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Bringing the age of exploration of Africa and its heritage to the web

Summary

The AFRITERRA Foundation is a non-profit Cartographic Library in Boston dedicated to assembling and preserving the original cartographic record of Africa. Since September 2005 and thanks to a partnership with Suffolk University, Afriterra has launched a project of digitization of rare maps of Africa belonging to its collection. The objective of the project is to make the maps accessible to a wide range of potential users, from scholars to K-12 educators, from humanists and artists and to the general public. Suffolk University has been very interested in the project since one of its abroad campuses are located in Dakar, Senegal and also has a very active History Department. Most of the maps are related to the age of exploration of the Africa continent, and so they reflect mostly the view of Africa and of the world by the western civilizations and how this view has changed over time. The information that is reported in the maps will be pivotal to better understand the complex relationships between the different civilizations and the African societies. Many of the maps are in a relatively good to fair state, but quite few ones, especially the oldest and rarest, such as maps by Al-Idrisi, Ptolemy, Silvanus, Munster, Servetus, and others, are in precarious conditions. The digitization is critical to allow users to easily access these maps and the information and knowledge of the status of the world that they represent. In order to achieve the maximum accessibility, Afriterra has decided to adopt a standardized approach to the digitization, its cataloguing and its distribution through internet. For the digitization, Afriterra has adopted standard image formats, both for the storage of the images as well as for its compression and distribution. For the cataloging, a double approach was adopted: one involves the upgrade of an in-house inventory system, and another the cataloging of each cartographic material according to the OCLC (Online Computer Library Center) standards. By adopting these standards, our aim is to allow the export of the metadata relative to each cartographic material either in Marc8 or Unicode formats from Afriterra to other organizations, such as the Suffolk University Library, as well as to other institutions around the world. Moreover, it will be easy for internet users and search engines such as MSN, Google, and others, to search, find and retrieve the metadata and its maps. The backend database structure has also been re-structured so to include each cartographic object and its metadata. One of the challenges has been to make the architecture of the digital library of Afriterra flexible enough to reconcile the different user's needs and to accommodate the growth of Afriterra collection. The defining mission of this project centers on a long-term educational commitment to provide unparalleled content and access to historical and geographic material. At the present time, we are actively looking for possible institutions interested in exploring different ways of sharing information or resources regarding the cartographic material of Africa and its surroundings.

Introduction

In September 2005, Afriterra Foundation launched in partnership with Suffolk University a project to digitize the rare maps of Africa in the Afriterra collection. The Afriterra Foundation is a non-profit cartographic Library in Boston dedicated to assembling and preserving the original cartographic record of Africa. It has the largest collection of rare maps of Africa in North America.

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The objective of the digitization project is to make the maps accessible to a wide range of potential users, from scholars to K-12 educators, from humanists and artists to the general public. In this way, the project will help to provide a new source of historical material about Africa, and allow new interpretations based on a larger mass of information. Suffolk University, located in Boston, Massachusetts, has been very interested in the project because one of its abroad campuses is located in Dakar, Senegal, and because its History Department is deeply involved in African Studies. Most of the maps are related to the age of exploration of the Africa continent. They reflect primarily the view of Africa and the world by Western Civilization. Together they show how this view has changed over time. The maps will help provide a better understanding of the complex relationships between the different civilizations and the African societies. Many of the maps are in fair to good condition, but several maps, especially the oldest and rarest treasures, such as maps by Ptolemy, Silvanus, Münster, Servetus, and others, are in precarious condition. They cannot be handled manually without further deterioration to their condition. The digitization is critical to allow users to easily access these maps.

This paper will describe our approaches in digitizing the maps and will discuss the various issues related to the cataloguing of the cartographic material in order to bring this knowledge to the world through the Internet.

