## DIGITIZING BYZANTIUM

Byzantine Studies Conference Sarasota, November 6, 2009

Dumbarton Oaks, November 10, 2009

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**Daniel Terkl** 

Sarah Teetor

Günder Varinlioğlu

Fani Gargova

## Panel Presentation Dumbarton Oaks November 10, 2009 Sarah Teetor, University of Vienna

## Workflow, Standards and Quality Management within the Project DiFaB

(Slide 1)

Today I will be presenting practical aspects of our working procedure as discussed at our internal DiFaB Workshop on 29 September 2009 combined with some technical aspects of digitisation, which were presented by my colleague Daniel Terkl at the Annual BSC Conference, 5 - 8 November 2009.

Before I begin I would like to recall the types of image material being incorporated within Project DiFaB. Our collections consist of:

- 1. historical photographs and negatives in the possession of the Photographics Archive at the Institute of Art History at the University of Vienna;
- 2. small format slides from the personal estate of Dr. Horst Hallensleben; and
- 3. new digital photographs taken by members of the Project.

All three groups of images are being collected and integrated into the same database system.

In the next few minutes I will focus on the scanning of the small format glass slides (*Slide 2 - Hallensleben Slides*) from Dr. Hallensleben and their entry into the database PHAIDRA - "Permanent Hosting, Archiving and Indexing of Digital Resources and Assets" - which was developed at the University of Vienna as a long term - even "permanent" - archive of digital assets. Considerations to be mentioned are the use of standards for the scanning process as well as standardization for the entry of the accompanying metadata, the "information to each image", so that they are easily retrievable when searching in the database-repository.

The scanning process that I will now describe developed out of many attempted variations over the course of about two years. This timeframe does not include the experiences many on the project had had with the database "Unidam", which was previously in use at the Institute of Art History in Vienna. This procedure also represents our best intentions to maintain the integrity of Hallenleben's collection as an archive; to preserve the images from the loss, destruction, or decomposition of the material image carrier; as well as to make this visual material accessible to and usable for a larger audience.

The slides, like those shown here, are stored in wooden drawers, with about 300-450 slides in each drawer. As they are organized by location and then monument, we first give the slides an inventory number. After the external glass has been cleaned, the slides are then scanned (*Slide 3 - Technical Aspects*) with a color target to guarantee, in the digital image, the trueness of color, which can be affected by the scanner used. This is particularly important should any of these images be used in a publication. We scan the color slides with a resolution of 4000dpi. The reason for this very high resolution is as follows: in order to attain an unaltered image one must scan at a higher resolution than that of the original material - in this case photographic film - or else effects such as banding /stripes

can occur; and moreover, the scanner is able to capture more information than can be perceived by the human eye. The scanned images are then saved in tiff format - following the standards of Dublin Core - as this is a lossless format and is widely compatible.

After the slides have been scanned once, jpeg copies are produced using the program ImageMagick to aid in a detailed quality control of the scans. Common problems of image quality seen are so-called "Newton Rings", a rainbow effect caused by the curved film touching the flat glass plate, dirt particles between the glass plates, and, most disturbingly, a hazy chemical film most likely caused by the decomposition of the slide film. In these cases, the slides are carefully cut open on three sides and the glass is cleaned using a microfiber cloth, without any cleaning agents. The slides are then taped shut and scanned again. (*Slide 4 - Before and After Cleaning*). At first glance, the difference in image quality may seem minimal, but cleaning nevertheless has a great impact on the clarity and focus of the scanned image. In an earlier phase of the project, such slides were put into new glass-less frames (*Slide 5 - Frames without Glass*) thus removing them from the hand-constructed frame and handwritten information of Hallensleben; however, further thought about the general archival function of the project has lead to this compromise in procedure.

The rescanned slides are then reviewed before being uploaded with the rest of the scanned images onto a University server. From the University's server, the digital images are then uploaded into the PHAIDRA database (http://phaidra.univie.ac.at). (*Slide 6 - New Object in PHAIDRA*) As you can see, PHAIDRA is a digital repository for many kinds of digital assets, not just images but also audio and video files, documents and even books, that are concurrently searchable both for the file owner and for external users.

After a digital file has been uploaded, the metadata are to be filled in. This information provided is the key to identifying a digital image, and we use a standardized format and controlled vocabulary to ensure that 1) the entries can be retrieved within a larger pool of files and 2) that their designation to the project DiFaB is apparent.

I would now like to show you an example of a simple search and our metadata entry, using an image of Sveti Kliment in Ohrid. A simple search for "Ohrid" yields the following results (*Slide 7 - Simple Search*). We can then open the Metadata-Editor for this image. Previously, the metadata fields were organized into 9 tabs, within the past two weeks a 10th has been added, as well as an English language interface.

## Tab 1 - General (Slide 8):

Titles can be entered in multiple languages - which are also searchable by language. The "Title" is entered in a standardized format: place (current political designation), monument/object. Under "Description" we enter exactly what Hallensleben wrote on the slide, down to his punctuation. The somewhat "verse-like" format is exact and XML compatible, which means it can be transferred into another program withoutout losing any information as

the lines/divisions remain recognizable. "Keywords" are general designations of subject and technique visible on the scanned image.

## Tab 2 - Life Cycle (Slide 9):

Multiple roles - such as photographer, technical translator - can be assigned to document the history of an image (with exact dating) and its association to the Project.

## Tab 3 - Technical Data (Slide 10):

This field contains information about the format and size of the digital asset as well as the permanent link, which can be accessed from outside the database.

