa Research Institute, about recent activities in the National Museum of Japanese History and the National Diet Library; and about the necessity of preservation of maps and plans prepared for public organizations and the internet homepages of various museums. We also considered a short report by FUCHIMOTO Masataka (Asia Air Survey Co., Ltd.) on the technological trends in the survey industry in Japan, the keywords of which were urban control point survey, large scale mapping, GPS, laser profiler, survey with total station (electronic distancemeter and transit combined), image sensing, remote sensing and GIS, with comments by NOGAMI Michio (Nihon University) and by NISHIKAWA Osamu (University of Tokyo), and to contribute to design the future National Museum for Map & GIS.

Geographic Information from the Geographical Survey Institute

TANIOKA Seiichi
Geographical Survey Institute

The Geographical Survey Institute (GSI), the national mapping agency of Japan, has pro-
vided topographic maps to the public for more than a hundred years, to indicate details of land forms and land uses of Japan's entire area. From 1993, GSI began to digitize their maps and constructed an in-house database of topographic maps. At present, paper maps, digital maps and spatial data frameworks for GSI are produced from the database and widely published. GSI charges duplicate cost only to the user so that digital maps and spatial data frameworks in CD-ROMs are almost half the price compared with paper maps of the same area.

Since July 2000, topographic maps are released without any charge to the public through the Internet. As compared with a paper map which a user must visit a bookstore to purchase, an Internet map is more beneficial for most users because they can use the latest maps at any time and anywhere they need by downloading. The statistics in 2001 show that annual amount of supply of Internet maps from GSI is almost equal to that of paper maps.

It is supposed that users’ needs for real-time map revision increase under the situation that they can easily access the maps. To meet the demand, GSI is now trying to change the data structure of the in-house database from raster-based time slice data to vector-based spatial temporal data. After this renewal is completed, it will be possible to revise continually at least administrative boundaries, railways and major roads.

On the other hand, GSI operates a clearing-house that provides catalogue information on maps and geographic data. With the clearing-house and the Internet map provision service, a virtual map museum is realized on the Internet. When maps are revised continuously, the virtual map museum becomes a mainstream of map museums with its ability for real-time map provision.

Thus a part of the role of the Cartographic Museum recommended by the Science Council of Japan will be set up in contemporary style. If the function for cartographic research is enriched and added to it, the real Cartographic Museum will fully come true. GSI will cooperate to realize this project by progressing the research.

Practical Application of Information Technology (IT) to Nautical Charting and Geographical Data Holdings of the Japan Hydrographic and Oceanographic Department (JHOD)

NISHIZAWA Kunikazu
JHOD, Japan Coast Guard

Electronic Navigational Chart (ENC) containing all the chart information necessary for safe navigation is produced in accordance with the internationally standardized data-structure and format. “Electronic Chart Display and Information System (ECDIS)” using ENC has a variety of operational functions, including variablescales of charts displayed, superimposed display with radar images and GPS derived positions. Updating of charts also can be made easily. Conventional paper charts are currently compiled and produced from the ENC database, negative films for making printing plates being put out through optical plotters. It is of urgent necessity for our office to complete digitization of the rest of our nautical charts. Completion of their digitization means that all our chart information is always updated on the database, leading to an expected on-line chart supply system.

The Japan Oceanographic Data Center, JODC, which is established in the Hydrographic and Oceanographic Department, is the sole oceanographic data bank in Japan. JODC is responsible for collecting and archiving useful marine data and information as well as providing public users with these data and information. Of various datasets held by JODC, the following datasets on bathymetry have been produced and made available: JODC Bathymetry Integrated Random Dataset (J-BIRD), which is dataset consisting of a total of 1.8 million spots data integrated with a variety of data digitized from smooth sheets of surveys, bathymetric charts and nautical charts mainly covering areas in and around Japan as well as a vast amount of bathymetric data obtained by various organizations and institutes in Japan and abroad; JODC-Expert Grid Data for Geography (J-EGG500), which is another dataset consisting of soundings in every 500-meter square mesh integrated with a vast amount of bathymetric data obtained by narrow-multibeam echosounding carried out in and around Japanese waters. In addition to those mentioned above, JODC has
been proceeding with a project for microfilming analogue data and materials such as smooth sheets of surveys carried out during the period from 1917 to 1991, seismic profiling records of seabottom surveys from 1967 to 1986, old editions of paper charts published during the period from 1871 and 1981, and reproductions of antique "Ino's maps."

