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PROGETTI DIGITALI  
PER LA STORIA DELL'ARTE MEDIEVALE  
DIGITAL PROJECTS  
IN MEDIEVAL ART HISTORY

a cura di  
Paola Vitolo

ARCHEOLOGIA E CALCOLATORI  
Supplemento 10, 2018

*All’Insegna del Giglio*

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## INDICE

PAOLA VITOLO, <i>Introduzione</i>	7
BANCHE DATI / DATABASES	
CAROLINE BRUZELIUS, PAOLA VITOLO, <i>Recovering the architectural patrimony of South Italy: The Medieval Kingdom of Sicily Image Database</i>	15
SÉBASTIEN BIAY, ANTOINE COURTIN, ISABELLE MARCHESIN, <i>L'OMCI – Ontology of Medieval Christianity in Images de l'INHA. Une encyclopédie par l'image</i>	29
LICIA BUTTÀ, MARIA DEL MAR VALLS FUSTÉ, SARA SÁNCHEZ ROIG, <i>El archivo digital DANAEM: Danza y Arte en la larga Edad Media</i>	49
RICOSTRUZIONI VIRTUALI / VIRTUAL RECONSTRUCTIONS	
DONAL COOPER, <i>Firenze scomparsa: le chiese di Santa Chiara e San Pier Maggiore e la loro ricostruzione digitale presso i musei di Londra</i>	67
CAROLINE BRUZELIUS, ANDREA GIORDANO, LUCAS GILES, LEOPOLDO REPOLA, EMANUELA DE FEO, ANDREA BASSO, ELISA CASTAGNA, <i>L'eco delle pietre: history, modeling, and GPR as tools in reconstructing the choir screen at Sta. Chiara in Naples</i>	81
ARCHITETTURA MEDIEVALE: TIPOLOGIE, FUNZIONI, DECORAZIONI E CONTESTI / MEDIEVAL ARCHITECTURE: TYPOLOGY, FUNCTION, DECORATION AND CONTEXT	
PATRICK J. GEARY, <i>Carolingian culture at Reichenau &amp; St. Gall</i>	107
UTE DERCKS, FEDERICO PONCHIO, ROBERTO SCOPIGNO, <i>CENOBIUM 10 years after: an evolving platform for Digital Humanities</i>	123
STEPHEN MURRAY, ANDREW TALLON, RORY O'NEILL, STEFAAN VAN LIEFFERINGE, <i>Mapping Gothic</i>	143
BLANCA GARÍ, GEMMA T. COLESANTI, MARIA SOLER-SALA, LEOPOLDO REPOLA, <i>De CLAUSTRA a PAISAJES ESPIRITUALES: proyectos de Digital Humanities sobre el espacio monástico medieval (siglos XI-XV)</i>	155



## INTRODUZIONE

L'applicazione delle tecnologie digitali al mondo degli studi storico-artistici è una realtà in crescita inarrestabile. Con qualche ritardo rispetto ad altre discipline umanistiche, come l'archeologia – la cui storia è ora ripercorribile grazie al Virtual Museum of Archaeological Computing (<http://archaeologicalcomputing.lincei.it/>) – la storia dell'arte sta scoprendo e sviluppando, in maniera via via più sofisticata, le possibilità dell'impiego dei nuovi mezzi. Il loro utilizzo, in qualunque misura e a qualunque livello si intenda, ha indubbiamente e irreversibilmente modificato il ritmo del lavoro e l'approccio ai problemi, i metodi e l'efficacia dell'insegnamento, la diffusione dei risultati della ricerca. La pubblicazione online di cataloghi e materiali testuali e figurativi ha avuto il merito di facilitare enormemente il reperimento delle fonti e la circolazione delle informazioni in un orizzonte planetario, rendendoli accessibili in maniera fino a poco tempo fa impensabile. Tra i numerosi repertori oggi a disposizione, diversi e vari per storia e tipologia, è doveroso ricordare almeno l'Index of Medieval Art (già Index of Christian Art: <https://ima.princeton.edu/>) dell'Università di Princeton; Gallica, la biblioteca digitale della Bibliothèque Nationale de France (<http://gallica.bnf.fr/>), con i suoi – ad oggi – circa cinque milioni di documenti online (tra periodici, libri, fotografie, immagini, registrazioni sonore, cartulari, fotografie, manoscritti anche miniati); l'archivio della Fondazione Memofonte (<http://www.memofonte.it/>), istituita da Paola Barocchi, che offre in libero accesso numerose fonti testuali per la storia dell'arte. I programmi di digitalizzazione del patrimonio storico-artistico italiano, promossi dal Ministero dei beni e delle attività culturali e del turismo, inoltre, intendono offrire un più facile accesso alle informazioni, oltre alla possibilità di una gestione più razionale e sistematica da parte dei funzionari e degli operatori del settore: un possibile esito di queste campagne potrebbe essere indicato nel portale Bavarian. Kultur und Wissenschätzte Bayerns, relativo alla regione bavarese (<https://www.bavarian.de/>).

Parallelamente, la possibilità di presentare agli studenti, alla comunità scientifica e al pubblico, dati e discussioni con efficacia e al tempo stesso con aderenza al livello dell'elaborazione teorica (si pensi anche soltanto alle potenzialità del semplice power point), consente una diffusione più ampia degli esiti della ricerca.

Accanto all'affermazione di questi strumenti, che fanno ormai imprescindibilmente parte del bagaglio di qualunque studioso, si sta assistendo ad un utilizzo sempre più sottile delle tecnologie informatiche come parte integrante della tradizionale metodologia di ricerca. Per i non "nativi digitali" questo orizzonte è stato, ed è, indubbiamente una sfida, in quanto impone di ripensare

in termini del tutto nuovi il lavoro tradizionale e l'approccio metodologico al quale si è stati formati. Il lavoro di gruppo, con l'interazione di competenze diverse, quando proficuo, facilita lo scambio di esperienze e di saperi: storici generalmente poco istruiti in campo informatico, e informatici chiamati a modellare i mezzi a disposizione in base alle questioni e ai problemi posti dagli storici, devono necessariamente trovare punti di incontro, elaborare un linguaggio comune. I luoghi in cui queste diverse competenze naturalmente convivono stanno producendo progetti di grande innovatività: gli istituti del CNR dedicati alle applicazioni tecnologiche per il patrimonio culturale, ad esempio, oltre a riunire studiosi di varia formazione, istituiscono partenariati con istituti di ricerca ed enti locali, con esiti importanti che, purtroppo, solo in minima parte è stato possibile raccontare in questo volume.

Se tali condizioni si risolvono, generalmente, in un reciproco vantaggio, rimangono a mio avviso alcuni aspetti relativi all'organizzazione del lavoro su cui è necessario riflettere, poiché pongono questioni nuove rispetto ai modelli tradizionali. La possibilità di “pubblicare” i risultati di lavori ancora in corso, che vengono integrati e completati con il procedere della ricerca, comporta che lo studioso coinvolto, specie se a livelli di direzione, sia perennemente impegnato, e in misura non “quantificabile”, nel controllo scientifico dei contenuti e della coerenza dei dati ai criteri stabiliti in fase di pianificazione, oltre che nel coordinamento del gruppo di ricerca. Parallelamente, una parte sempre più significativa di tempo verrà necessariamente impiegata per prendere confidenza con i mezzi informatici, al fine di dialogare con gli esperti del settore in maniera costruttiva. Collegato a questi c'è infine il problema, non secondario, della distinzione dei rispettivi meriti e degli apporti individuali, tanto più in progetti di lunga durata o che coinvolgano studenti, in cui i collaboratori si avvicendano con una certa frequenza. Si tratta di temi con cui coloro che elaborano i criteri di valutazione della ricerca dovranno prima o poi confrontarsi seriamente e responsabilmente.

C'è da chiedersi, d'altro canto, come cambierà l'approccio delle nuove generazioni allo studio della storia dell'arte dal momento che le tecnologie stanno modificando l'orizzonte problematico e metodologico di queste discipline, e al tempo stesso le Digital Humanities rappresentano ormai un vero e proprio ramo del sapere accademico, come dimostrato dal fiorire di corsi di laurea, dottorati di ricerca, scuole estive e corsi di formazione ad esse dedicati che, tra le altre cose, promettono nuove prospettive occupazionali per i laureati di area umanistica. Per il momento, la sfida di integrare attivamente i nuovi mezzi nella didattica si scontra con problemi organizzativi e logistici che rendono accessibili queste esperienze a gruppi ristretti di partecipanti: tra i più interessanti programmi attivi, si segnalano il Wired!Lab della Duke University (North Carolina, USA) nato nel 2009 (<http://www.dukewired.org/>), e il progetto “The Shape of Monuments” iniziato nel 2014 all'Università La Sapienza di Roma.

Un aspetto meno evidente della collaborazione tra diversi settori scientifici i cui esiti sono, in definitiva, anche meno controllabili sia da parte degli stessi studiosi, sia da parte dei destinatari dei “prodotti culturali”, è il condizionamento che le tecnologie inevitabilmente impongono ai contenuti. Che si tratti di banche dati o di strumenti di ricostruzione virtuale, il mezzo informatico impone infatti le sue logiche: tutt’altro che strumento “al servizio” della disciplina è, nella realtà, parte costitutiva del processo di elaborazione dell’aspetto scientifico della ricerca. Nella mia esperienza, che trovo confermata dagli autori dei saggi di questo volume, ho preso consapevolezza del fatto che, qualunque sia lo specifico campo tematico di applicazione, la necessità di visualizzare i dati, di poterli efficacemente presentare, incrociare, comparare, o semplicemente di renderli identificabili dalla tecnologia informatica, impone di sistematizzare il sapere sulla base di criteri che allo storico risultano spesso astratti, o troppo rigidi rispetto alla fluidità della materia su cui si lavora e alla complessità del reale. Se indubbiamente tutto ciò consente di maneggiare e interrogare una quantità di dati prima impensabile, è al tempo stesso necessario che sia il ricercatore sia l’utente siano consapevoli del fatto che, inevitabilmente, ciò che sullo schermo ha l’aura di obiettività e di autorivolezza è in realtà il frutto di una selezione di dati e dell’elaborazione di criteri. Attenzione, però, a considerare tutto ciò come un limite: lo strumento condiziona in maniera inattesa le prospettive e i risultati, impone una riflessione continua sul progetto stesso e sui suoi presupposti, ispira cambiamenti e aggiustamenti in corso d’opera stimolati anche dalla risposta dei fruitori, molto spesso consente di aprire piste di ricerca e di analisi altrimenti impossibili. La vera sfida è quindi riuscire a risolvere la piena intelligibilità dell’idea scientifica nella capacità di offrire il dato quale elemento di conoscenza, e non come semplice informazione fine a se stessa. D’altra parte, la necessità che all’esterno si abbia percezione della complessità di questi meccanismi sarebbe importante anche per una più equa e consapevole valutazione dei prodotti: chi lavora su progetti digitali vede infatti spesso sminuito il proprio lavoro – sbrigativamente e superficialmente liquidato come compilatorio o come meccanicistico strumento di interpretazione del dato storico – in sede di attribuzione di finanziamenti, per assistere poi, una volta che i risultati diventano accessibili, ad un loro largo utilizzo come fonti e risorse.

Le ricadute di tutti questi cambiamenti sono, come si può immaginare, significative a tutti i livelli, e investono lo sviluppo delle discipline, l’organizzazione del sapere, la didattica, la fruizione culturale.

Esiti di grande originalità sono emersi di recente dal settore medievistico. Chiunque lavori sull’età di mezzo è costretto a confrontarsi con materiali che la storia e il caso hanno disperso tra istituzioni diverse da quelle alle quali erano stati destinati (per esempio suppellettili liturgiche o codici), con orizzonti semantici difficili da approcciare se non attraverso il concorso di molte

fonti e varie competenze, con la necessità di raccogliere idealmente i materiali che concorrono a definire e comprendere un contesto culturale, una tipologia artistica o un tema iconografico, con opere allontanate dagli originari contesti, con edifici modificati e convertiti a nuove forme e funzioni, quando ancora esistenti. Le potenzialità del mezzo informatico possono rivelarsi sorprendenti, poiché offrono strumenti inediti e facilitano la creazione di percorsi, il confronto tra oggetti e dati, la possibilità di ipotizzare restituzioni di ciò che non c'è più.