- "Installation Guide" refers to the color target used. The color target is uploaded separately; this reference is included with every image we upload into the database.
- <u>Tab 4 Educational</u>: N/A for DiFaB, however these fields make clearly visible the concept of this digital repository as also applicable to storage of classroom assignments.
- <u>Tab 5 Rights and Licenses</u> (*Slide 11*): in choosing one of 7 licenses one can regulate how "protected" the image is, and if its usage incurs costs. It is important to note that the licenses can be changed; however one cannot restrict a more open license once it has been given, but it is possible to change a restricted license to one with more open access. DiFaB supports an open-access policy no costs and no restricted usage concerning its images; the burden of copyright law rests on the user in accepting the user agreement, and additionally, traffic on the server is monitored by the IT department of the University.
- Tab 6 Comments: Not currently in use by the Project
- <u>Tab 7 Classification</u> (*Slide 12*): ÖFOS and EuroVoc designate larger classification groups which are earchable and used by the entire University when they enter digital assets. These once mandatory fields have been continued for the sake of the uniformity of the metadata. The value of the Getty Thesauri and their standardized vocabulary will be discussed by my colleague Fani Gargova.
- <u>Tab 8 Association</u>: Designates the digital asset as "belonging to" a specific department within the University of Vienna, in our case the "Faculty of Historical and Cultural Studies", "Department of History of Art".
- Tab 9 "Contextual Allegation" (*Slide 13*): This somewhat oddly translated heading corresponds to the German "histkult", referring to information specific to the Faculty of Historical and Cultural Studies. It is in these fields that we enter information pertinent about the digital image that is pertinent to our archiving project, such as the inventory number, a stamp if applicable (some slides have stamps of other collections), and "Bestand Hallensleben" (Collection Hallensleben). GPS coordinates can also be added to facilitate further application of these images as will be discussed by my colleague shortly.
- <u>Tab 10 Provenience</u> (*Slide 14*): This is a new heading added within the last two weeks as a cooperative effort of the University's IT department and Project DiFaB. In these fields there is the possibility to add information about the material image carrier (for example, designations of the source such as slide or negative), data about the institution or project of its origin, as well as a rough or precise dating of the object.

The IT Department is currently working on restructuring the metadata fields to express a more clear differentiation of information. This will hopefully be implemented shortly.

In systematically going through all of these data fields, it may seem like entering this information for each single image takes more time than it is worth. However, all of this information must not be entered each time one uploads a digital asset. There is the possibility to create templates, modify them, and even share templates with other users, which significantly speeds up the process of metadata entry. Creating a template takes about 30 minutes, and once saved, one can upload and enter around 30 images per hour.

Lastly and very breifly, I would like to show you a "behind the scenes" element of our daily working procedure, the "DiFaB-Wiki" (http://www.univie.ac.at/difabwiki/index.php?title=Hauptseite) (*Slide 15*). It serves as a tool of communication, but also as documentation for the work being done within the project and on the visual material itself. Using the same basic principle as Wikipedia, any project member can read, edit, or create new pages, and these multiple versions are saved and can be compared with each other.

The basic structure of the Wiki can be seen under "Portal", a table of contents (*Slide 16*), which includes links to background information and resources about digital archiving, current events of interest to the Project, as well as a Code of Good Practice which provides exact, detailed instructions of our working procedure (*Slide 17*). Each page is accompanied by a Discussion page, where problems and other issues can be addressed, such as here, the exact format for representing the labels of Hallensleben's slides (*Slide 18*). The Versions of a certain page can be compared with previous or newer versions (*Slide 19*), thus documenting the development of our working procedure. We also use the Wiki to make public the results of our quality controls (*Slide 20*), so that the project members can work remotely, more quickly and effectively.

In closing, this somewhat labor-intensive process of scanning, standardised entry, and documentation seems necessary to ensure the longevity of such valuable visual material and its future function as learning and research material. That is, until even better and more efficient technologies are made available.

## Workflow, Standards and Quality Management within the Project DiFaB

Sarah Teetor, University of Vienna Dumbarton Oaks, 10 November 2009

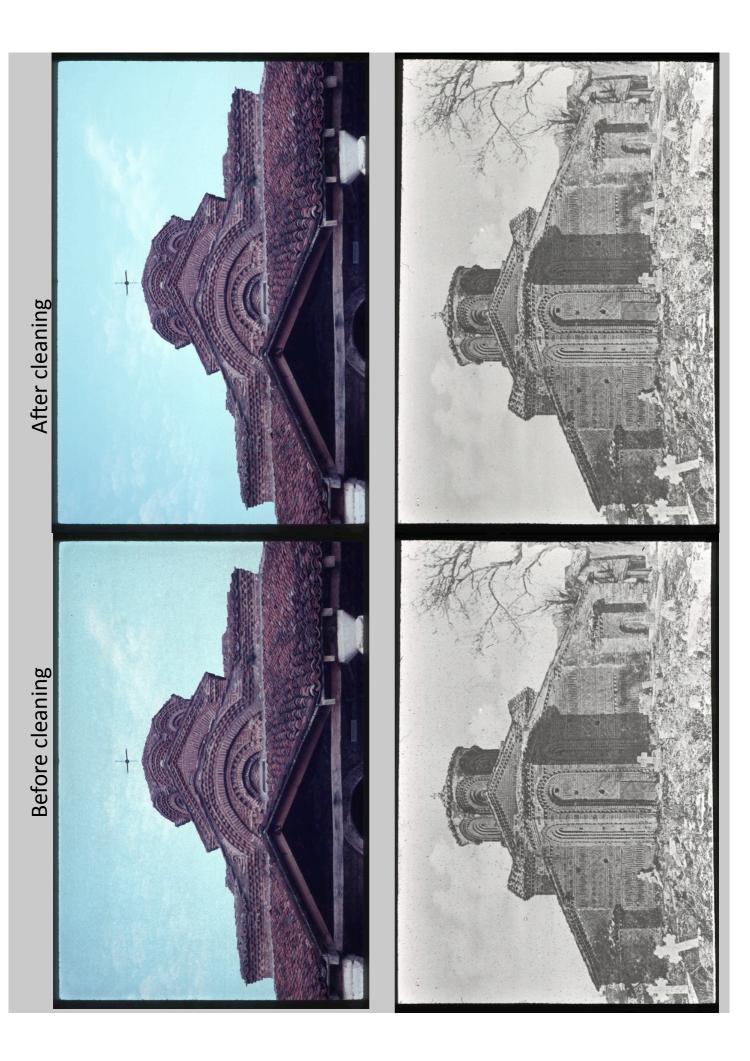
## Glass Slides from Hallensleben



## Technical Aspects:

- Color Target for Scanning Color Slides
- Resolution –4000 dpi
- ◆File Format .tif