Status of Afriterra Collection

The Afriterra Foundation collection has more than 2,000 original rare maps of Africa, most of them spanning a period from 1492 to 1900. In total, Afriterra has more than 5,000 maps, engravings, and antique rare books of the African region. Afriterra's maps cover all regions of Africa and range from palm-size to wall-size, from large regional scale to small continental scale. The early maps are both aesthetic objects and educational tools. Within this context, rivers such as Gambia, Senegal, Niger, Congo, Orange, Zambezi, and Nile were mapped by different cartographers in different periods. Several regions, such as Gambia, Senegal, Niger, Congo, South Africa, Mozambique, Ethiopia, and Timbuktu, and kingdoms, such as Songhay, Asante, Dahomey, Oyo, Benin, Ife, and Zulu, were described and symbolized. The location of slave trade sites, such as Arguin, Goree, St. Louis, De Los, Sherbro, Calabar, Biafra, and Loango, were depicted both on map and pictorially. The languages used in the cartographic items include Dutch, English, French, German, Italian, Latin, Portuguese, and Spanish. Each language and culture reflects different perspectives on the African continent, and its people, resources, and environment. The core map collection at Afriterra constitutes a unique and rare opportunity to make a comparative view of the different cartographic styles and different engraving and printing procedures adopted through the centuries by different societies. Many of the maps reflect original testimonial information gleaned from indigenous Africans, but most certainly represent a view of Africa from the major exploratory and imperial European societies as they undertook their quest for legitimacy through the colonial domination of Africa.

Historic and rare maps need careful management to ensure their survival for current and future generations. At present, the preservation strategy focuses on digitizing the cartographic material that has the highest value and the highest exposure risk. In this way, we will reduce the physical handling of those at-risk maps. In addition, we are identifying the cartographic material that needs further care and identifying the possible resources, both people and funds, for future preservation activity.

Figure 1. "Map of Africa Including the Last Discoveries," Phillips, R., 1809.
This is an example of a map in need of preservation, ID 00820. The scale is given in
"Scale of 30 Days Journey on Camels, each at 4 ½ geogr.
Miles & for the latitude from 18 to 30," Afriterra Foundation.

Digitization and Afriterra Basic Principles

During the initial efforts to fund the digitization effort, we had limited success because we had not integrated the project within an educational framework. When we recognized the need to place the Afriterra collection within an educational framework, we decided to explore a partnership with Suffolk University. Through this partnership, Afriterra would succeed in finding an immediate use for the cartographic material that we digitized and brought onto the Internet. The Afriterra Foundation and Suffolk University have partnered both providing funding for the current level of activities: the digitization and cataloging of the first 1,000 maps of Africa. This close collaboration between Afriterra and Suffolk will help to increase the study and understanding of the cartography of the imperial and exploratory periods of Africa among Suffolk faculty and students, especially within the African History Department.

The Afriterra objective is to bring its rare cartographic material not only to Suffolk University community, but to the world community. We recognize the special connection between our maps and scholars within academia at Suffolk and at other institutions worldwide. In order to achieve its objective of widespread dissemination, Afriterra has decided to make the digital collection available through the Internet. Afriterra has also identified difficulties in sharing the cartographic data and information through the Internet. In order to promote collaboration and sharing of such data, Afriterra has made a concerted effort to develop web user interfaces, open source software, and standardized data formats and processes that facilitate the integration of Afriterra cartographic documents with other platforms and/or software tools. A detailed plan for the dissemination of the cartographic material has not yet been formulated. Nevertheless, Afriterra has undertaken efforts to collaborate with several institutions to engage students and scholars from around the world in using the cartographic materials. Afriterra has also begun identifying companies to sponsor travel exhibits. Areas of scholarly studies that Afriterra would like to promote include toponyms analysis, semiotics, symbolism study, epistemology, and hermeneutics of the historical cartography of Africa as well as the use of maps for building the imaginary collective of Africa. For example, by looking at the cartouches that embellish several maps, it is possible to analyze the culture of the cartographer that built the map and the messages that are connected to the style and symbolism used in the cartouches. Moreover, several stereotypes are used to represent the African shoreline:

from a mysterious shoreline, to a shoreline filled with monsters and other mythical creatures. As a third example, by looking at the cartographic annotations, people can study the history of certain toponyms through time and through different cultures.

Digitization Approach

In order to achieve maximum accessibility, Afriterra has decided to adopt a standardized approach to digitization, cataloguing, and distribution through the Internet. For the digitization, Afriterra has adopted standard image formats, both for the storage of the images and for image compression and distribution over the Internet. Two separate sets of formats were adopted: jpeg and tiff formats. Each tiff image has a resolution of about 400 dpi, while the jpeg image, given its small memory footprint, is used for the fast retrieval of the image through the Internet or as thumbnail image. Tiff images are compressed and pyramided for easy parsing of the images through standard web browsers such as Internet Explorer and Firefox. The digitization process is conducted outside Afriterra, at the Digital Scanning Department of Harvard University, in order to guarantee the highest degree of resolution, the accuracy of the output images, and the safe handling of the cartographic material.