Al tempo stesso, le tecnologie informatiche costruiscono canali attraverso cui far acquisire a un pubblico sempre più variegato familiarità con un'epoca le cui tracce materiali si rintracciano a fatica nel tessuto delle città moderne, e stimolano la consapevolezza delle comunità sulla storia nella quale sono, spesso inconsapevolmente, immerse. Veicolando i risultati della ricerca scientifica in forme accattivanti e comprensibili, i mezzi digitali consentono, inoltre, di raggiungere efficacemente non solo gli studenti, ma anche i visitatori e i turisti, e possono contribuire ad innalzare il livello della richiesta culturale e delle aspettative del pubblico.

I saggi di questo volume vogliono essere un contributo a delineare, attraverso il racconto di specifiche esperienze, il quadro dell'attuale stato della ricerca e delle tendenze in atto, offrendo uno spaccato di una realtà in rapida crescita. Sia i progetti pionieristici, sia quelli più recenti, conclusi o ancora in corso, dimostrano come il settore degli studi sul Medioevo stia vivendo una stagione di grande vitalità nel contesto delle Digital Humanities. Le iniziative qui raccontate sono rappresentative di vari campi e settori di interesse, di diversi approcci sul piano metodologico, delle strategie di comunicazione e della strumentazione applicata, e consentono di riflettere sulle reali possibilità dei mezzi a servizio della storia dell'arte: in quale misura essi rispondono alle esigenze della disciplina e quali prospettive è possibile intravedere, quali risultati sono stati raggiunti, quali obiettivi sono stati mancati, quali difficoltà si sono incontrate. Ho chiesto agli autori di esporre tutti gli aspetti del loro lavoro, non solo quello scientifico e tecnologico, ma anche la complessa organizzazione che ogni iniziativa di questo tipo comporta, e di conseguenza i problemi logistici, pratici, materiali, che inevitabilmente condizionano risultati, tempi e prospettive di sviluppo dei progetti. Si è scelto inoltre – nello spirito della rivista «Archeologia e Calcolatori» – di consentire a ciascun autore di scrivere i propri testi nella principale lingua di lavoro o nella lingua madre, per valorizzare la varietà culturale dei partecipanti, la loro rappresentatività geografica, il raggio degli interessi. La varietà delle afferenze (università e istituti di ricerca) e gli esempi di collaborazione tra enti confermano, infine, quanto possa essere stimolante non solo aprire gli orizzonti delle discipline, ma anche valorizzare le specifiche competenze delle istituzioni.

La prima sezione del volume raccoglie saggi su progetti orientati alla creazione di banche dati finalizzate alla raccolta e all'interrogazione di

materiale figurativo relativo a precisi interessi di ricerca. Il punto di partenza della mia esperienza nelle Digital Humanities, e di conseguenza anche dell'idea di questo volume, è il progetto *The Medieval Kingdom of Sicily Image Database*, al quale mi dedico dal 2011 grazie alla generosa iniziativa di Caroline Bruzelius (Duke University, NC). Il progetto si propone di raccogliere le immagini storiche dei monumenti medievali dell'Italia meridionale al fine di documentare cambiamenti e trasformazioni degli edifici, delle loro decorazioni, dei rispettivi contesti ambientali. Se il fine di questa iniziativa è quello di recuperare informazioni sull'originaria configurazione dei monumenti a partire da materiale prodotto per lo più in età moderna (principalmente tra il XVII e il XXI secolo), altri due saggi di questa sezione sono dedicati a fonti squisitamente medievali, studiate e presentate con un approccio innovativo e interdisciplinare, che tiene conto delle molteplici relazioni e dei contesti culturali di cui le immagini sono prodotto ed espressione. Il progetto *Ontology of Medieval Christianity in Images*, diretto da Isabelle Marchesin presso l'*Institut national d'histoire de l'art* di Parigi, si propone uno studio dell'immagine religiosa medievale nella complessità dei significati culturali e semantici, al fine di ricostruire la dimensione "ontologica" dell'iconografia cristiana, cioè il suo essere specchio di un sistema di pensiero e di rappresentazione del mondo. Il database *Iconodansa-Danaem*, realizzato da un gruppo di ricercatori della *Universitat Rovira i Virgili* di Tarragona sotto la direzione di Licia Buttà, si incentra sulle fonti testuali e figurative relative alla danza medievale nella Penisola Iberica, stimolando la ricerca in un settore di studi ancora poco praticato.

La seconda sezione è dedicata a progetti di ricostruzione virtuale di edifici medievali, che dimostrano la validità dell'applicazione tecnologica nell'analisi di contesti storicamente molto stratificati: si tratta di un tipo di indagine che non sarebbe stato possibile con i metodi di studio tradizionali, e che al tempo stesso implica un coinvolgimento attivo delle comunità locali che hanno contribuito con entusiasmo alla loro realizzazione. Il rilevamento delle fondamenta del tramezzo della chiesa di Santa Chiara a Napoli, realizzato di recente da un composito gruppo di ricerca coordinato da Caroline Bruzelius, e la restituzione virtuale di due chiese fiorentine (Santa Chiara e San Pier Maggiore), promossa da Donal Cooper (University of Cambridge), hanno permesso di recuperare tracce di un Medioevo "perduto" nei centri storici di due tra le più importanti città medievali italiane.

La terza sezione riunisce strumenti di fatto sostanzialmente ideati come banche dati, ma focalizzati in maniera specifica sullo studio dei complessi architettonici medievali e dei loro patrimoni materiali e culturali, con cui ci si è proposti di ricostruire idealmente contesti, comparare informazioni su edifici, fondazioni e insiemi decorativi. Incentrato in particolare su due delle principali abbazie benedettine carolingie, quelle di Reichenau e di San Gallo, il progetto

ideato nel 1998 da Patrick Geary e Bernard Fischer intende riunire materiali e fonti oggi dispersi tra diverse istituzioni (170 manoscritti documentati da immagini, oltre che da un ricco corredo di informazioni sui contenuti e sugli aspetti codicologici), insieme a saggi di studio e riferimenti bibliografici, ed offre l'occasione di una esplorazione dettagliata della "Pianta di San Gallo". *Cenobium*, nato dieci anni fa da una collaborazione tra il Kunsthistorisches Institut di Firenze e l'Istituto di Scienza e Tecnologie dell'Informazione del CNR di Pisa, è un repertorio di decorazioni e temi iconografici di alcuni chiostri medievali, che offre la possibilità di visualizzarne i particolari, localizzare i pezzi nelle originarie collocazioni e di personalizzare la ricerca selezionando specifici dati nella LightTable: uno strumento prezioso, considerata la vitalità che lo studio dei chiostri ha conosciuto di recente. Il progetto *Mapping Gothic*, intrapreso nel 2014 da Stephen Murray, Andrew Tallon e Rory O'Neill alla Columbia University di New York, è il frutto di numerose e impegnative campagne di rilevamento e documentazione fotografica di edifici gotici europei (al momento principalmente francesi) di cui, grazie alle potenzialità analitiche del mezzo informatico, si possono comparare dati, misure, dettagli architettonici, immagini, e di cui si possono approfondire questioni critiche grazie ad una raccolta di saggi specialistici. *Claustra e Paisajes espirituales*, elaborati nell'ambito di collaborazioni internazionali tra numerosi enti e istituti di ricerca che fanno capo all'Università di Barcellona, pur non essendo banche dati di taglio specificamente storico-artistico, rappresentano esempi di approcci interdisciplinari allo studio della spiritualità femminile medievale e dell'impatto delle fondazioni monastiche nei contesti ambientali europei, in cui lo strumento tecnologico gioca un fondamentale ruolo di raccolta e di elaborazione scientifica dei dati, consentendo di creare connessioni tematiche, geografiche, culturali.

Questa raccolta di saggi fotografa una situazione in grande fermento e le tendenze in atto nel panorama generale. Al tempo stesso consente di fissare una precisa fase di sviluppo delle singole iniziative, come si capisce dai bilanci tracciati dagli autori e dalle riflessioni di tipo metodologico proposte, a prescindere dal punto di avanzamento del lavoro. I racconti consentono infine al lettore di entrare nell'officina della collaborazione tra informatica e scienze storico-artistiche. La speranza è che tale bagaglio di esperienze rappresenti un esempio di "buone pratiche" a vantaggio non solo di chi sia già impegnato in imprese di questo tipo, ma anche di chi voglia intraprenderne di nuove.

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BANCHE DATI  
DATABASES



## RECOVERING THE ARCHITECTURAL PATRIMONY OF SOUTH ITALY: THE MEDIEVAL KINGDOM OF SICILY IMAGE DATABASE\*

### 1. PROJECT OVERVIEW: THE SIGNIFICANCE OF THE DATABASE AND THE HISTORICAL MATERIAL IT COVERS

We experience buildings of the medieval past through the filter of repairs, restoration, and reconstruction. This may be particularly true for the monuments of the historic Kingdom of Sicily, which have been subjected to damage from earthquakes, volcanic eruptions and the aerial bombardments of World War II. In addition, South Italian monuments, like those everywhere in Italy, were usually once covered by Baroque decoration in the seventeenth and eighteenth centuries, much of which was later removed during a period of “remedievalization” after the unification of Italy. Urban growth, especially after the middle of the twentieth century, has transformed the visual and symbolic role of these representational monuments, their relation to the urban and natural landscape, and their importance for the visual cultures of Europe and the Mediterranean.

So what do we actually *see* when we look at a medieval monument? Whose “Middle Ages” are we actually experiencing? Are there ways to come closer to the appearance of a site prior to all the changes and modifications described above?

*The Medieval Kingdom of Sicily Image Database* (Fig. 1), freely accessible online since October 2016 (<http://kos.aahvs.duke.edu/>), is an attempt to respond to this question by collecting visual documents (drawings, paintings, photographs, prints) that illustrate the appearance of, and changes to, the medieval monuments of South Italy (roughly 10<sup>th</sup>-15<sup>th</sup> centuries) (BRUZELIUS 2016; BRUZELIUS, VITOLO 2016; VITOLO 2017a, 2017b). The database makes accessible a large body of information, only partially published as the illustrations of scholarly texts and travel accounts (TUZET 1988; SCAMARDI 1998; COMETA 1999; DE SETA 2001, 2006, 2007; MANGONE 2002; GIUFFRÈ *et al.* 2006; SMECCA 2006; CIANCIOLI COSENTINO 2007; GRINGERI PANTANO 2009; MAGLIO 2009) in Italian, European and American collections and online databases of museums and cultural institutions. It is a compendium, or virtual museum, of thousands of images produced by artists, travelers, and even soldiers, from the Middle Ages through the mid-twentieth century. It collects material widely

\* This article is co-authored by Caroline Bruzelius (sections 1, 2, 5) and Paola Vitolo (section 3), and both as authors of section 4.

The Medieval Kingdom of Sicily Image Database  
A Visual Resource of Historical Sites c. 1100 - c. 1450

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This website collects historic images of the medieval monuments and cities in the Kingdom of Sicily. This body of imagery is vast and spread among public and private collections, museums, archives and libraries in many different countries. As an ongoing project that expands as new images are found and catalogued, our collection of images will probably never be exhaustive or complete.

The website is intended to make difficult-to-access images accessible in one resource as an aid in research and as a public service. The database collects and presents images, and contains only basic information for the views and sites represented. As we cannot fully anticipate the questions of future researchers, the editors have decided to be as inclusive as possible of monuments and their furnishings, including tombs, altars, mosaics, ceilings, pavements, and frescoes. We also include maps and city views.

The website is not intended to provide in-depth historical or stylistic analysis either of the sites or of the images. Our content is offered to enhance knowledge, study and research, as well as to provide lists of the artists and repositories to which users must write for permission for higher quality reproductions or publication rights. Users should note that the images do not always provide reliable documentation of a site, as the artists may have enhanced certain views, and architects sometimes suggested hypothetical reconstructions. All images should be verified against other (textual or visual) sources.

This site features historical images in a range of media, including drawings, paintings, engravings and photographs. Although our interests concern medieval monuments, the images range in date from the medieval period through the mid-twentieth century (World War II and post-war restoration). Images and brief information about their production can be found under the "Browse & Search" tab. Sites are organized by location. Each record contains a list of associated Images, a brief description of the site, and details about its creation and relevant sources when known. Contemporary images, including architectural plans, photographs and reconstructions, are collected within individual site entries under the "Visual Docs" tab.