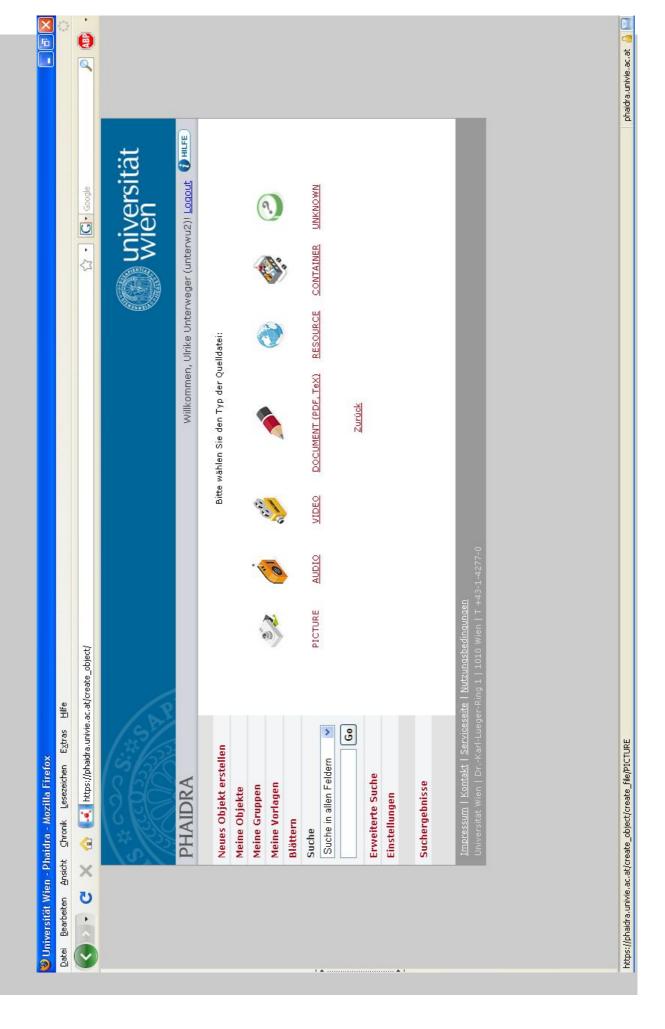




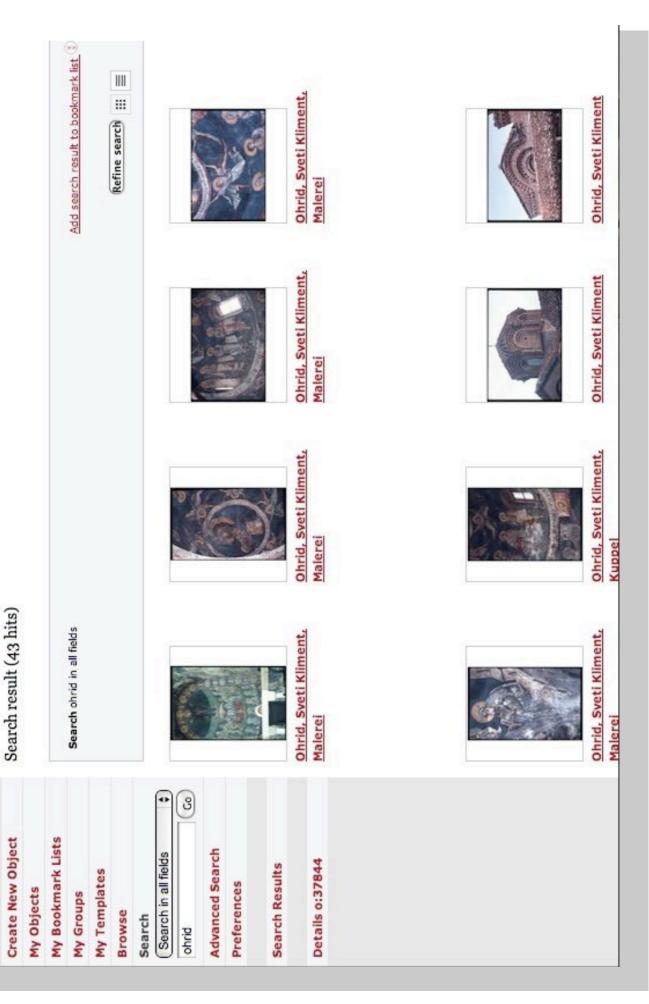
## Slide Frames without Glass



## Creating a new Object in PHAIDRA



## Simple Search



## Welcome, Sarah Teetor (teetors8)! Logout (1) HELP GENERAL LIFECYCLE TECHNICAL DATA EDUCATIONAL RIGHTS & LICENCES COMMENTS CLASSIFICATION ASSOCIATION CONTEXTUAL ALLEGATION in language: German in language: German in language: English in language: English Diabeschriftung Hallensleben: "Ohrid, Sv. Kliment / Kuppel / [Bild] / Christos, von Engeln ge- / tragen" Ohrid, Sveti Kliment, Malerei + General Add link(s) German 0:37844 Metadata editor for Object 0:37844 Description or Additional Data\*: Alternative Title: Language\*: Identifier\*: PROVENIENCE Subtitle: Title\*: ဒ Create New Object My Bookmark Lists Advanced Search PHAIDRA Search in all fields Search Results My Templates Preferences My Objects My Groups 018-038 Browse Search

+

Save metadata in object

Identifiers

+

Hallensleben, Byzanz, Architektur, Kirche in language: Cerman

Keywords:

Coverage:

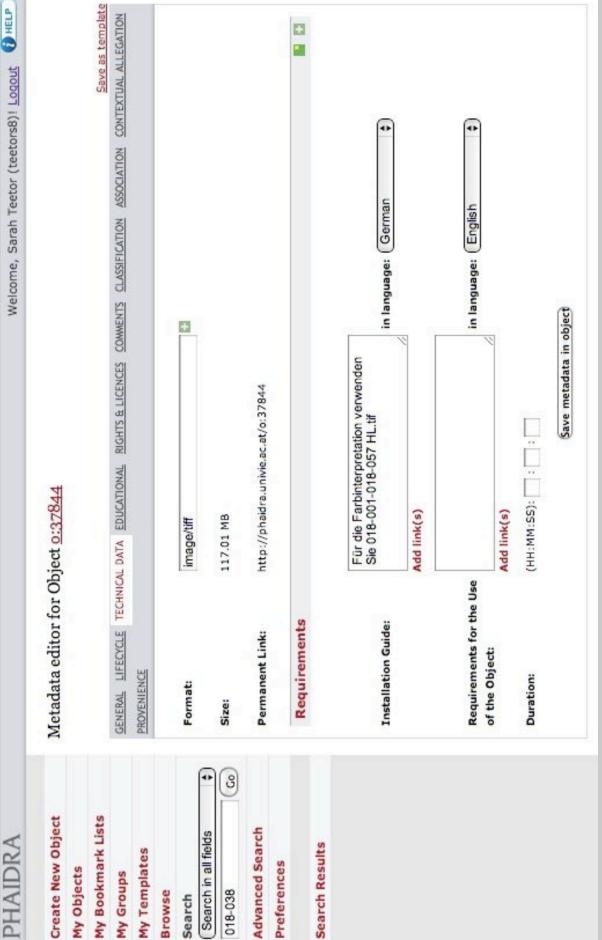
+

in language: English

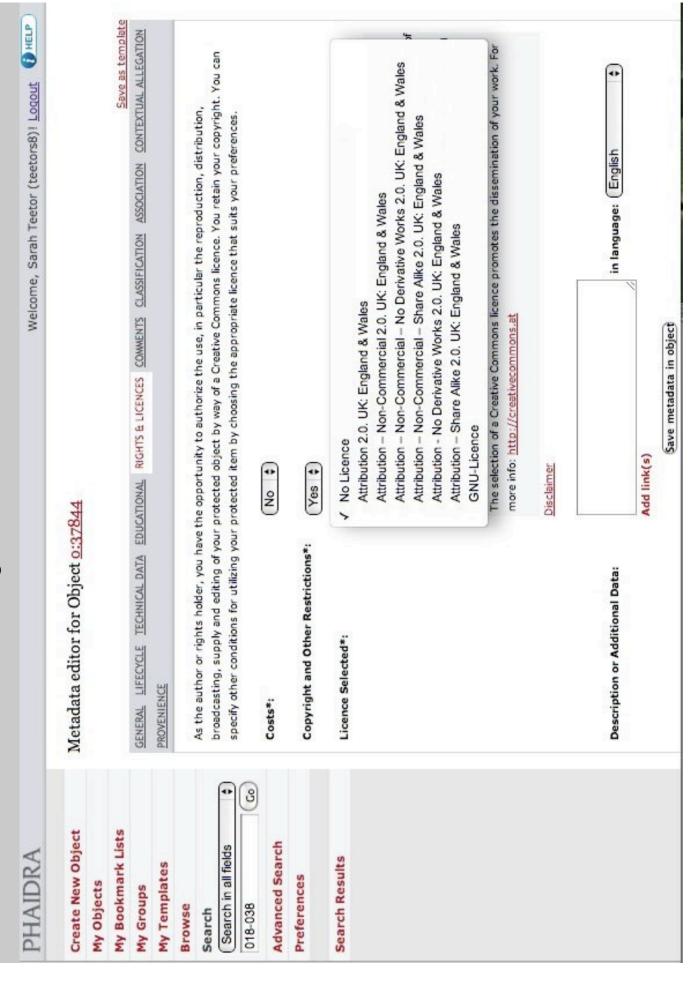
## Life Cycle

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## Welcome, Sarah Teetor (teetors8)! Logout **Technical Data**



## Rights and Licenses



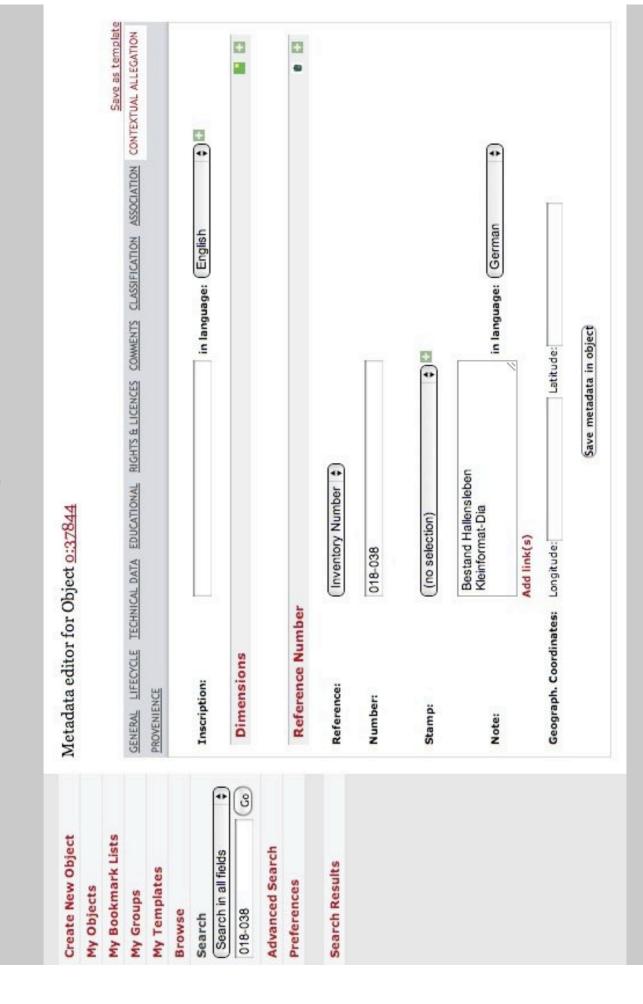
## Save as template GENERAL LIFECYCLE TECHNICAL DATA EDUCATIONAL RIGHTS & LICENCES COMMENTS CLASSIFICATION ASSOCIATION CONTEXTUAL ALLEGATION 8 8 8 Getty Thesaurus of Geographic Names 5663: medieval history 3956: social sciences MT3611: humanities 6: HUMANITIES 6808: Art history 7029392: World D36: SCIENCE EuroVoc 4.2 1245: history **ÖFOS 2002** Classifications (Classes, Subclasses) Classifications (Classes, Subclasses) Classifications (Classes, Subclasses) 68: Arts Metadata editor for Object 0:37844 Search assistance Search assistance Search assistance Classification PROVENIENCE Source: Source: Source: Path\*: Path\*: Path\*: 3 Create New Object My Bookmark Lists Advanced Search Search in all fields Search Results My Templates Preferences My Objects My Groups Browse 018-038 Search

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## Contextual Allegation / HistKult



## Provenience

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My Objects My Bookmark Lists	My Groups My Templates Browse		Advanced Search Preferences Search Results							