**Digital Atlas—Present and Future**  
MIZUTANI Kazuhiko  
Heibonsha Cartographic Publishing Co.

Digitalization of maps has changed the way in which maps are made, and the way in which they are used.

Conventional analogue production of maps required the harmonious collaboration of a number of experts who are highly specialized in line scribing photo-typesetting of letters and symbols, color printing, proofing, etc. Computer-aided digital production of maps now requires fewer specialist staff, and yet the process of compilation takes far less time. Furthermore, such aspects of map production as projection, scale and theme have become much easier to handle.

But it is regrettable that this easier handling gives rise to flooding of such maps on the market that would have hardly been marketable before for the reason of total disregard of the essential requirements of maps. The problems of what are the most appropriate scale, generalization, exaggeration or epitomization for the purpose of a map remain to be solved.

For all that, a digital atlas is greatly freed from those restrictions such as the size and the shape of products, the layout of maps, the projection to be adopted, the number of place names to be included and so on.

What is more, an expected exploitation of a digital encyclopedic atlas in the near future would enable us, atlas maker, to provide not only necessary information of place names as a conventional gazetteer did, but also provide other information, with both visual and aural components, and instantaneous access to the related thematic maps and to the latest geographic data (geographic information).

What should be the nature of a map museum in this digital era? It should be a museum where all map information, past, present and future, of all domains are linked under positioning control. And all this information should be accessible to anyone in the museum, or at home, school or office directly via the internet or in local museums or libraries via internet. This map museum should be not only for geography or cartography, but also for all sciences related to the earth surface, such as geology, biology, anthropology, archeology, pedology, regional economy, regional sociology, etc. and also for administration, education, business including map publishing companies, and daily practical life of everyone. The map museum should be so familiar and accessible to everyone as thinking on the base of the map museum would be natural for everyone. The map museum should register the maps and plans which are stored in other museums, libraries, archives, government offices and private sectors, and enable the map users to utilize these maps and plans via internet at home, school or offices, or in the local museums or libraries via Internet.

**Systems of Spatial Information Structure for Academic Studies**  
OKABE Atsuyuki  
University of Tokyo

Currently, the greatest need facing most researchers involved in spatial information science research is a technology that can combine different forms of spatial data so that it can be used for a variety of research purposes. For example, there are many researchers who want to conduct research that simultaneously combines data compiled in towns, villages and other categories in the national census, with land use mesh data of national numeric information, LANDSAT-TM satellite image data and other data of differing forms. They may wish to do this so that they can interpret various geographical phenomena, and also to establish measures for resolving spatial societal issues like global environmental issues.

However, the fact is that many practical barriers still exist before differing data can be used at the same time. In other words, the following issues remain: (i) there is no mechanism for researching various spatial data formats and their locations, and the location of spatial data...
sought by researchers is unknown, and (ii) even if the necessary spatial data exists, the data format, projection method, space compilation unit differ by data, and so conversion is very troublesome.

Each of these problems is not necessarily difficult from a technological point of view but, in reality large barriers exist for researchers. This demotivates researchers to conduct spatial information science research. It is critical for these issues to be resolved if spatial information science is to grow.

Based on the awareness of this problem, the CSIS is developing a spatial data infrastructure system. The spatial data infrastructure system is composed of two subsystems: (i) the spatial data clearinghouse, and (ii) the spatial data sharing system. The former is a search system with “data on spatial data”—that is, spatial metadata. This can provide information on the format, location and content of spatial data via the Web. For example, when researchers input information in this system concerning spatial data that they need (region, content, etc.), a list of spatial data matching is displayed. In other words, the spatial data clearinghouse is a system that resolves the aforementioned issue 1.