Many more images need to be gathered; progress is slow because the project is not funded at present and depends on the hard work of a few individuals. The website editors will be grateful to receive information on collections and publications that can contribute this resource. To offer suggestions or corrections, please use the "Contact Us" link above.

This web site is hosted by Trinity Technology Services (TTS) at Duke University. We are indebted to TTS for all of the support they have provided for this project.

Duke  ART, ART HISTORY & VISUAL STUDIES  UNIVERSITY OF TORONTO LIBRARIES 

Fig. 1 – *The Medieval Kingdom of Sicily Image Database*: homepage.

dispersed in museums, archives, and libraries in Europe, the United Kingdom, and the United States to enhance an understanding of the architectural legacy of the Norman, Hohenstaufen, and Angevin rulers. As no single individual could hope to retrieve all the images pertinent to a specific monument, the database was designed to help researchers, travelers, and local residents in understanding the history of the important medieval sites of South Italy.

Through the aggregation of large quantities of visual documentation, *The Medieval Kingdom of Sicily Image Database*, recently described as an «essential

resource for scholars of the Italian South» (NOBILE 2017, 17), allows users to identify patterns and relationships not otherwise evident, and to view monuments prior to multiple changes. With the completion of new features in 2018, viewers will also be able to visualize patterns of patronage, the locations of religious orders, the itineraries of travelers and artists, and architectural features on interactive maps that show images and sites in relation to networks of roads, ports, and the natural topography. The algorithm underlying the prototype of the database and website will also permit their application to other disciplines and research areas. Indeed, as a way to remember and record the past, our database could be considered an example of how to document destroyed or at-risk sites, and is a reminder of the fragility of our collective human patrimony.

South Italian monuments ranged in style from Byzantine and Islamic, to the Romanizing city gate of Capua, to the austere Gothic of the late thirteenth and fourteenth centuries styles. Many were representational state monuments, such as the Cappella Palatina in Palermo or Frederick II's triumphal city gate in Capua. South Italian buildings and their decoration were also often early instances of technical, structural, and iconographic innovation, such as the pointed arch and rib vault, features that migrated from the Mediterranean basin north to Europe. In the Renaissance and afterwards, these monuments inspired the artists and architects of many periods: Arts and Crafts artists studied the mosaics and the inlaid pavements of Norman churches, stage designers (such as Louis-Jean Desprez) searched for gloomy theatrical settings in castles hanging on cliff-sides, and lovers of the picturesque attracted by the dramatic landscapes at Baia and Cefalù. Our database is therefore not only about the monuments of the Middle Ages, but also about the *encounter* of later periods with these monuments.

The project was initiated by Caroline Bruzelius, and initially funded by The National Endowment for the Humanities (USA) with a Collaborative Research Grant (2011-2014); it is part of the research activities of the Wired! Lab (<http://www.dukewired.org/>) at Duke University (NC, USA). The database and website are presently directed by Bruzelius and Paola Vitolo (University "Federico II" of Naples, Italy), with Joseph Williams (University of Maryland, MD, USA) as project manager, David Tremmel (Duke University) as data manager and database & web developer, William Broom (Duke University) as project coordinator, John Taormina (Duke University) as metadata and image management consultant. A group of scholars at different stages of their academic careers have been involved over the years: the PhD researchers Gabriella Cinaciolo Cosentino, Francesco Gangemi, Alba Irollo, Ruggero Longo, Luciana Moccia, and a group of students at Duke University (Michael O'Sullivan, Zhuyan Zhang and Jessica Williams)<sup>1</sup>.

<sup>1</sup> The complete list of collaborators and consultants is available on <http://kos.aahvs.duke.edu/index.php>.

The project is partially hosted by the Bibliotheca Hertziana (Max-Planck-Gesellschaft für Kunstgeschichte) in Rome which offers a work area and meeting spaces and makes available its rare books and photographs.

## 2. METHODOLOGY AND DATABASE STRUCTURE

The technical infrastructure and scientific expertise for this project is provided by Duke University's Information Technology office in Trinity Technology Services (TTS), which has offered a commitment of on-going technical expertise and infrastructure support. This includes a sustainability plan to allow the website to be an open access online repository that can grow and evolve as new information is found and becomes accessible.

At the beginning of this initiative the research, cataloguing and technology teams created a master list of roughly 800 geo-referenced sites, developed the database structure, and established the criteria for the selection and cataloguing of images. The heterogeneous nature of the documents led us to develop a procedure that resulted in a sufficiently flexible structure to permit us to include extensive information for each kind of image. We created a Digital Asset Management Advisory Committee to develop a data collection template in accordance with VRA Core and Dublin Core metadata guidelines for each component of the project in order to ensure the integrity and usability of the data. The metadata templates were created to maintain consistency, guide data collection, and provide a framework for describing and contextualizing the visual representations of evidence. The project followed the cataloguing guidelines developed for the SAHARA project of The Society of Architectural Historians (<http://www.sah.org/publications-and-research/sahara/>); for art historical terminology, we referred to the Getty Art&Architecture Thesaurus (<http://www.getty.edu/research/tools/vocabularies/aat/>).

The database was designed with standard web technologies (HTML, PHP, CSS, Javascript) with File Maker as the data source, and using standard relational database techniques. This facilitates making relationships within the data, and their standardization during data entry. To streamline data entry and avoid duplication, lists of standard entries are maintained for the following data elements:

- Repositories, including metadata about the city, province and country where they are located;
- Creators and Patrons, including metadata about their nationality, gender, office and dates;
- Keywords;
- Bibliographic entries, including metadata dependant on type (book, book chapter, journal article, etc.) and based on standards used in EndNote software.

The database consists of two linked parts: the Images (the historical images) and the Works (the monuments and sites). For each image, data records include five specific types of information: Overview (description and basic information on chronology, title, image type, notes and analysis), the Image (a reproduction of the image with information on format and resolution), Creation (artist's name and dates, date of image, technique, measurements), Location (Repository), Research (bibliography and links to Google search and Books). Images entries are cross-referenced to the related Works entries. As many images are now available online, we also provide links to the online collections of many European and American institutions – for example the Italian Istituto Centrale per il Catalogo e la Documentazione database (<http://www.iccd.beniculturali.it/>), the British School at Rome Digital Collections (<http://www.bsr.ac.uk/library/digital-collections/>) – or to online databases of research projects as the CIRICE (Centro Interdipartimentale di Ricerca sull'Iconografia della Città Europea) project (<http://www.iconografiacitta-europea.unina.it/>). Each image can be enlarged in order to examine details. In cases where we have not received permission to reproduce an image, we offer a detailed description.

Given the variety of the material collected and catalogued, the acquisition of image rights and copyright fees for the database was assisted by Kevin Smith and David Hansen, directors of the Office of Copyright and Scholarly Communication at the Duke University. Images are always published in low resolution, not downloadable, and for research purposes only, in fulfillment of “fair use” standards. Copyright of all images lies in any case with the named individual or institution, and permission to reproduce part or all of the images must be requested from the relevant source. During our experience we discovered, however, that a number of institutions have been willing to allow us to use the images without a fee: these have included for example, the British and American Academies in Rome, the Architekturmuseum der Technischen Universität, the Residenzmuseum, the Bayerische Staatsbibliothek and Staatliche Graphische Sammlung in München, the Städel Museum and the Graphische Sammlung in Frankfurt am Main, the Architekturmuseum der Technischen Universität in Berlin, the Museumslandschaft in Hessen, the Graphische Sammlung in Kassel, and the Bibliothèque de l’Institut national d’histoire de l’art in Paris.

In the Works entries we provide abbreviated information on creation date, patronage, artistic and architectural features, condition, restoration and refurbishment. As this is above all a database of historical images, the information in Works is extremely brief. Works entries are cross-referenced to the related Image/Images entry/entries, listed with the following synthetic information: image view, type, description, thumbnail image. It is also possible to visualize Images as slides (clicking on “View as Slide”), where each Image is accompanied by title, creator and creation date.

The database is thus intended to function on multiple levels as:

- a geo-located image resource for historic monuments;
- a list of archives, museums and libraries with useful collections for research;
- a searchable tool for basic information on the artists who produced the images, with their dates and nationalities;
- a searchable tool of patrons and builders, as well as of specific stylistic features (such as domes and towers).

In order to disseminate the information in the database to a broad audience, we have been developing a searchable website. Searches can be made through:

- Collections (listed in a drop-down menu);
- Cities/Sites (alphabetically listed) with related lists of monuments;
- Creators (alphabetically listed);
- Advanced search (through image title, image type, creator nationality, materials, date, keywords ...).

The database includes a crowdsourcing component for involving users in identifying images, adding information or comments about monuments/sites or images, or inform us about collections relevant to the project.

### 3. AN EXAMPLE OF THE DATABASE IN ACTION: THE USE OF HISTORIC IMAGES IN CASE STUDIES OF THE CATHEDRAL AND THE CASTELLO URSINO IN CATANIA

The material collected in the database allows scholars to find images that shed light on the history of individual monuments, sites and cities. The database structure has the potential to recreate historical itineraries through the images, permitting users to reconstruct changes to monuments/sites, or their relation to the surrounding context over time.

For example, the volcanic eruption in 1669 and the earthquake in 1693 radically changed the appearance of the Cathedral and the Castello Ursino in Catania, both built in different historical periods as symbols of political power and control over the region. The Cathedral of Catania was founded in 1091 by Count Roger of Hauteville as a monastery-cathedral, and a Norman monk, Ansger, was appointed bishop-abbot. Ansger erected a monumental cathedral that loomed over the city and the port. The great scale of the church was a function of the new wealth and jurisdictional power bestowed upon the bishop, who governed the southeast corner of Sicily, assuming the authority of its former Muslim ruler, Ibn ath-Thumnah. The vast hulk of the cathedral, built in the dark volcanic stone from nearby Mount Etna, was thus a powerful symbol of Norman rule over a mostly Muslim population.

The cathedral was also intended to impress travelers or traders who approached the city by sea. A city view by an anonymous artist for bishop



Fig. 2 – View of Catania (1584), detail with the Cathedral (A) and the Ursino Castle (B). Rome, Biblioteca Angelica, BSNS 56/80.

Angelo Rocca in 1584 (today in the Biblioteca Angelica in Rome, BSNS 56/80) shows the cathedral with its imposing mass emerging above the coast along with the Castello Ursino. Both monuments dominated the urban landscape as well as the view of the city from the sea (Fig. 2; database entry nr. 10906).

Catania Cathedral was badly damaged, however, by the earthquake in 1693, as shown in the painting *Catania dal tremuoto del 1669 al 1708* (Private collection; database entry nr. 10902): the roof, the inner walls and piers collapsed. The cathedral was largely rebuilt in the early eighteenth century, although some parts of the eleventh century structure survive. Along with archaeological excavations and a series of important historic views – for example the early fifteenth century carved reliefs of the tomb of Mary of Aragon, in the cathedral (VITOLO, forthcoming): database entry nr. 10901 (Fig. 3) – the evidence indicates that it has a distinctly Norman and semi-fortified style, with the walls topped by crenellations (GANDOLFO 2007; BRUZELIUS 2014; BELLA 2017).

Along with the eighteenth century reconstruction of the cathedral, the surrounding urban environment has been transformed over the centuries.



Fig. 3 – Catania Cathedral in the carved reliefs of the tomb of Queen Mary of Sicily (d. 1401). Catania, Cathedral, Chapel of the Virgin.

A view of the city, *The City of Catania and Mount Etna, Sicily*, created by William Leighton Leitch and W.R. Smith and published by Clément Pellé in 1840 (PELLÉ 1840; database entry nr. 10320) illustrates the beginning of the modern urban expansion of the coast, with new buildings erected on the remains of the sixteenth century city walls. The height of the new buildings reduced, *de facto*, the “out of scale” dimensions of the Norman cathedral in relation to the urban environment. Some years later, a print published in Gu-stavo Chiesi’s *La Sicilia illustrata nella storia, nell’arte, nei paesi* (Milan 1892, 233) illustrates the newly constructed railway bridge that caused, together with the expansion of the harbour area, the distancing of the cathedral from the port (database entry nr. 10214).