## DiFaB-Wiki, Opening Page

2 Sarah Eigene Diskussion Einstellungen Beobachtungsliste Eigene Beiträge LaTeX/PDF Beobachten Quelitext betrachten Versionen/Autoren Seite Diskussion

Hauptseite

- DiFABWiki-Portal
- Aktuelle Ereignisse Letzte Änderungen
  - Bibliographie
- Bibliographie-Info Wikipedia-Hilfe

## Suche

DIGITALES FORSCHUNGSARCHIV BYZANZ

DiFaB steht für Digitales Forschungsarchiv Byzanz. Das DiFaB ist ein Projekt am kunsthistorischen Institut der Universität Wien 🗗 Es geht um die Archivierung von neuen (meist

digitalen) Daten (hauptsächlich Bildern, aber auch elektronischen Modellen), wie auch um die Digitalisierung von analogem Material (Fotos, Dias, etc.). Zugleich wird an dem zu bearbeitenden Material geforscht. Zugriff zu diesem Wiki haben nur MitarbeiterInnen aus dem Projekt und von Partnerprojekten.

ARCHIVE

DIGITAL RESEARCH

FOR BYZANTIUM

Seite Suchen

- Links auf diese Seite
  - verlinkten Seiten Anderungen an
- Hochladen
- Druckversion

Spezialseiten

Permanentlink

Diese Seite wurde bisher 1.850-mal abgerufen.

Datenschutz

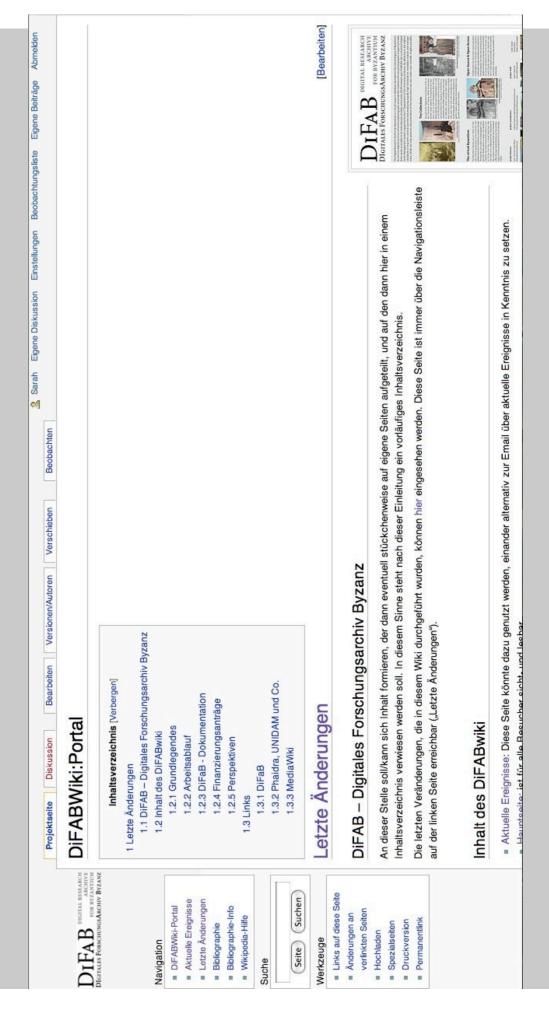
Impressum

[Fe II Powered By

Diese Seite wurde zuletzt am 29. Mai 2009 um 13:47 Uhr geändert.

Über DiFABWiki

## Portal – Table of Contents





## JIFAB PIGITAL RESEABCH ARCHIVE FOR BYZANZTUR GITALES FORSCHUNGSARCHIV BYZANZ

## Navigation

- DiFABWiki-Portal
- Aktuelle Ereignisse
- Letzte Änderungen
- Bibliographie
- Bibliographie-Info
- Wikipedia-Hilfe

## Suche





## Werkzeuge

- Links auf diese Seite
- verlinkten Seiten Änderungen an
- Hochladen
- Spezialseiten
- Druckversion
- Permanentlink

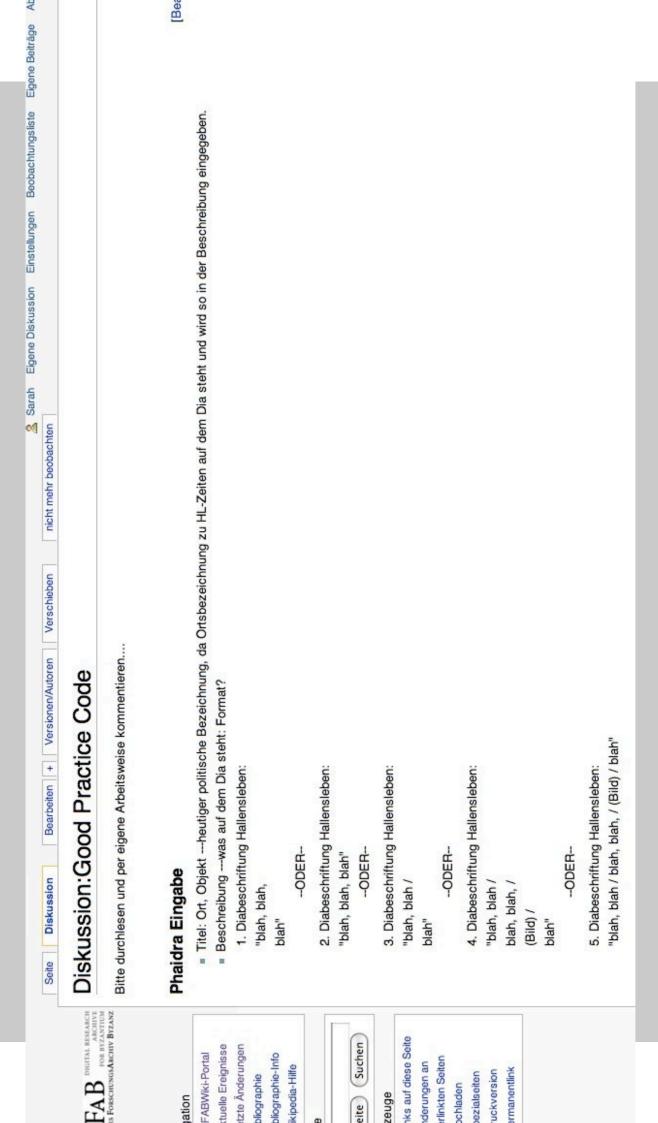
## Inhaltsverzeichnis [Verbergen]

- 1 Code of Good Practice for Scanning of Color/B-W Slides
- 1.1 Nummerierung der einzelnen Dias
- 1.2 Scanvorbereitung Tabelle
- 1.3 Scannen
- 1.3.1 Software und Einstellungen
- 1.3.2 Dias in den Scanner laden
- I.4 Umrahmen
- 1.5 Bild.bearbeitung
- 1.5.1 erste bearbeitung in AdobeBridge
- 1.5.2 Drehen und jpeg erzeugen in Image Magick
- 1.6 auf den Uni-Server (Z: oder L:) hochladen sofort!