Once the maps are digitized, the images receive post-processing adjustments to assure the maximum contrast, color balance, and resolution. Once the images are received, they are checked for clarity, and for naming errors and other type of errors. Sometimes, because the storage of the paper maps followed certain criteria, the digital images also follow the same criteria. For example, we first digitized maps of the whole Africa continent; however, in some cases, we digitized at the same time those maps that form the whole Africa continent in their combined representation. The result is that, for a unique map ID, there may be more than one digital map or object that has to be named according to an alphanumeric sequence (for example, 00722a, 00722b). In other cases, we noticed that the verso of a map was as revealing as the front of the map, and therefore we proceeded to digitize both the front and the verso of a map, for completeness and with the goal to make the digital archive as complete as possible for future scholarly studies.

Figure 2. "Aphricae Tabula II," Münster, ca. 1540, front and verso – Afriterra Foundation.

Once digitized, each map represents one object within the open source database, MySQL, which back ends to the Afriterra website. The current web site is backended by a DOS-based catalog application written in Turbo Pascal, which is the only digital record of the Afriterra collection. A

new web site will be launched in June 2006[1]. It will allow for a faster search and retrieval of the digitized maps.

At present, the digital images are considered as objects of the database and are not registered to spatial points on the surface of the Earth. We have not excluded the possibility of georeferencing some of these images in the future. This georeferencing process, which establishes a relationship between places on a planar map image and known real-world coordinates, will allow the user to select only a specific region of interest within the digital image. In this way, it will facilitate the spatial and temporal analysis of maps. In addition, it will constrain less the capacity of the Internet connection during data transfer and will diminish the memory requirements on the user's computer platform.

Cataloging Approach

Afriterra has embarked on developing a complete inventory of its collection. It is also following cataloguing standards and best practices for the metadata relative to the cartographic material to allow for easy integration with the metadata standards adopted in other institutions and libraries. For the cataloging, two approaches were adopted:

1. the upgrade of an in-house inventory system developed by Eric Rizzo from Afriterra, and
2. the cataloging of the cartographic material according to the Online Computer Library Center (OCLC) standards and practices.

Afriterra's backend database structure has been re-structured to include each cartographic object and its metadata. One of the challenges has been to make the architecture of Afriterra digital library flexible enough to reconcile the needs of the different users needs and to accommodate the growth of the Afriterra collection. The in-house database can be viewed and queried online at *www.afriterra.org* and can be searched by cartographer/publisher, date, title, region, latitude and longitude, and key words.

By adopting OCLC standards, we decided to make possible the export of the metadata relative to each cartographic material either in MARC8 or Unicode formats from Afriterra to other organizations, such as the Suffolk University Library. The adoption of metadata standards and, later on, the metadata servers such as Z39.50 will allow Internet users and search engines such as MSN, Google, and others to search, find, and retrieve the metadata and its maps. Afriterra believes that standardized metadata services will help address the issues of interoperability of the metadata. Soon it will not matter whether the metadata schemas will be MARC, Dublin Core, FGDC, EAD, Unicode or others, because there will be either a federated metadata server such as Z39.50 or middleware – called "crosswalks" – that will be easy to deploy. These approaches will allow institutions in the United States and around the world to search for African maps by accessing standard metadata services through Internet browsers. This approach is already underway at several institutions, such as Harvard University and Brown University. Because of the strong partnership between Afriterra Foundation and the Suffolk University, we have established a specific workflow that involves the cataloging according to the OCLC standard through NELINET, and the export of the record holding to the Suffolk Library System Innovative Millennium, after checking for quality assurance (Figure 3).

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[1] http://www.afriterra.org