The thirteenth century Castello Ursino was erected by emperor Frederick II Hohenstaufen as part of a general re-organization of the defensive structures of the region, including the restoration of the Norman fortresses and the erection of new castles (in Catania, Syracuse and Augusta: MAURICI 1997, 155-191; CADEI 1998; DI BLASI 2000). It was intended as a symbol of his power and control over the territory and dominated the south side of the city. Its imposing quadrangular structure, surrounded by cylindrical towers, was built on a cliff overlooking the sea, as noted in the above-mentioned drawing at the Biblioteca Angelica, and in another city view of 1598 (BRAUN, HOGENBERG 1598, tav. 69) (Fig. 4; database entry 10905). As a result of the



Fig. 4 – View of Catania, in BRAUN, Hogenberg 1589, tav. 69.

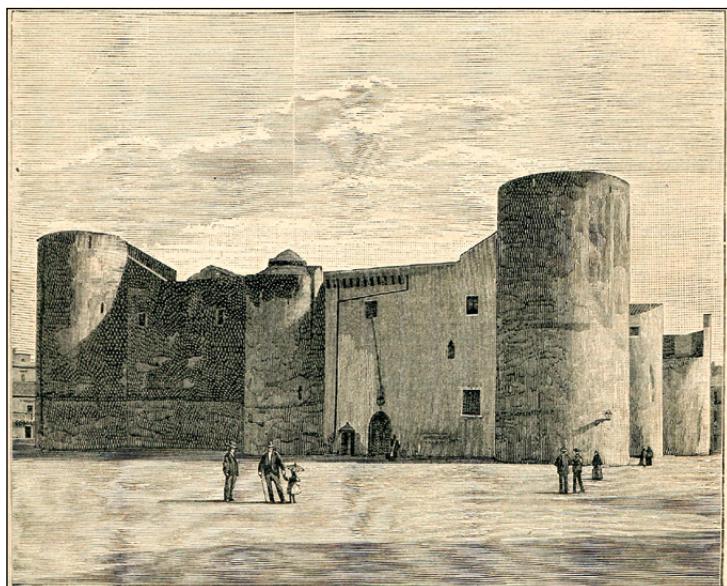


Fig. 5 – Castello Ursino, in CHIERICI 1892, 245.

1663 volcanic eruption, however, the castle is now a kilometre inland, and the moat filled with lava the print published by Gustavo Chiesi (1892, 245) (Fig. 5; database entry nr. 10213) shows it before the excavation in the 1930s and before a multi-phase reconstruction in the twentieth century (most recently in 2008: CAFFO 2009). The coastal profile at the beginning of the twentieth century shows how urban expansion transformed the topographical concept of the castle, one that has repeatedly changed its function and has now become a Civic Museum.

#### 4. METHODOLOGICAL CHALLENGES

Limits and problems related to the use of historical images have been clear from the very beginning to the creators of the database. In particular:

- This research initiative potentially has an endless duration and therefore has no claim of being exhaustive. The database is a work in progress. Furthermore, it is not presently funded, and is supported by volunteer researchers: it should by no means be considered exhaustive or complete.
- Each image must necessarily be approached critically and cross-referenced with other kinds of written and/or figurative sources. Individual views may not be reliable representations of the exact condition of places and buildings at a specific date. For example, an artist may have simplified, schematized, or modified the representation of a monument or a site for personal and artistic purposes; an architect might have created a reconstruction hypothesis; a photographer may have recreated particular effects or chosen certain visual angles that could have altered the perception of objects and spaces. In our database, the cataloguer, within the limits of his or her skills and knowledge reports cases such as these, but users must also use the database with a critical spirit.
- The editors of the database have selected images for their importance as possible documentation that attests to the condition of monuments at certain periods of their history. As the creators of the website are not in a position to judge the significance of each image for individual research, we are as inclusive as possible, gathering and cataloguing the images of buildings and their decoration that seem relevant to us. It is our expectation that those whose work focuses on individual sites or topics will verify that an image is historically correct, as the cataloguers are not experts on all subjects.
- Since the acquisition of images proceeds through collections, the collection of material is not necessarily representative of the total work of an artist or a traveler, or of the places and monuments they depicted. It is not the intention of the database to collect everything produced by a particular artist, or necessarily document every single center or building.
- Copyright law is rapidly changing and is different between the United States and Europe. See our copyright page for our interpretation of the copyright law

as it presently stands in the United States, where the dataset is based (<http://kos.aahvs.duke.edu/copyrightreuse.php>).

## 5. FUTURE DEVELOPMENT OF THE PROJECT

The editors of the database, in looking towards the future, have in mind the following steps:

- 1) Enlarge and expand the image collections of the database, gathering new material in European and American collections. To this end we will incorporate a crowdsourcing component that can help us include private collections, such as the photographs and drawings of World War II veterans.
- 2) Enlarge the geographical representation and typology of materials, focusing on geographical areas not yet well represented in the collection (Basilicata, Molise, Calabria).
- 3) Amplify the typology of sources to include for example images in illuminated books.

At present, the research team and technical assistants are developing an interactive mapping function that will show the locations of sites in relation to the roads, ports, and other modes of travel and the geophysical and political features of the region. The new mapping component will be searchable by types of institutions (monasteries, churches, castles, palaces, gates, bridges, towers, etc.) as well as artistic styles or the names of artists or patrons. It will be possible to visualize the itineraries of Grand Tour travelers. These new capacities will enable scholars to craft a personal approach to their research questions, identifying for example the spread of certain types of strategic foundations (such as castles of religious groups), or to consider issues such as “center” and “periphery,” analyzing the relations of monuments and territory in relation to symbolic or strategic objectives within different local conditions. Finally, the map will permit the integration of this type of inquiry with the study of the itineraries of artists, architects, scholars and travelers of modern periods so that we may be able to reflect upon the accumulated knowledge derived from travel and movement through space.

## 6. CONCLUSION

It is our hope that this initiative will become a fundamental resource for the documentation and study of the rich historic patrimony (cities, works of art, buildings) produced in medieval South Italy. We also hope the project will assist in the research, restoration, and appreciation of the historic legacy of South Italy – not only in the major urban centers, but also in the smaller (but no less important) cities (such as Galatina, Nola, Nardò, for example) as well as the countryside. The research team is deeply committed to the

history of monuments as part of the transmission of memory and identity, as well as the importance of historical preservation informed by the full range of documentary resources.

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## REFERENCES

- BELLA T. 2017, *Bâtir face à la mer: la Cathédrale normande de Catane en Sicile. État de la question*, in *L'art roman et la mer*, «Les Cahiers de Saint-Michel de Cuxa», 48, 23-37.
- BRAUN G., HOGENBERG F. 1598, *Civitates orbis terrarum*, 5, Köln.
- BRUZELIUS C. 2014, *The Norman Cathedral of Sant'Agata in Catania*, in G. BORDI, I. CARLETTINI, M.L. FOBELLI et al. (eds.), *L'officina dello sguardo. I luoghi dell'arte. Immagine, memoria, materia. Scritti in onore di Maria Andaloro*, II, Roma, Gangemi, 121-126.
- BRUZELIUS C. 2016, *Visualizing the Medieval Past: The Kingdom of Sicily Image Database Project*, in J.-M. MARTIN, R. ALAGGIO (eds.), *Quei maledetti Normanni. Studi offerti a Errico Cuozzo per i suoi settant'anni da colleghi, allievi, amici*, Ariano Irpino, Centro Europeo di Studi Normanni, 109-116.
- BRUZELIUS C., VITOLO P. 2016, *The Kingdom of Sicily Image Database*, «Archeologia e Calcolatori», 27, 107-130.
- CADEI A. 1998, *I castelli federiciani: concezione architettonica e realizzazione tecnica*, in P. TOUBERT, A. PARAVICINI BAGLIANI (eds.), *Federico II e la Sicilia*, Palermo, Sellerio Editore, 183-201.
- CAFFO F. 2009, *Castello Ursino di Catania. Gli anni dei restauri 1988-2008*, Catania, Soprintendenza per i beni culturali e ambientali.
- CHIESI G. 1892, *La Sicilia illustrata nella storia, nell'arte, nei paesi*, Milano, Sonzogno.
- CIANCIOLI COSENTINO G. 2007, *Francesco Saverio Cavallari (1810-1896). Architetto senza frontiere tra Sicilia, Germania e Messico*, Palermo, Caracol.
- COMETA M. 1999, *Il romanzo dell'architettura: la Sicilia e il Grand Tour nell'età di Goethe*, Roma, Laterza.
- DE SETA C. (ed.) 2001, *Grand Tour: viaggi narrati e dipinti*, Napoli, Electa.
- DE SETA C. (ed.) 2006, *Iconografia delle città in Campania: Napoli e i centri della provincia*, Napoli, Electa.
- DE SETA C. (ed.) 2007, *Iconografia delle città in Campania: le province di Avellino, Benevento, Caserta, Salerno*, Napoli, Electa.
- DI BLASI A. 2000, *Il Castello Ursino di Catania e il suo ruolo territoriale*, in G. ARENA, A. RIGGIO, P. VISOCCHI (eds.), *Monastero e castello nella costruzione del paesaggio. I seminario di geografia storica (Cassino 1994)*, Perugia, Rux, 361-365.
- GANDOLFO F. 2007, *Le Cattedrali siciliane*, in A.C. QUINTAVALLE (ed.), *Medioevo: l'Europa delle Cattedrali. Atti del Convegno (Parma 2006)*, Milano, Electa, 191-207.
- GIUFFRÈ M., BARBERA P., CIANCIOLI COSENTINO G. (eds.) 2006, *The Time of Schinkel and the Age of the Neoclassicism between Palermo and Berlin*, Cannitello, Biblioteca del Cenide.

- GRINGERI PANTANO F. 2009, *L'isola del viaggio. Palazzolo Acreide, il Museo dei viaggiatori in Sicilia*, Catania, Sanfilippo.
- MAGLIO A. 2009, *L'Arcadia è una terra straniera. Gli architetti tedeschi e il mito dell'Italia nell'Ottocento*, Napoli, CLEAN.
- MANGONE F. 2002, *Viaggi a sud: gli architetti nordici e l'Italia, 1850-1925*, Napoli, Electa.
- MAURICI F. 1997, *Federico II e la Sicilia. I castelli dell'imperatore*, Catania, Maimone.
- NOBILE M.R. 2017, *Medioevo meridionale reinterpretato in un sito della Duke University, «Il disegno di Architettura»*, 41, maggio, 16-20.
- PELLÉ C. 1840, *Les Iles et les bords de la Méditerranée*, London, Fisher.
- SCAMARDI T. 1998, *Viaggiatori tedeschi in Calabria: dal Grand Tour al turismo di massa*, Soveria Mannelli, Rubbettino.
- SMECCA P.D. 2006, *Viaggiatori britannici e francesi in Sicilia (1500-1915): bibliografia commentata*, Lugano, Agorà.
- TUZET H. 1988, *Viaggiatori stranieri in Sicilia nel XVIII secolo*, Palermo, Sellerio.
- VITOLO P. 2016, *The Kingdom of Sicily database project*, in *Virtual Museum of Archaeological Computing, Itineraries-Projects* (<http://archaeologicalcomputing.isma.cnr.it/itineraries/projects/the-kingdom-of-sicily-database-project-and-the-collections-of-historical-images-for-archaeological-studies/>).
- VITOLO P. 2017a, *Il Medioevo, il paesaggio, le città: evocazione, interpretazione, documentazione. Il progetto The Medieval Kingdom of Sicily Image Database*, in G. BELLÌ, F. CAPANO, M.I. PASCAIELLO (eds.), *La città, il viaggio, il turismo. Percezione, produzione, trasformazione, Conference Proceedings (Naples 2017)*, Napoli, Cirice, 731-736 (available on: <http://www.iconografiacittaeuropea.unina.it/>, section *Il Sud d'Italia tra schizzi e appunti di viaggio. L'interpretazione dell'immagine, la ricerca di una identità*, eds. B. MUSSARI, G. SCAMARDÌ).
- VITOLO P. 2017b, *Un contributo allo studio del patrimonio artistico e architettonico dell'Italia meridionale: il progetto The Medieval Kingdom of Sicily Image Database*, in P. BARBERA, M.R. VITALE (eds.), *Sicily Through Foreign Eyes: Travelling Architects. La Sicilia nello sguardo degli altri: architetti in viaggio. Conference Proceedings (Siracusa 2017)*, Siracusa, LetteraVentidue, 489-505.
- VITOLO P., forthcoming, *The Tomb of Mary of Aragon in the Catania Cathedral as a representation of the political context in the Aragonese Kingdom of Sicily*.