The spatial data sharing system is a system that is being developed to resolve issue 2. In this system, various spatial data is managed using a uniform format. Researchers can download these data after undergoing a set procedure, and use it for their own research.

The Role Expected of the Digital Museum for Cartography: Center of Information Network
YAMAMOTO Kayoko
Lake Biwa Research Institute

Since the Internet was born, about thirty years have passed. The Internet serves as the leading tool of communication all over the world in recent years. The importance of IT (Information Technology) is widely recognized with the spread of the Internet and it is expected that GIS should bear the main role in many fields of IT.

On the other hand, various kinds of museums have been built in many places in Japan and digital museums have increased. In digital museums, the exhibits are designed to inspire visitors to explore the outdoors and renew awareness of regional environment, history, architecture, and so on. In additions to this, digital museums play an important role as the base of regional information and information center. Therefore the purpose of this study is to discuss the possibility of the digital museum for cartography to focus on these new roles.

In present Japan, many kinds of digital maps are created and accumulated in various organizations, and the Internet provides access to these. On a regional level, it is necessary for the digital museums of cartography to accumulate not only paper maps but also digital maps to play the role of base of regional information, information center and exhibition by the Internet. It is also necessary for such museums to have the function of research and study. The National Digital Museum for Cartography should summarize these museums through the computer network and should play the role of systematizing all the information about maps.

By using computer network systems such as the Internet to access digital museums for cartography, anyone is able to acquire various information based on digital maps. The most significant role expected of such digital museums is to produce added value by piling up various information on digital maps to offer more beneficial information to many users all over the world. For example, at the regional level, the digital museums for cartography should offer information about the region and natural environment, and should introduce the network and the activities of NGO/NPO.

By these service functions, it also enables the museums for cartography to support the activities of NGO/NPO. Furthermore, handicapped people who have difficulty in going outdoors can also experience the pleasure of the museums for cartography by using the Internet at home. And in order to realize these objectives, it is essential for the museums for cartography to build the partnership with enterprises, administrations, research organizations and universities.
The Use of Information Technology in Museums and Its Application to Viewing Ancient Maps

ADACHI Fumio, SUZUKI Takuzi,
and Aoyama Hiroo
National Museum of Japanese History

The purposes for using information technology in museums fall into three broad categories: (a) to provide information such as notices of special exhibitions, (b) to make museum holdings available to the public, and (c) to contribute to exhibition displays. Due to the growing popularity of the Internet, more museums are making an effort to post museum information online. Recently several ways of using digital technology in exhibitions themselves can be seen.

Some Japanese historical drawings and paintings, such as folding screens or scrolls, are extremely large or long and have very detailed subjects. They are often so large that they are difficult to handle and require considerable exhibition space, so there are few opportunities to display them. If they are displayed, it is often dark and difficult to see fine details due to low lighting conditions designed to prevent color fading. Whether or not the purpose of observation is research, the period a real materials is available for observation is restricted by a limitation placed on the total quantity of lighting in a year.

The National Museum of Japanese History has developed a super-high-definition free viewing system to solve these problems, and it is being used for research and exhibitions. The system can handle image data as large as 100,000×100,000 pixels or more and allows any part of the image to be easily scaled to any size for viewing.

Ancient Japanese maps are often very large, with very small lettering, so it is difficult to both conserve them and make them available to serious viewers. Akioka Takejiro's ancient map collection alone, which is housed in the National Museum of Japanese History, consists of more than 1,000 works. Some of the large works are 3 m×4 m in size and long maps can be over 7 m in length. Therefore, digital technology is an effective tool for making these ancient Japanese maps available to the public.

The Shoho-Nihon-Zu in Akioka Takejiro's collection is a Japanese map that was designed and edited by the Edo shogunate in the first year of Shoho (1644). The map has been digitized and entered into the system. It is simple to view everything from the entire map, which is 2.4 m×2.3 m in size, down to place names that are in text only about 2 mm in size. This system is useful both for conducting historical research on ancient Japanese maps and for exhibiting them.