1.7 Bilder (jpegs) auf dem Server sollten von einem/r Dritten kontrolliert werden, bevor sie in Phaidra hochgeladen werden.

- 1.7.1 Neuscans
- Phaidra Einarbeiten (Stand 07/09)
- 2.1 Allgemein:
- 2.2 Lebenszyklus:
- 2.3 Technische Angaben:
- 2.4 Didaktik:
- 2.5 Rechte & Lizenze:
- 2.6 Anmerkungen:
- 2.7 Klassifikation:
- 2.8 Organisation:
  - 2.9 Histkult:
- 2.10 Eingabe von Farbtargets
- 3 Qualitätskontrolle
- 4 Diskussionsthemen/Erneuerungen bis 4/09

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## Comparing Versions



## Results of Quality Control

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Phaidra					[Bearbeiten]
Lade 1					[Bearbeiten]
001-001-001-100	00				[Bearbeiten]
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001-001	ja	gut	in Ordnung	Wie mit Repro, aber Autor umgehen?	
001-002	ja	gut	in Ordnung n. Bearbeitung		
001-003	ja	gut	in Ordnung n. Bearbeitung		
001-004	nein	gut		noch nicht vereinnahmt: neu scannen, vereinnahmen	
001-005	ja	gut	in Ordnung n. Bearbeitung		
001-006	ja	gut	in Ordnung n. Bearbeitung		
001-007	ja	gut	in Ordnung n. Bearbeitung		
001-008	nein	gut	100	nicht findbar: offensichtlich vergessen: neu scannen, vereinnahmen	
001-009	ja	gut	in Ordnung n. Bearbeitung		
001-010	ja	gut	in Ordnung n. Bearbeitung		
001-011	ja	gut	in Ordnung n. Bearbeitung		
001-012	ja	gut	in Ordnung n. Bearbeitung		
001-013	ja	gut	in Ordnung n. Bearbeitung		
001-014	ja	neu scannen	in Ordnung n. Bearbeitung	Scan?	
001-015	ja	gut	in Ordnung n. Bearbeitung		
001-016	ja	gut	in Ordnung n. Bearbeitung		
001-017	ja	gut	in Ordnung n. Bearbeitung	Bonn-Repro, wie auszeichnen?	

## Digitizing Byzantium - Perspectives

## Fani Gargova Digital Research Archive for Byzantium, University of Vienna

After my colleagues' talks on key aspects of analogue archiving, digital preservation, image quality and the importance of good databases, I would like to concentrate on the perspectives offered within databases like DiFaB. Using a church in Ohrid as an example, I will show the potential of our working methods, to gain new scientific insights through new computer-based visualisations such as mapping.

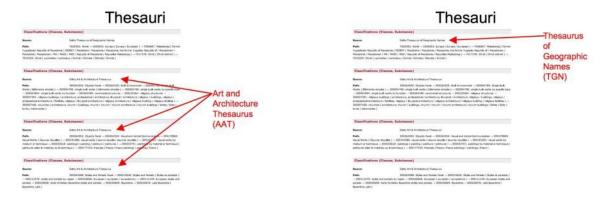
As Daniel Terkl already mentioned, following standards is a major principle to ensure the longevity of our data, but also to provide material that can easily be searched for.

## Thesauri

- regulated vocabulary
- · controlled vocabulary
- · stable categorizing

A particularly important aspect within this framework is the use of controlled vocabulary for the metadata. This is the only way to ensure the stable categorising of a dataset. A way to achieve this aim is the use of thesauri.

PHAIDRA, our repository, has implemented - on DiFaB's initiative - the three major Getty Thesauruses:



The Union List of Artist Names (ULAN), the Art and Architecture Thesaurus (AAT) and the Thesaurus of Geographic Names (TGN). In working with these tools we ensure the use of a regulated, standardised vocabulary. The structure of the Thesaurus of Geographic Names follows the typical hierarchy of a thesaurus: Starting with the largest entity, it is subdivided down to the smallest sensible entity.

## Thesaurus of Geographic Names







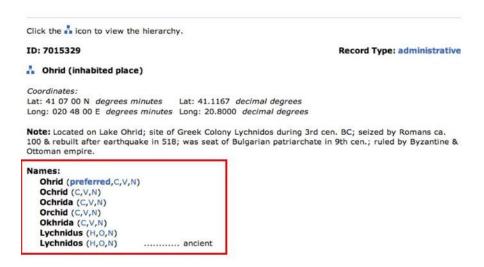
For a geographical thesaurus, the most large-scale decision is met in differentiating between an extraterrestrial place or the planet Earth "world", and then, following a comprehensibly logical division, the continent, the country, the province, the city and sometimes even the district.

## Thesaurus of Geographic Names



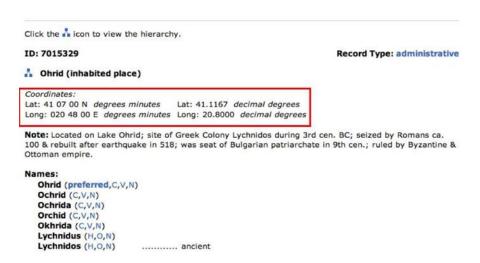
The advantage of this thesaurus is on one hand, that every term is bound within a structure, so that it can be contextualised.