## SITOGRAPHY

- British School at Rome. Digital Collections: <http://www.bsrdigitalcollections.it/>.
- Centro Interdipartimentale di Ricerca sull'iconografia della città europea (CIRICE): <http://www.iconografiacittaeuropea.unina.it/>.
- Duke University, Wired! Lab: <http://www.dukewired.org/>.
- Getty Art&Architecture Thesaurus: <http://www.getty.edu/research/tools/vocabularies/aat/>.
- Istituto Centrale per il Catalogo e la Documentazione (ICCD): <http://www.iccd.beniculturali.it/>.
- Marburg Photo Archive: <http://www.fotomarburg.de/>.
- The Medieval Kingdom of Sicily Image Database: <http://kos.aahvs.duke.edu/>.
- The Society of Architectural Historians, SAHARA project: <http://www.sah.org/publications-and-research/sahara/>.

## ABSTRACT

*The Medieval Kingdom of Sicily Image Database* uses new media technologies to reframe our understanding of medieval Europe by focusing on the role of the built environment for the formation of State identity in the medieval Kingdom of Sicily during the Norman, Swabian, Angevin and Aragonese dynasties (c. 950-1420). The material in the database is important for two reasons: the significance of South Italy as a prototype of multicultural State formation and the highly fragmentary condition (war bombardment, earthquakes, urban transformation) of the sites that played a central role in the power structures of the Kingdom. A comprehensive database of historical images of monuments and cities (prints, drawings, maps, photographs) made by scholars, artists and travellers from the fifteenth century to the twentieth century, can enable scholars and the public to recover the appearance of the landscape, cities, and individual monuments prior to radical renovation or destructions. An interdisciplinary research team is conducting a systematic survey and critical cataloguing of images dispersed in the archives, museums and libraries of Italy, Europe and US.

## L'OMCI – ONTOLOGY OF MEDIEVAL CHRISTIANITY IN IMAGES DE L'INHA. UNE ENCYCLOPÉDIE PAR L'IMAGE

### 1. L'INHA PRODUCTEUR DE RESSOURCES NUMÉRIQUES

L'Institut national d'histoire de l'art (INHA), qui renferme une grande bibliothèque en histoire de l'art et un département des études et de la recherche, développe une politique scientifique de service public centrée sur une production documentaire numérique en histoire de l'art. Son principal outil est AGORHA (<http://agorha.inha.fr/>), une plateforme d'accueil qui, outre ses publications d'ouvrages numérisés, gère des bases de données spécialisées dans la discipline (39 bases publiées à ce jour). Les bases sont de taille variable, certaines considérables, comme le RETIF (Répertoire des tableaux italiens conservés dans les institutions françaises, XIII<sup>e</sup>-XIX<sup>e</sup> siècles: <http://www.purl.org/inha/agorha/001/4/>), comprenant, au 4 avril 2017, près de 14.000 œuvres, 3000 notices et près de 1700 références bibliographiques – d'autres sont plus modestes, tel le catalogue des œuvres du Musée des monuments français d'Alexandre Lenoir aujourd'hui refondu dans la Cité de l'Architecture et du Patrimoine, et dont il s'agissait d'identifier les œuvres et de restituer la muséographie d'origine (<http://www.purl.org/inha/agorha/001/45/>).

Ces ressources documentaires (bases de données, catalogues descriptifs de fonds, publications numériques) sont issues des programmes menés par le Département des études et de la recherche de l'INHA sur toutes les périodes de l'histoire de l'art, de programmes de récolelement et de valorisation des collections patrimoniales de la bibliothèque de l'INHA (archives d'historiens de l'art, autographes, albums photographiques, estampes, revues spécialisées, etc.), mais aussi d'actions collaboratives menées avec des institutions partenaires de l'INHA, comme la Bibliothèque nationale de France (Base Caylus, exposant les dessins de son traité sur les antiquités: <http://caylus-recueil.huma-num.fr/>), le Musée d'Orsay (Base Salons, sur les Salons parisiens entre 1673 et 1914: <http://salons.musee-orsay.fr/>), ou encore des mécènes (Base Rothschild: <http://collections.rothschild.inha.fr/>).

AGORHA, en ligne depuis 2011, a la spécificité de proposer des bases de données interopérables et donc interrogeables de concert (œuvres, références bibliographiques, personnes, événements, sujets), entre lesquelles l'interrogateur passe d'une information à une autre, et peut, au-delà des modes classiques d'interrogation, fonctionner par liens et rebonds entre les ressources. Le Département des études et de la recherche promeut également des productions documentaires alternatives: anthologies, éditions numériques – dont le Digital Montagny, coproduit avec le Getty Research Institute (<https://digitalmontagny>).

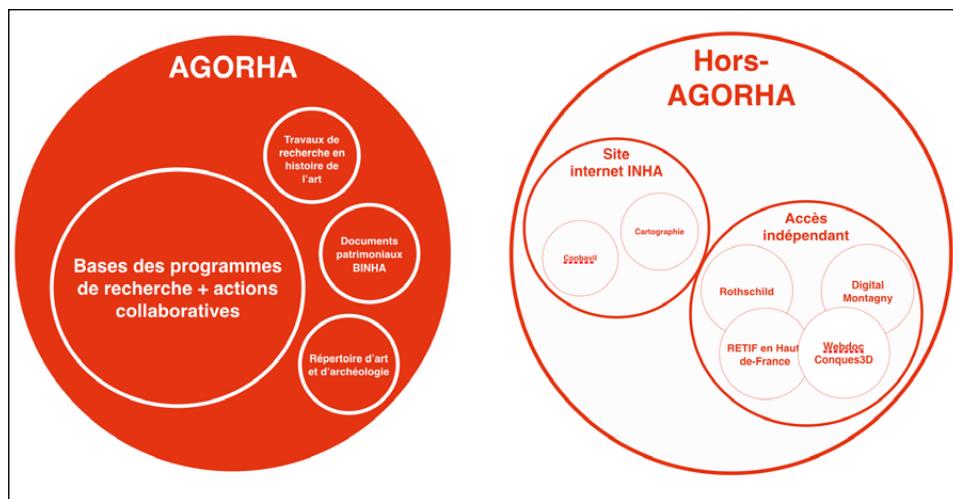


Fig. 1 – Les ressources numériques de l’INHA.

inha.fr/fr) – qui constituent autant de micro-laboratoires d’édition numérique documentaire, dont voici un panorama (Fig. 1).

Précisons qu’afin de s’inscrire dans la politique générale d’ouverture de données de la recherche, les données produites dans ces bases sont disponibles dans une quarantaine de sets OAI-PMH (protocole informatique permettant d’échanger des métadonnées) avec une licence en Creative Commons 4.0 permettant leur réutilisation. Parmi les projets du Département des études et de la recherche, se tient celui qu’a initié Isabelle Marchesin, et qui a été élaboré et modélisé par l’équipe des médiévistes de l’INHA qu’elle dirige: six doctorants, et un docteur chargé de la conduite du programme, Sébastien Biay. Il s’agit de l’OMCI – *Ontology of Medieval Christianity in Images / Ontologie du christianisme médiéval en images*. Comme ressource numérique, le programme OMCI propose une approche inédite des images médiévales sous la forme d’un prisme – un objet éditorial à deux faces, l’une encyclopédique, l’autre iconographique – et relève d’une anthropologie historique du Moyen Âge occidental.

Jusqu’ici, les modèles dominants en iconographie chrétienne sont, outre le *Lexikon der christlichen Ikonographie* (KIRSCHBAUM, BRAUNFELS 1968-1976), l’*Index of Christian Art* de Princeton (ICA), dont l’OMCI se rapproche pour ses termes non inédits, et le *Thésaurus des images médiévales en ligne* (TIMEL) produit par le Groupe d’Anthropologie Historique de l’Occident Médiéval (École des Hautes Études en Sciences Sociales) et le Centre d’Études Supérieures de Civilisation Médiévale (Université de Poitiers/CNRS).

Le thésaurus *Iconography Authority* (IA) du Getty Research Institute ne sera sans doute pas créé en interne, mais importé du Princeton Index, actant ainsi le recul d'Iconclass dans la discipline. À l'horizon de notre programme se tient l'ambition scientifique de donner accès à une taxinomie notionnelle, jusqu'ici étrangère aux bases et aux dictionnaires d'iconographie chrétienne, qui a motivé et orienté la forme du projet, non sans une certaine relation d'iconicité entre les enjeux et le modèle. Doit s'entendre par là que le mode de fonctionnement initial de la source historique que le projet étudie, les images chrétiennes du Moyen Âge, a guidé le choix adopté par l'équipe pour la logique d'organisation des données, le choix de la terminologie et de l'architecture même du site web qui l'expose. Ces trois aspects – l'identification d'une ontologie chrétienne médiévale en images (ontologie comme notion philosophique et théologique relative aux essences et non pas ontologie informatique), le choix d'une exposition de type encyclopédique et le format numérique de sa présentation – sont présentés ci-après.

## 2. DÉLIMITATION DU CHAMP ÉPISTÉMOLOGIQUE

Le projet théorique d'une *Ontologie du christianisme médiéval en images* se fonde sur un contexte historique spécifique: la production des images a eu lieu là même où s'élaborait la pensée abstraite, théologique comme philosophique (philosophie politique, esthétique et philosophie naturelle), d'une Église romaine qui dominait la civilisation de l'occident médiéval. S'efforçant d'introduire dans tous les champs de la vie sociale et intellectuelle ses principes régulateurs et ses objets et modèles de pensée, l'Église a, dans le même temps, cherché à constituer un espace propre, où le monde les clercs serait distinct de celui des laïcs, sans que cet horizon de domination des savoirs et des consciences ne puisse faire l'économie de concessions avec les autres composantes politiques et sociales du Moyen Âge (LE GOFF 1964; BASCHET 2004).

Dès le VII<sup>e</sup> siècle, les établissements religieux constituent une interface précieuse entre les savoirs et la maîtrise des techniques artistiques, qu'elles prennent forme dans les livres, les objets liturgiques ou les édifices cultuels. Avec la consécration d'un empereur romain occidental en l'an 800, l'Occident chrétien devient une réalité politique et une communauté liée par une vaste entreprise d'harmonisation des pratiques linguistiques, culturelles et liturgiques. Communauté de fidèles, la chrétienté se transforme au cours du XII<sup>e</sup> siècle en un espace d'appartenance sur lequel le pape entend exercer un pouvoir dominant, qui sera limité par des schismes et par l'autonomisation des puissances politiques (LOGNA-PRAT 2006). Mais si l'histoire de la civilisation chrétienne occidentale est l'histoire de la domination d'une institution religieuse, elle est aussi celle de l'appropriation d'un héritage judaïque et d'un héritage gréco-romain constamment sous inventaire (simultanément intégrés,

discriminés et refoulés par la théologie chrétienne). À aucun moment le christianisme médiéval n'efface les cultures sur lesquelles il a conquis son espace d'expansion, que ce soit du point de vue des traditions littéraires ou de celles des arts visuels, les motifs issus du répertoire antique étant mis au service de l'Évangile. Les images, comme le fixent les *Libri carolini* de Théodulf d'Orléans, y sont abordées comme une voie médiane d'édification à l'attention des fidèles; elles sont nécessaires mais non suffisantes, et envisagées sans adoration ni rejet. Elles ont aussi pour fonction d'être des supports herméneutiques et des supports de méditation au sein des abbayes, où les moines mâchent et remâchent à des fins rituelles, exégétiques et spirituelles le contenu des livres qu'elles ornent (KESSLER 2000). Les établissements religieux se couvrent eux aussi d'images monumentales, peintes ou sculptées; toujours plus nombreuses, elles atteignent, au XII<sup>e</sup> siècle, une saturation qui, exception faite de quelques mouvements rétifs à l'image elle-même, ne décroîtra jamais.