The Map Collection of the National Diet Library

TOMIHISA Syun-iti
National Diet Library

In October 2002, the Kansai-kan (Kansai Building) of the National Diet Library (NDL, US Library of Congress equivalent) will open in the suburbs of Kyoto, in Kansai District of Japan, and most of the foreign periodicals are moved to the Kansai-kan. But the Map Collection of the NDL stays at the Tokyo Main Building as before.

The Map Room (the 4th floor, the Main Building) has approximately 400,000 domestic and foreign single-sheet maps published during and after the Meiji Era (after 1868) including Japanese maps produced by the national mapping authorities (mainly topographical maps, hydrographical charts and geological maps), and Gaihouzu (topographical maps and military maps of foreign countries and of occupied areas produced by the General Staff Office, the Governor-General of Korea and the Governor-General of Taiwan before 1945).

Residential maps of Japan, a collection of approximately 29,000 volumes of maps covering all parts of Japan and published after 1960, are also available in the Map Room. CD-ROM maps are not available at present.

Old maps up to the Edo Period (before 1868) are in the Kotenseki-Siryositu (the Rare and Old Materials Room).

Domestic and foreign atlases, parts of folding maps published before 1945, Rosenka-zu (the land price data published by the National Tax Administration Agency) have to be requested at the book counter.

43 sheets of Inoh-Daizu (large scale map by...
Inoh Tadataka) which are stored in the NDL, originally at the scale of 1/36,000, drawn by Inoh Tadataka in the early 19th century and copied manually ca. 1873, can be seen through Internet (http://www.ndl.go.jp). Inoh-Daizu series is composed of 214 sheets to cover the territory of Japan in those days. The above-mentioned 43 sheets cover partially the eastern part of Japan including Edo (Tokyo) area. The size of the sheet is different sheet by sheet. As an example, the size of map area of No. 90 sheet including Edo is 99.0 cm × 171.0 cm. With internet homepage, almost all area of that sheet can be seen on Window scene. One can enlarge the image by clicking in two steps into enlarged image and highly enlarged image.

The NDL has a plan of "electronic library," but it is beginning mainly from the congress documents, bibliographical information and old books and pictures, considering the copyright.

The Preservation of the Map in the Internet Age and Opening to the Public

SAITO Tadamitsu
Kokusai Kogyo Co., Ltd.

On this occasion, we will study the significance of the state of current map creation, map storage and public presentation, as well as report on the results of the investigation regarding the actual situation concerning maps publicly presented on recent Internet homepages. Throughout history, maps have been drawn up and are still used to communicate information between people; however at the same time, many maps have been worn out by everyday use as simple necessities of their time. Even now, 50 to 60 thousand maps are created annually by public organizations and private companies, such as publishers. However, there is no organization in Japan that systematically collects and preserves these maps.

Regarding maps currently stored in museums and libraries, map location lists are published and made available. Nevertheless, recently maps have also become available via Internet homepages. In such homepages, some large maps are divided up, and can be enlarged and viewed in their original sizes.

The web pages of the Geographical Survey Institute as well as the National Diet Library Map Room list some museum and public organization sites that specialize in maps. For details, please refer to the separate report for the people concerned with this symposium. Also, map-viewing services on the Internet, such as Map Fan Web or Mapion, are very popular for private-use lifestyle maps. They can be searched for using place names, and it is also said that color print services for each mapping site are accessed about 1 million times a day. Maps are also viewable on university or public libraries and information centers. However, at many of these sites, it is not particularly easy to set about searching for maps from the top homepage.

As a result, there is demand for the creation of a Net Map Museum to search for map data via a single homepage on the Internet. Private map data made available over the Internet can also be considered expendable. Old map data, including that of public organizations, may also suffer the fate of being discarded in the near future. The storage of these map databases will also be examined, and hopefully a National Map Academic Museum can be realized in cooperation with some of the foreign organizations that did not present reports this time.