The basic steps involved in the Afriterra cataloging according to the OCLC framework require keyword searches through the WorldCat catalog to determine whether other institutions already have a holding that corresponds to the Afriterra map that we have digitized. If we do not find the exact match, we derive or create a new record. We check each field of the record of the map through the OCLC standards and the Authority File to determine whether the format and style of certain entries, such as the author, are already standardized, or whether there are misspellings, standard punctuation, missing or wrong subfield tags, and missing or incorrect codes in the fixed fields or in a coded field. After this process, we submit the record for validation, and, if the record is validated, we update the holdings of the Afriterra Library on OCLC.
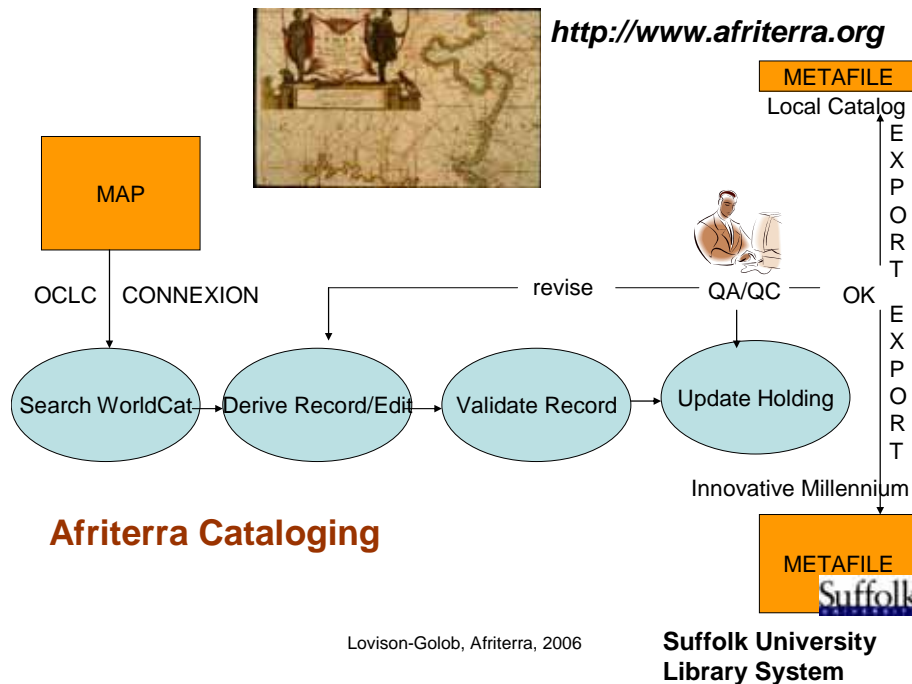

Figure 3. Afriterra Cataloging Workflow.

Another step is the quality assurance and controls that, in our case, is carried out remotely by Paige Andrew from the Pennsylvania State University. Once we are satisfied with the level of quality assurance reached, each holding is exported into Innovative Millennium, which is the metadata schema that has been adopted by the Sawyer Library at Suffolk University. Once the record is included in the Sawyer Library, we proceed to edit each record by cross-referencing some fields to reflect the Afriterra ownership and location of the maps. As a result of this procedure, the metadata of each cartographic document is searchable both within the Suffolk University Library System[2] (Figures 4 and 5) and from the Afriterra web site. The digital maps will be accessible and retrievable at the Afriterra web site.

During the cataloging, several issues have emerged. Frequently, the maps in the Afriterra collection do not have any record holdings and most of the time is devoted to record in the most complete manner possible the cartographic documents at hand. In addition, the histories of individual cartographers are not clear, and the assistance from the Authority file within the OCLC web interface is somewhat limited. For example, the cartographer Peter C. Monath is not listed in the OCLC Authority File. P.C. Monath is printed as the cartographer on the original paper map. His

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[2] http://library.suffolk.edu/screens/opacmenu.html