Considérer la continuité du christianisme médiéval à l'échelle d'une période allant du VII<sup>e</sup> au XV<sup>e</sup> siècle nous amène à en suivre des fils extrêmement longs, des transformations, parfois même des révolutions dans le champ des savoirs théoriques, des techniques mais aussi des fonctions et des usages de l'image. Comment ignorer la diversification des lieux de savoirs, des monastères insulaires jusqu'à la création des universités, puis l'émergence de cours humanistes à la fin de la période? Comment ignorer, ce faisant, la transformation des champs de la connaissance, notamment sous l'effet de la transmission par le monde arabe d'une partie essentielle du corpus philosophique grec? Que l'on pense seulement à la transformation du concept de nature, qui de la division des essences de l'être, dont un traité de Jean Scot Érigène se fait l'expression à l'époque carolingienne, se polarise ensuite dans son rapport à la grâce (*surnature*) et en vient à désigner, au XII<sup>e</sup> siècle, le seul domaine de la créature, plus spécifiquement des principes et des lois qui régissent le grand tout du monde créé (SOLÈRE 2004). Ou que l'on aborde le dogme de la transsubstantiation, qui évolue à la mesure d'une liturgie eucharistique accentuant sa dimension visuelle (élévation, processions), et se confronte à des contradicteurs considérés comme hérétiques (SCHEFER 2007). Que l'on considère aussi l'ascension, à la fin du Moyen Âge, d'une société communale déliée des pouvoirs féodaux et ecclésiastiques (ce qui ne se signifie pas sans Dieu), un rapport à la mort tissé de nouveaux modes de médiation entre terre et ciel (purgatoire, confréries par exemple) qui affectent directement les images. Ce sont également de nouvelles conditions de production des images qui se font jour, celles d'une commande qui déborde largement l'ancien cadre ecclésiastique et royal, et de nouveaux modes de représentation, qui exaltent l'expérience sensible individuelle, la mise en scène du collectif, mais aussi la mimésis, au point de conduire à l'élaboration d'une théorie de la perspective.

En synthèse, le projet de l'*Ontologie du christianisme médiéval en images* ne prend pas le risque d'une uniformisation, mais celui d'une simplification. Il repose sur deux grands postulats. Le premier est celui de l'existence d'une société chrétienne médiévale à l'histoire longue, qui a rendu possible l'avènement d'un modèle de représentation du monde assez stable, et d'une religion faisant anthropologiquement système, non sans que cette appréhension ne fasse écho à la logique même d'une économie générale du Salut, pensée comme un tout extrêmement cohérent par les docteurs chrétiens. En l'espèce, il est possible de suivre tout au long de cette période une pérennisation des principales formes théoriques qui constituent le noyau de l'ontologie du christianisme médiéval: le rapport à Dieu – dans lequel s'instaure la médiation nécessaire d'une Église – la structure analogique de l'ordre du cosmos et la forme hiérarchique des relations entre les êtres, un agencement des nombres, des formes et des substances dans l'espace et dans le temps, qui est compris comme une expression du divin (DE BRUYNE 1946). Ce n'est qu'en déniant à l'âme d'être le principe de vie du corps, en faisant de la nature le seul empire de la physique ou encore en isolant l'homme du fonctionnement du monde que la métaphysique du XVII<sup>e</sup> siècle actera, dans le corpus philosophique occidental, la fin de cette ontologie chrétienne médiévale (BASCHET 2016, 276).

Le second postulat est que l'impulsion donnée à l'image figurative par l'Église du premier Moyen Âge détermine un arrimage précoce et durable de la production visuelle aux grandes articulations conceptuelles d'une pensée qui s'exprime par ailleurs dans les textes et dans les pratiques. Les nombreuses variables historiques et doctrinales, si elles sont impossibles à prendre toutes en compte, nous ont conduits à favoriser, dans notre projet, des choix d'objets issus du noyau des XI<sup>e</sup>-XIII<sup>e</sup> siècles, période qui marque la pleine expression de l'ontologie du christianisme médiéval et son déploiement accompli dans le champ iconographique, de même qu'elles nous ont conduits à prendre en considération ses manifestations singulières et tardives, aux XIV<sup>e</sup> et XV<sup>e</sup> siècles, alors qu'elles manifestent, de manière aussi novatrice que radicale, les fondements de cette ontologie.

### 3. L'OMCI, UNE MICRO-ENCYCLOPÉDIE “MÉDIÉVALE”

Le choix d'un modèle numérique et encyclopédique pour exprimer l'ontologie chrétienne médiévale tient à la nécessité d'articuler un maillage notionnel continu avec la discontinuité et la variété de ses expressions plastiques. Le paradigme s'est présenté au sein même de la production du Moyen Âge. Au tout début du XIV<sup>e</sup> siècle, un prieur dominicain du nom d'Arnold de Liège entend organiser le matériel utilisé par les prédicateurs, les *exempla* (petites histoires à vocation d'éducation morale), en 550 rubriques classées alphabétiquement. L'un des caractères novateurs de l'ouvrage, qui porte le nom d'*Alphabetum*

*narrationum*, est le nivellement alphabétique qu'il adopte, c'est à dire une mise en ordre qui ne relève plus du modèle divin mais de la raison linguistique des hommes (ARNOLDUS LEODIENSIS 2015; pour une bibliographie sur les encyclopédies médiévales, cfr. l'Atelier Vincent de Beauvais: <http://atelier-vincent-de-beauvais.irht.cnrs.fr/>). Cette nouvelle organisation du savoir autorise un système d'équivalence terminologique (par exemple sous le terme *dilectio*, sont spécifiés être entendus aussi *amicitia* et *amor*); elle permet des renvois à d'autres rubriques, la navigation dans les textes s'opérant à l'échelle de l'ouvrage entier; elle considère le florilège, non plus comme une construction d'autorités, mais comme la couverture efficace d'un domaine conceptuel. En l'occurrence, Arnold de Liège ne classe pas toutes les sources qu'il a à sa disposition, mais sélectionne des historiettes qu'il juge emblématiques et suffisantes en nombre et en qualité pour recouvrir efficacement le champ sémantique et la potentialité tropologique de chacun des termes-rubriques de son ouvrage.

La proposition littéraire d'Arnold de Liège fait sens comme objet documentaire, puisqu'elle propose une taxinomie de l'ensemble des structures narratives à partir desquelles le discours pastoral met en scène le modèle d'une vie chrétienne exemplaire. Elle fait aussi œuvre scientifique, puisqu'elle discrimine et pose, par ses choix de rubriques et ses choix d'exemples, les conditions d'interprétation symbolique – en l'espèce, morale – du matériau qu'elle organise. Par ailleurs, et ce n'est pas l'un des moindres aspects passionnants de la démarche, le prédateur pense les *exempla* qu'il ordonne comme autant d'artifices cognitifs, d'images mentales qui convoquent les résonances analogiques contenues dans les signes-mots et les signes-gestes de la culture chrétienne médiévale.

C'est dans un format similaire que le programme OMCI cherche à mettre en lumière l'ontologie chrétienne directement ou implicitement convoquée dans le discours visuel des figurations religieuses et des thèmes profanes imprégnées d'anthropologie chrétienne. Pour ce faire, il vise à construire, organiser et analyser un noyau documentaire exemplaire des représentations figurées par lesquelles se construit, s'exprime et se partage l'expérience chrétienne du créé et de l'intré. Cette expérience est plurielle et organisée en strates de significations, dans l'approche des images comme dans celle de la liturgie. La première d'entre-elles est toujours littérale, et dans le cadre des images chrétiennes, concerne le récit biblique ou hagiographique, ce que la culture médiévale qualifie d'*historia*. Toutefois, dans la profondeur du sens auquel cette *historia* donne accès, se tient un plan beaucoup plus dense et complexe, mais aussi plus radical, fondamental, qui est celui de l'économie générale du Salut chrétien, c'est-à-dire du contexte au sein duquel tout ce qui a eu lieu, tout ce qui a lieu, et tout ce qui aura lieu se tient dans une profonde unité téléologique, liée aux paramètres de départ de l'histoire et à leur évolution dans le temps. Ainsi l'Homme créé va-t-il choir pour être sauvé, ainsi la matière du monde va-t-elle disparaître à la fin des temps, etc.

Pour mieux comprendre ce qui se joue en deçà de la surface des images, un rapide exemple s'impose. Considérons ici deux scènes figurant pour l'une l'animation d'Ève, et pour l'autre l'Expulsion d'Adam et Ève du paradis terrestre, telles qu'elles sont représentées sur la porte de Hildesheim, fondue en 1015, et dont les huit premiers panneaux du vantail gauche racontent le Chute à travers des épisodes de l'Ancien Testament, et les huit panneaux de droite racontent le Salut avec des épisodes du Nouveau Testament (pour une étude exhaustive: MARCHESIN 2017). Si le premier des seize panneaux historiés de la porte ottonienne représente, sur le plan narratif, l'animation d'Ève par Dieu, le sujet central de l'image possède une dimension plus universelle (Fig. 2). Il figure la mise en forme (et en substance) progressive, en trois étapes de croissance, d'un seul et même végétal, l'Arbre de vie. Cet Arbre de vie est d'abord incarné par le petit arbuste trine naissant de la terre représenté tout à gauche, puis par l'arbuste médian qui adopte une structure orthonormée et dont une branche supérieure tend vers le grand arbre placé entre Dieu et Adam. Ce dernier, ample, parfaitement symétrique et accompli, et dont les branches nouées en cœur annoncent la fructification à venir, s'impose comme le paradigme formel et conceptuel de la Vie en soi, par-delà la vie qui est donnée à Ève dans l'image. Ce processus naturel emblématique est décrit comme une expression de l'ordre universel par Augustin d'Hippone, *De Genesi ad litteram* (lib. V, XXII, 44).

Au panneau 5, après qu'ont été figurés la rencontre entre Adam et Ève, le Péché originel, et les reproches de Dieu à Adam et Ève, on assiste à l'expulsion des humains hors du paradis terrestre (Fig. 3). Cette expulsion, sur le plan narratif, fait écho au texte biblique qui raconte comment un ange armé du glaive interdit l'entrée au territoire paradisiaque (Gn 3, 24). Toutefois, dans la profondeur de l'ontologie – de l'essence du monde – ce qui est figuré ici est la Mort en soi, tout comme le panneau 1 présentait la Vie en soi. Derrière le glaive de l'ange, se tiennent en effet deux végétaux superposés qui reprennent les traits généraux de l'Arbre de vie du premier panneau, mais l'évoquent sur un modèle scindé: la séparation de la partie haute et de la partie basse de l'arbre archétypal manifeste une séparation entre le corps et l'âme qui est synonyme de mort pour l'humanité. La partie basse, déliée, sans tenue ni force, est une figure du corps de chair destiné à mourir et à retourner à la glaise dont il est fait. La partie supérieure, agitée, acérée en sa partie centrale comme l'est le glaive angélique, est une figure de l'âme déformée, en souffrance, de l'âme mourant aussi, non pas comme le corps dans une dilution de matière, mais dans sa perte de forme, de ressemblance à Dieu. Une âme sans Dieu, quoiqu'immortelle, est une âme morte, dit Augustin (*Cité de Dieu*, lib. XIII, XII).

Aussi surprenant que cela puisse paraître, un artiste de l'an mil a figuré, au sens propre du terme, la Vie et la Mort, par l'entremise de végétaux. Comment éviter de passer à côté de ces significations fondamentales, en l'espèce



Fig. 2 – Hildesheim, Cathédrale, porte de bronze (1015), panneau 1, ©Archiv Monheim-Dom Museum Hildesheim.



Fig. 3 – Hildesheim, Cathédrale, porte de bronze (1015), panneau 5, ©Archiv Monheim-Dom Museum Hildesheim.

universelles et constitutives de la culture chrétienne du Moyen Âge, si l'on s'arrête, comme le font les lexiques, à des récits, à des personnages ou à des figurations allégoriques? Ces dernières ne sont pas les seules, loin s'en faut, à incarner la qualité spéculative de la culture visuelle. Notre réponse a été la constitution d'une ressource dédiée à l'articulation sémantique des notions

fondamentales de l'ontologie du christianisme médiéval avec les formes iconographiques par lesquelles ces notions ont été transposées dans le langage visuel.