## Thesaurus of Geographic Names



On the other hand it provides synonyms in different languages, as well as historical spellings for each particular facet. In addition to these important features, the TGN is first of all a thesaurus of GEOGRAPHIC NAMES:

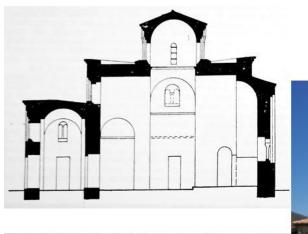
## Thesaurus of Geographic Names

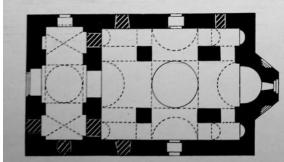


but these names are bound to factual spatial realities, which are recorded by their geographic coordinates. The coordinates are important as they provide an unambiguous mathematically-based identification of a place beyond politically and culturally-based names and borders. These

gatherings of numbers remain stable beyond language and culture. Although scholars of the humanities can hardly work with these coordinates, they are written in a language that is recognizable for every computer. It is important to not underestimate the importance of easily machine-recognizable data and compatibility, as it can serve as intelligent data, providing the foundation for working with contemporary methods and techniques of visualisation technology.

## Ohrid, Sveti Kliment - architecture







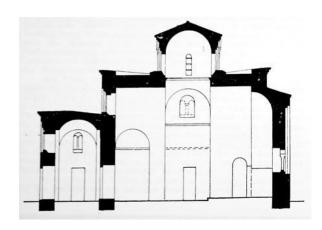
To illustrate the importance of such implementations, I would like to show an example related to the geographical context of Byzantine architecture.

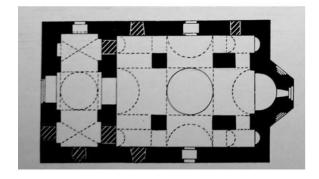
In an article published in 1975 by Horst Hallensleben, whose vast slide archive DiFaB is digitising, argued that two churches - located over 200 kilometres linear distance apart – had been constructed by the same building workshop.

The church Sveti Kliment, or Bogorodica Perivleptos, in Ohrid is a building of the cross in square type on pillars. The naos together with the narthex measure approximately 16 by 10 meters. The brick- and stonemasonry is worked in a conspicuous cloisonné technique comprising, especially

on the eastern façade, characteristic ornamental forms such as meander and chessboard patterns. The construction of the building can be dated to the years 1294/1295 through an inscription in the west wall of the narthex.

## Ohrid, Sveti Kliment - frescoes

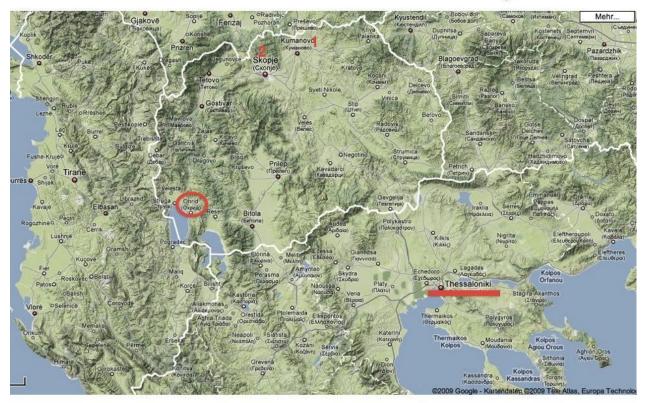






The famous frescoes of the church were executed by two painters whose names are recorded: Michael and Eutychios.

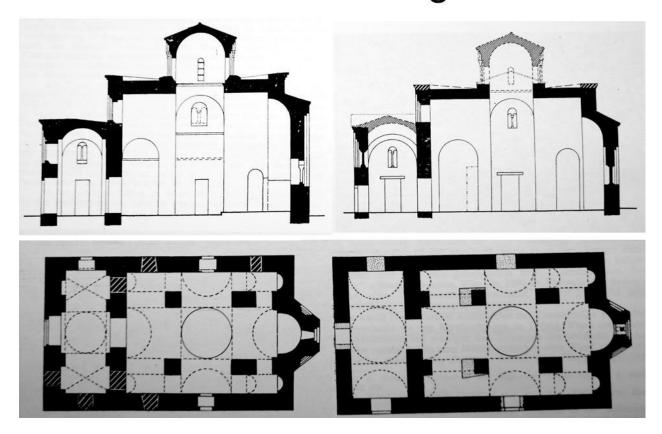
## Frescoes - Michael and Eutychios



The origin of the artists points to Thessaloniki, while two other churches to the north of Macedonia, in Staro Nagoricino (Number 1 on the map) and Cucer (Number 2 on the map), can also with certainty be attributed to at least one of them. It has been argued, probably also DUE TO the paintings, that the models for the churches' architecture are to be sought in Thessaloniki.

## Sveti Kliment

## Panagia Bellas



Nevertheless the most similar architectural examples are situated in southern Epirus. The church named Kokkini Ekklesia or Panagia Bellas in modern Drosopigi shows the closest parallels with Sveti Kliment in Ohrid. In comparing the longitudinal section and the ground plan of both buildings, it is evident that they are so strikingly similar with differences apparent only in certain minor details.

## Sveti Kliment



## Panagia Bellas



The same conclusion can be drawn regarding the brick and stone cloisonné masonry and the ceramoplastic decoration, to name just some of the common aspects. Even the size of Panagia Bellas measuring 16 by 9 meters is almost equal to Sveti Kliment.

Sveti Kliment



Panagia Bellas

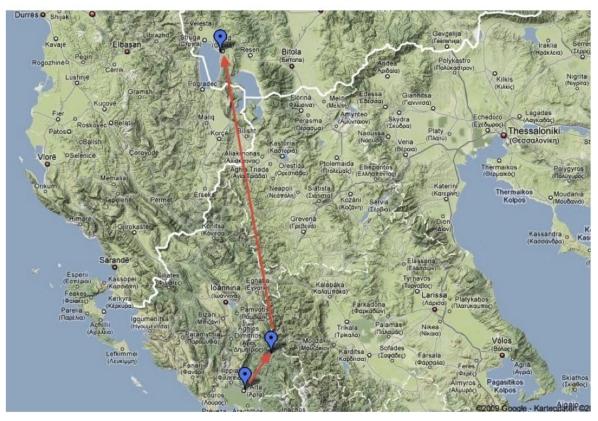


Parigoritissa



At the same time, both churches show in their method of construction and appearance a great similarity to the Paregoritissa in Arta, which can be dated to the same period and more specifically to the beginning of the 1290s.