lifespan from 1683 to 1747 does not match the time of printing of the map in 1760. Yet, none of the children of P.C. Monath, themselves cartographers, had names that started with P.C. We encourage our users to help resolve this conundrum.
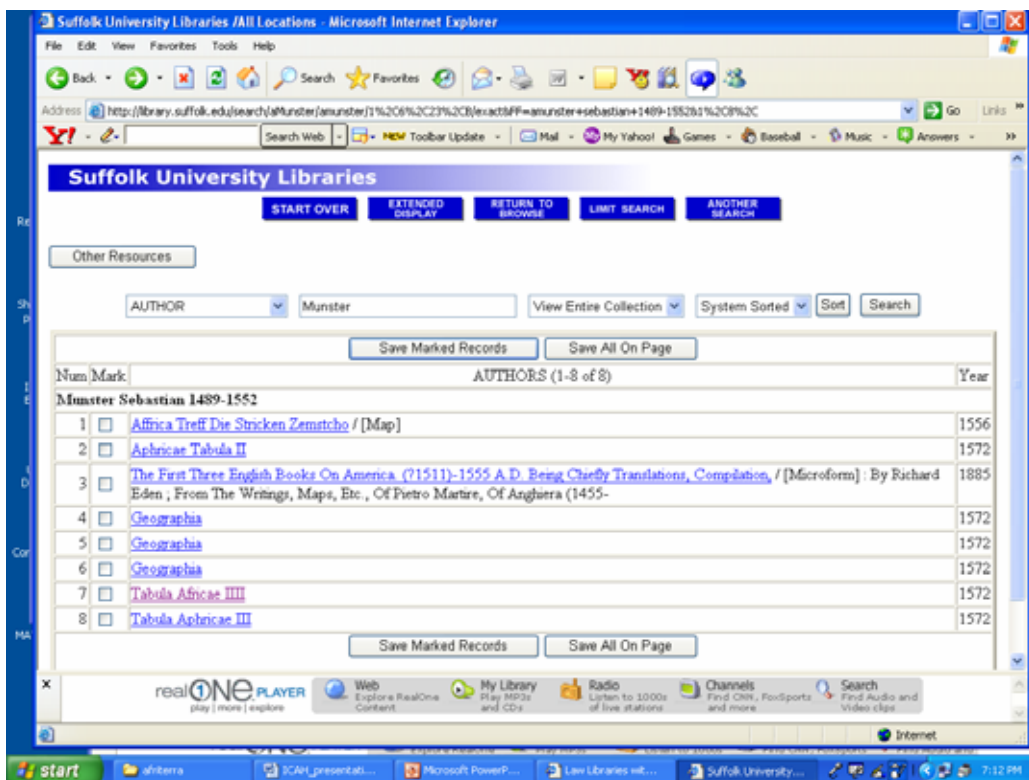

Figure 4 – Suffolk University Innovative Millennium Library Interface
with the location reference to Afriterra Collection at http://www.afriterra.org.

Figure 5- Suffolk University Innovative Millennium Library Interface
with the location reference to Afriterra Collection at http://www.afriterra.org (detail).

Overall, the task of digitizing and cataloguing the Afriterra collection is taking more time and resources than we had expected, but we continue to work towards achieving a world-class digital map collection of Africa's rare maps.

Conclusions

The mission of the Afriterra project to digitize its collection of African rare maps is to make accessible historical and geographic material of Africa for educational, research, and other purposes. We have described in detail our basic principles and methodology and presented our workflow for the digitization and cataloguing of the Afriterra material, specifically the first 1,000 rare maps. Although we have not yet developed a detailed framework for the dissemination of the cartographic content, we have discussed briefly the educational content of the maps and the unique opportunity for developing historical and other types of studies of the maps and their contribution to understanding the position of Africa in world history, as well as the evolution of different cultures and societies within Africa. At present, we are actively seeking additional grant sources with common goals to complete this work, as well as institutions interested in exploring different ways of sharing information or resources regarding the cartographic material of Africa and its surroundings. Through the adoption of web standard user interfaces and processes as well as open source software tools, we have followed an interoperability approach that was first discussed and demonstrated in 2003 (4). This approach will allow large institutions in Europe, Africa, and the United States as well as small organizations to participate collaboratively to bring to the world the history of cartography of Africa. We are also seeking scholars and students who are interested in analyzing in different ways the Afriterra cartographic documents. In this way, we hope to advance the depth of knowledge about the historical cartography of Africa. A new endeavor is also required to bring knowledge about the historical past from the African maps to the K-12 environment.

Acknowledgements

References

"The Patterns and Meaning of a Great Lake in West Africa," Dr. Gerald J. Rizzo, Afriterra Foundation, Imago Mundi Imu, 2005.

Lévy J. and M. Lussault (2003). *Dictionnaire de la géographie et de l'espace des sociétés.* Belin.

Casti E. (1998). L'Altrove Negato nella Cartografia Coloniale Italiana: il caso Somalia. In E. and A. Turco (ed.), *Culture dell'Alterita.* Unicopli.

Lovison-Golob L. (2003). Mapping History on the Internet. 20th International Conference on the *History of Cartography*.

Lovison-Golob L. (2005). www.navigator.fas.harvard.edu

Metadata Object Description Schema - MODS – Official web site. www.loc.gov/standards/mods/

Online Computer Library Center (OCLC). www.oclc.org.

Mason C., M Berson, R. Diem, D. Hicks, J. Lee, T. Dralle (2000). Guidelines for Using Technology to Prepare Social Studies Teachers. *CITE* Journal, 1(1), 107-116.