#### 4. LA STRUCTURE SÉMANTIQUE DE L'OMCI

##### 4.1 Rubriques, thématiques, motifs

La première étape du programme de recherche menant à l'exposition numérique des résultats est un "lexique racine" qui renferme une quarantaine de termes, qualifiés de Rubriques, renvoyant aux notions fondamentales de la théologie chrétienne (Corps, Image, Médiation, Lumière, Sacrifice, Loi, Temps, Théophanie, Matière, Communauté, etc.). On le comprendra aisément, il est impossible de scinder avec clarté le territoire notionnel des termes du lexique, et notre ambition est de créer, en tenant compte des chevauchements, des antinomies et des complémentarités de sens, un tissu théorique continu qui ne laisse pas de vide.

À l'autre bout de la chaîne se trouvent les images médiévales, qui mettent en œuvre ces concepts de manière opérante. Les analyses iconographiques nous permettent d'identifier dans le corpus iconographique médiéval des *exempla* visuels (dans le sens médiéval du terme), que nous désignons par le terme de Motifs, et qui peuvent être de différentes natures:

- Des situations ou performances (par ex. "la pastorale");
- Des relations (par ex. "l'union de l'âme avec le corps");
- Des processus (par ex. "la purgation des péchés");
- Des figures rhétoriques (par ex. le parchemin d'un manuscrit comme peau du Christ);
- Des objets, que nous pouvons aborder soit dans leur matérialité soit par le truchement des représentations figuratives (par ex. l'image acheiropoïète, c'est-à-dire non faite de main d'homme).

Chacun de ces Motifs se rattache à une Rubrique:

- La pastorale, à la Rubrique "Révélation du Verbe";
- L'union de l'âme avec le corps, à la Rubrique "Âme";
- La purgation des péchés, à la Rubrique "Salut";
- Le parchemin d'un manuscrit comme peau du Christ, à la Rubrique "Matière";
- L'image acheiropoïète, à la Rubrique "Image".

La richesse sémantique des Rubriques, conjuguée à la diversité des images chrétiennes, génère cependant un foisonnement de Motifs. Par exemple, à la notion d'image (*imago*), se rattachent des réalités aussi différentes que:

- L'image comme reflet (par ex. l'image reflétée dans un miroir);
- L'image comme objet fabriqué (une figure peinte ou sculptée);

- L'image comme vision (par ex. la vision intérieure d'un souvenir ou d'une pensée);
- L'image comme trace (par ex. le vestige de Dieu dans l'Homme, qui fut fait *ad imaginem*).

Le champ sémantique de chaque Rubrique appelle par conséquent une classification de ces réalités en Thématiques iconographiques, qui constituent l'enjeu épistémologique majeur du programme:

- “L'image comme empreinte”, c'est-à-dire comme rémanence d'une présence sainte et de sa puissance, recouvrira les Motifs de l'image spéculaire et de l'imageacheiropoïète;
- “L'image comme corps”, recouvrira les Motifs d'images comme objets fabriqués dès lors qu'ils manifesteront l'animation d'une statue, soit par l'intervention miraculeuse de son prototype divin, soit dans le cadre d'une performance liturgique (par ex. une statue portée en procession);
- “L'idole” recouvrira les situations où une image fabriquée est animée par un prototype démoniaque ou inscrite dans une cérémonie d'adoration païenne;
- “L'image mentale” recouvrira les représentations ou évocations de visions intérieures procédant de l'activité de l'âme ou de l'inspiration divine;
- “L'image comme similitude divine” traitera enfin des différentes manifestations iconographiques de la relation d'image entre l'Homme et Dieu.

#### 4.2 Relations sémantiques

La relation entre deux éléments est un phénomène structurant dans l'architecture d'un univers de concepts. Nous avons évoqué à l'instant la relation d'image entre l'Homme et Dieu; plus haut, nous évoquions l'union de l'âme avec le corps. L'arborescence des Rubriques, Thématiques iconographiques et Motifs iconographiques que l'on vient d'expliquer assigne à chaque Motif une place déterminée sous une Thématique unique, elle-même rangée sous une Rubrique unique. Il existe toutefois des relations signifiantes entre Motifs, entre Thématiques et entre Rubriques, autres que les relations exprimées dans cette première arborescence linéaire. Ainsi, la relation d'image entre l'Homme et Dieu n'est pas le seul fait de la Rubrique “Image”, puisque cette relation est aussi à l'origine des facultés cognitives de l'Homme (l'âme de l'Homme, avec les propriétés intellectuelles qu'elle renferme, est à l'image du Verbe). En conséquence, la Thématique “Image comme similitude divine” (Rubrique “Image”) est également liée à la Thématique “Âme intellectuelle” (Rubrique “Âme”) par une relation de causalité (la similitude divine est le principe originel des facultés de l'âme intellectuelle de l'Homme). Prenons un autre exemple. L'union de l'âme avec le corps n'est naturellement pas le seul fait de la Rubrique “Âme”, la Rubrique “Corps” y étant fort logiquement associée. Il existera donc une relation signifiante entre la Thématique “Âme comme

principe de vie” (qui recouvre le Motif de “L’union de l’âme avec le corps”) et la Thématique “Corps comme matière”, relation qui sera, cette fois, qualifiée de relation d’effectivité, l’âme induisant l’animation de la matière corporelle.

Les Thématiques iconographiques constituent l’enjeu épistémologique majeur du projet de recherche dans la mesure où elles se présentent au sein de l’arborescence comme la charnière entre les concepts (Rubriques) et les objets visuels (Motifs). Afin de garantir la lisibilité de la cartographie sémantique de l’OMCI, le choix a été fait de ne penser les relations entre unités notionnelles qu’à leur niveau seul. Le résultat est un dispositif de relations sémantiques entre Thématiques iconographiques qui infère, sans qu’elles ne soient explicitées, des relations entre les Rubriques qui les contiennent. Le tissu théologique d’origine est ainsi également rétabli dans ses interrelations spécifiques.

## 5. L’INFRASTRUCTURE NUMÉRIQUE

La réflexion menée sur le modèle ou plutôt sur le *visage* d’une production numérique qui serait adaptée à ce projet scientifique a été rendue possible par une collaboration étroite entre des professionnels ayant des profils complémentaires: historiens de l’art, chargés de ressources documentaires, architectes de l’information, etc. Il a été indispensable de concilier les obligations d’ouverture des productions documentaires et de mise à disposition de la communauté scientifique, l’exigence d’interopérabilité des données et une approche éditoriale portée par un discours scientifique propre à l’OMCI. Notre production s’inscrit dans le concept d’éditorialisation établi par Marcello Vitali-Rosati (VITALI-ROSATI 2016), qui décrit l’ensemble des dispositifs permettant la structuration et la circulation du savoir: processus internes, logique de *work in progress* entre les équipes pluridisciplinaires, mise en place d’outils/plateformes et, en conséquence, expérimentation des contraintes et des avantages d’un dispositif socio-numérique, sans oublier l’aspect théorique, qui prend en considération l’impact du numérique sur le processus de production des connaissances scientifiques. Au cœur de chaque projet de ce type réside l’ambition d’établir un niveau épistémologique de réflexion qui résulte de la confrontation des chercheurs à la modélisation, et vise à identifier, en premier lieu, l’objectif du modèle, son “utilité”. Bruno Bachimont (BACHIMONT 2007) distingue le modèle comme format de travail (*id est*, ce qui permet de réaliser les traitements et les structures au sein d’une unique application) et le modèle comme format d’échange (ce qui permet de «rendre lisible, par différentes applications, les mêmes données»). On ajoutera à cela un troisième type de modèle communément identifié dans la communauté des humanités numériques, que l’on qualifie de modèle conceptuel. Il s’applique à un domaine dont l’objectif est de définir les principales entités qu’il contient, et qui définira toutes les relations que ces entités développent entre elles, sans se soucier de leur implémentation dans

une production documentaire. Nous considérons, pour reprendre les termes d'une conférence de Thomas Francart, que «modéliser, c'est communiquer», et qu'il est nécessaire, lors de ces trois phases, qu'un constant dialogue lie les acteurs du projet. Dans le cas de l'OMCI, afin de répondre aux attentes du collectif qui se devait de considérer ces trois états du modèle – format conceptuel, format de travail, format d'échange – tout en favorisant l'exploitation des uns par les autres, nous avons dû fabriquer des “produits parallèles”: un stade matriciel adossé à un format permettant la visualisation et servant de test en phase intermédiaire aux équipes rédactionnelles; mais aussi, un format SKOS (<http://www.sparna.fr/skos/SKOS-traduction-francais.html#labels/>) pour le partage du modèle adossé à un format d'éditorialisation intégré dans un CMS (Content Management System).

S'est ensuite posée la question des langages de représentation des connaissances, langages qui, à l'heure du web de données, sont souvent confondus car étroitement liés. En l'espèce, il est nécessaire de distinguer trois formes: l'ontologie numérique, le thésaurus, la taxonomie. L'OMCI se place à l'intersection de l'ontologie et du thésaurus. L'ontologie cherche à décrire de façon formelle un domaine de connaissances en identifiant les types d'objets concrets (physiques) ou abstraits (concepts) de ce domaine, leurs propriétés et leurs relations; son standard de représentation peut être OWL (Ontology Web Language). Le thésaurus est une liste des concepts et des termes relatifs à un domaine, organisés entre eux, avec leurs libellés, leurs traductions, leurs synonymes, et leurs descriptions/définitions; son standard de représentation est le SKOS. Dans SKOS, les concepts peuvent être identifiés par des URIs, libellés avec des chaînes de caractères, se voir assigner des notations (codes lexicaux), être documentés à l'aide de plusieurs types de notes, être reliés à d'autres concepts, organisés dans des hiérarchies informelles et des réseaux associatifs, agrégés dans des schémas de concepts, regroupés dans des collections libellées et/ou ordonnées, et alignés avec des concepts d'autres schémas de concepts. Pour l'OMCI, nous avons besoin tout à la fois de décrire nos objets tels qu'ils sont, en précisant chacune de leurs caractéristiques, mais aussi, dans un souci de présentation de ces objets dans un espace éditorialisé, d'organiser cette représentation des connaissances par des relations hiérarchiques et associatives permettant d'accéder aux contenus éditoriaux. Ce langage SKOS peut être utilisé seul ou combiné avec d'autres langages formels de représentation de connaissances tel que le OWL. SKOS a ainsi la qualité de capturer la plupart des ressemblances entre les propriétés sémantiques et hiérarchiques de SKOS et les propriétés sémantiques et de la représentation de connaissances (OWL) et de les expliciter, de façon à permettre l'échange de données et de technologies entre tous les types d'applications. Ce modèle de données permet en particulier de réaliser le portage des systèmes d'organisation de connaissances existants vers le Web Sémantique, selon un système d'encodage à la fois standardisé et peu coûteux.

Dans l'OMCI, deux types d'objets sont manipulés, à savoir les entités (entités de type terminologique sous forme de libellé et entités de type artefacts, également sous forme de libellé) et les propriétés qui relient ces entités entre elles. Les entités terminologiques sont de trois sous-types: Rubrique, Thématische, Motif. Chaque entité Motif est illustrée par une entité de type Artefact (enluminure, sculpture, peinture murale, objet d'orfèvrerie, etc.). Pour éviter les confusions, nous empruntons au CIDOC-CRM, le nom d'une entité qui nous semble le moins prêter à confusion, à savoir la E24 pour *Physical Man-Made Thing* (CIDOC-CRM). Pour ces entités, nous nous reposerons sur la classe skos:concept, pouvant être vue comme une unité de pensée, et pour le site, nous les agrégerons dans un schéma de concepts. La souplesse des différentes classes est essentielle dans l'approche *work in progress*, comme le souligne la spécification de la W3C (skos:ConceptScheme: <https://www.w3.org/TR/2009/REC-skos-reference-20090818/>): «what constitutes a unit of thought is subjective, and this definition is meant to be suggestive, rather than restrictive» (Fig. 4).

Les propriétés qui relient les entités sont de trois natures:

- Nature structurelle reliant les trois types d'entités de manière hiérarchique;
- Nature illustrative reliant le Motif et l'entité Artefact;
- Nature sémantique reliant des entités de type Thématische.