## Arta - Drosopege - Ohrid



Through the list of all these comparanda it is possible to trace the path of the building workshop involved on all of these monuments: it seems that they were first employed in Arta, then moved north to Drosopege, where they built the Panagia Bellas to appear again in Ohrid in 1294 to erect Sveti Kliment according to the same plan. They might have stayed in Ohrid and built other churches, such as Sveti Jovan Kaneo.

This example strikingly shows one of the rare examples of true relatedness of monuments over such a great distance and introduces new issues on questions such as cultural transfer within the Byzantine Empire, working methods of workshops and the importance of a founder for the appearance of a building.

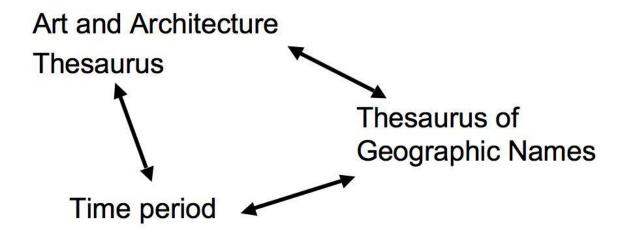
After this excurse I will now return to the role a good database linked to a geospatial application can perform in such "discoveries", but also in the formation of questions like the ones I described above.

## Art and Architecture Thesaurus

- · Provide assets with keywords
  - physical attributes
  - materials
  - styles
  - periods
  - etc.

Earlier I presented the thesaurus of geographic names. Another powerful thesaurus concerning material culture is the art and architecture thesaurus, short AAT. All of the architectural and decorative aspects of those buildings that I have described above could be provided as keywords within a database using the AAT: from the cross-in-square church, the stone and brick cloisonné to the ceramoplastic decoration and the fact that they bear inscriptions. Even stylistic features and functions could be attributed. In doing so, when searching within the database for one of the terms, these examples would appear as search results. Successively closer inspection could be done in the traditional method of image comparison.

## place, time and subject-matter

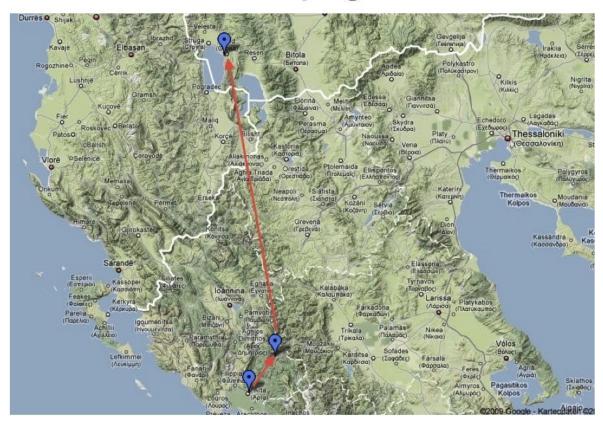


Daniel Terkl already examined the importance of linking space, time and subject matter within a database for users with a background in historical studies. Thus when an asset is provided with keywords using the AAT, with spatial specification using the TGN and additionally attributed to a specific time period, it is possible to draw a profound picture of this monument. This picture is most forcefully perceived when visualised within at least one of the three parameters: time, space, or subject, and there is no doubt that maps have potential as a strong visualisation tool. In a map contexts are perceived simultaneously and at a glance.

Cartographers now work with geographic information systems using exactly the type of data that can easily be evaluated when the metadata provided within the database is prepared properly and extensively. These maps are virtual applications allowing for flexible handling of the information they incorporate. They represent a visual, sometimes simplified, interface for the use of complex data structures.

One of these potentials is the visualisation of time within a spatial environment which is the basis for the further understanding and contextualization of the subject-matter and its history marked by changes and movement.

## Arta - Drosopege - Ohrid



If I return to the example of Sveti Kliment and Panagia Bellas, supplying the images of these monuments that are available in the database with rich metadata, using controlled vocabulary, means that a search request for ceramoplastic decoration within the time span of 1250 to 1300 would provide the results mentioned above, and using the geospatial interface would visualise the stylistic connectedness of these two monuments in a striking way, not only as points on a map but also as the workshops movement from one place to another in time. Thus the strength of this new method is that it is possible to find more similar connections, which are not apparent at fist glance through the simple use of such a database.

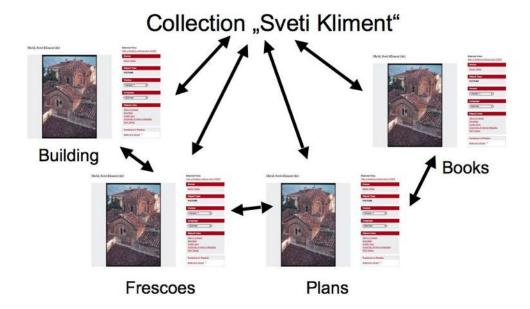
I have tried to focus mainly on data in general and not only just on pictures. This is of particular significance, as the approach presented does not limit itself to purely visual databases.

## Interdisciplinary environments



DiFaB's repository PHAIDRA offers the possibility to archive different types of assets, as documents, books and video. An additional important feature is the possibility to create so called "collections". A collection is a dataset that interlinks several digital assets and that is provided with its own independent metadata.

## Interdisciplinary environments



Returning to the example of Sveti Kliment, the collection would be the monument "Sveti Kliment" itself with metadata about the monument and its history. The different components of this collection could be pictures of the building, of the frescoes, plans, inscriptions, transcriptions, as well as books written about the monument and even virtual reconstructions and animations. Such systems form the basis for interdisciplinary and multimedia cooperative environments, where experts working on different aspects of an object could bring together their knowledge. Linking these different datasets within the geospatial environment described above could reveal the entire history and context of a monument.

What I have tried to describe in this talk are technical innovations already available whose potential only needs to be realized by the humanities in order to gain the added value of all this data that we work with, day by day, and that multiplies itself at a speed that is not manageable anymore. We do not know in which direction technology will change and what requirements we will have to meet in the future. Therefore it is important to be prepared and to be conscious of these issues. Databases, as well as their contents need to have as open a structure as possible and maintain the highest standards so that all the data continues to be accessible in the future, to be used within newer systems and applications and stay up-to-date with technological progress.