Ces propriétés de sens peuvent relever de la notion de causalité (a pour principe, a pour conséquence), de la notion d'effectivité (affecte, est affecté par), d'antinomie et enfin d'équivalence (Fig. 5).

## 6. LA MISE EN ŒUVRE DU PROGRAMME

Une première phase du programme a été consacrée à l'invention du projet, à sa modélisation intellectuelle et sa projection numérique, puis à l'établissement de la liste des Rubriques et à la prospection de leurs champs sémantiques respectifs, jusque dans d'éventuelles relations entre des Rubriques.

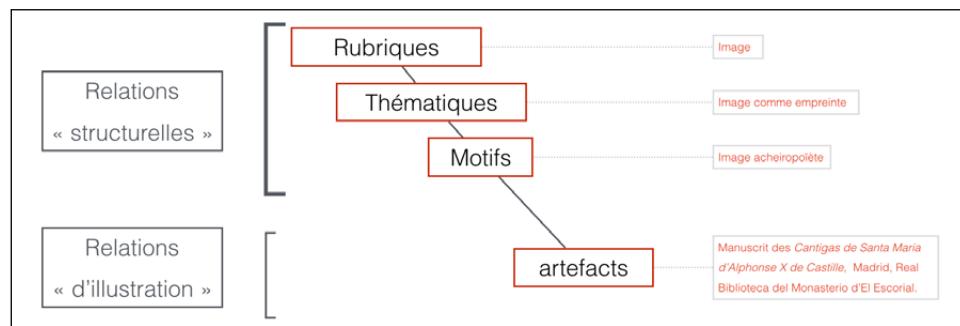


Fig. 4 – Les relations hiérarchiques de l'OMCI.

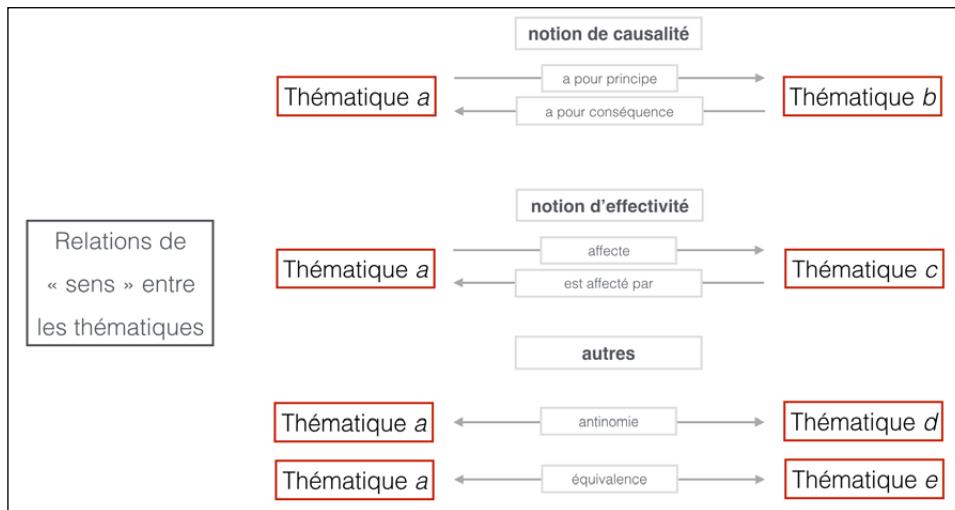


Fig. 5 – Les relations de sens entre les thématiques de l'OMCI.

Ce travail a été mené par Ambre Vilain (docteur), Maréva U, Vincenzo Mancuso et Annamaria Ersek (doctorants en histoire de l'art à l'INHA), sous la responsabilité d'Isabelle Marchesin, janvier 2015 à janvier 2016. Le travail a consisté en un séminaire hebdomadaire au cours duquel chaque proposition de matériel lexical comme iconographique était discutée en commun. Une maquette du site web cible a été mise en forme par Maréva U.

La deuxième phase, inaugurée début 2016 et appelée à se prolonger parallèlement à la troisième (évoquée ci-après), consiste en la rédaction des Rubriques. Les contenus de l'OMCI sont rédigés Rubrique par Rubrique, et la collection des objets iconographiques ainsi que leur analyse est synchrone de l'élaboration de la définition générale des concepts et des Thématiques. L'équipe des rédacteurs actuelle est constituée de Sébastien Biay (docteur, chef de projet INHA), Marion Loiseau (doctorante INHA / Université de Poitiers), Isabelle Marchesin (directrice de recherches INHA / Université de Poitiers), Louise-Élisabeth Queyrel (doctorante INHA / Université de Bourgogne - Université de Mayence), Pierre-Marie Sallé (doctorant INHA / École pratique des hautes études) et Marjolaine Massé (doctorante INHA, Université de Poitiers) et Nancy Thébaut (doctorante boursière de la fondation Samuel H. Kress - Université de Chicago). L'avancée de la production éditoriale, du choix et de l'analyse des objets iconographiques est testée par le groupe, qui produit aussi une bibliographie commune sous Zotero. Les rubriques achevées font l'objet d'un maquettage sous InDesign permettant leur diffusion restreinte auprès de la communauté scientifique (Fig. 6).

# RÉVÉLATION



*Le moulin mystique, v. 1120,  
Vézelay, S<sup>e</sup>-Marie-Madeleine.*

*La révélation désigne l'action de se découvrir, de se dévoiler (*revelare* signifie rejeter le voile en arrière), de se rendre visible, manifeste (φανερών en grec ancien). Elle implique un processus continu au cours du temps historique et place la connaissance de Dieu en regard de ses créatures. Cette rubrique se concentre sur les modalités de la force agissante que Dieu emploie pour faire percevoir à ses créatures l'ordonnancement du monde, son « dessein » ou plan divin, qui leur permet de se préparer à la révélation de l'Apocalypse, accomplissement dernier et récapitulatif de la fin des temps.*

*Le Verbe est entendu à la fois comme l'ensemble des transcriptions et des proférations humaines des enseignements que Dieu a révélés à l'homme dans l'Histoire et comme l'entité englobante et organisatrice renvoyant à Dieu lui-même s'adressant directement aux hommes. Cette révélation est consignée dans l'Ancien et le Nouveau Testament.*

*Le processus de révélation divine se place dans une logique de progression, au prisme de l'écoulement du temps historique : tout d'abord, les prophètes et patriarches de l'Ancien Testament qui ont consigné leur connaissance de Dieu avant son Incarnation en la personne du Christ et ont préparé sa venue ; puis le Christ lui-même (dont le nom, χριστός, signifie le Messie, l'oint de Dieu), révélation vivante, dont la résurrection le jour de Pâques confirme et accomplit sa nature divine. Après son ascension et la descente de l'Esprit saint le jour de la Pentecôte, il a légué à ses disciples ses enseignements et le témoignage de sa vie. Ce double héritage de mots et d'actions a été consigné par les évangélistes et les disciples dans le Nouveau Testament. La troisième scansion du temps historique, avant la fin des temps et la révélation finale de l'Apocalypse (qui signifie révélation en grec ancien), est celle de l'Église, héritière des enseignements des apôtres et chargée de diffuser l'Évangile.*

La naissance du Christ clôt d'une certaine manière la révélation divine, le Messie et Fils de Dieu s'étant fait homme. Mais après sa mort et sa résurrection, les écrits laissés par ses disciples et apôtres ont servi de base à une interprétation de la Bible par les docteurs et pères de l'Église. Ceux-ci, suivant le principe de l'accomplissement des Écritures déjà présent dans l'Ancien Testament et qui se manifeste dans les propres paroles du Christ et les épîtres de ses proches, ont cherché à lier Ancien et Nouveau Testament, et ont ainsi fondé un des mécanismes principaux de l'exégèse chrétienne : la typologie. Il s'agit d'un système de pensée d'ordre providentiel, central dans la cosmologie de l'époque médiévale, comme le souligne Erich Auerbach dans *Figura* (1938). La typologie est ainsi utilisée comme un des fondements pour mettre en valeur la connaissance de Dieu visible dans

Fig. 6 – Début d'une rubrique maquettée sous InDesign.

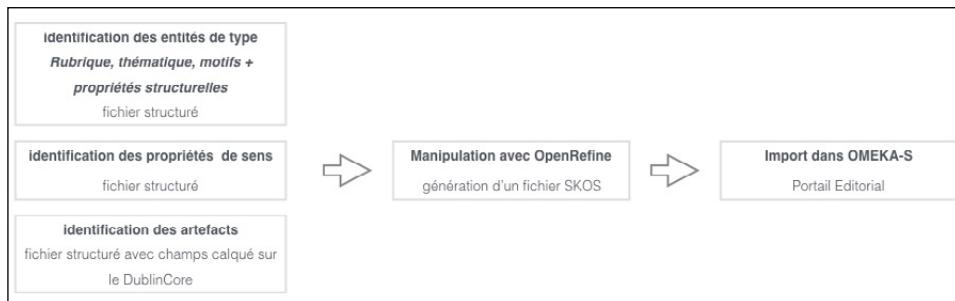


Fig. 7 – Processus de création de données de l'OMCI.

The screenshot shows the navigation menu of the OMCI editorial portal. The main title is 'Ontology of Medieval Christianity in Images OMCI'. The menu includes: Browse Items, Browse Collections, Browse Exhibits, Collection Tree, Subjects List, Subjects Tree, and Contact Us. Below the menu, a sidebar displays a hierarchical tree of thematic and motif categories. The tree starts with 'Ame', 'Assemblée', 'Bibliographie', 'Communauté', 'Corps', and 'Image'. The 'Image' category has several sub-categories: 'idole' (with 'Non-présence' and 'Présence autre'), 'Image comme similitude divine' (with 'Christomorphisme', 'Consubstantialité et visibilité', and 'Vestige divin'), 'Image mentale' (with 'Image-seul' and 'Image-vision'), and 'Image-corps'.

Fig. 8 – Aperçu de l'arborescence des Rubriques, Thématiques et Motifs sur le portail éditorial en construction.

La troisième phase est la construction de la ressource numérique, dont le développement est assuré par Antoine Courtin et la Cellule d'Ingénierie Documentaire de l'INHA depuis juin 2016. La réalisation s'articule en trois temps: la liste des entités et l'identification des propriétés de sens entre les entités est réalisée à partir de deux fichiers tabulés de type Excel. Il s'agissait d'utiliser un format/outil que tous les membres de l'équipe puissent maîtriser. La structure a été établie suite à plusieurs réunions de travail. En parallèle, l'identification des *artefacts* illustrant les Motifs a été réalisée en mettant l'accent sur une démarche simplifiée (image et champs de description calqués

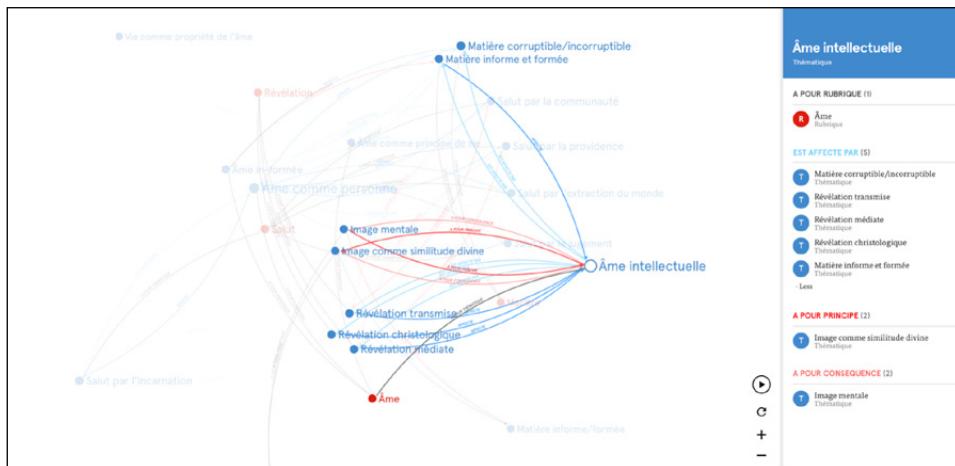


Fig. 9 – Cartographie sémantique d'une thématique réalisée avec Graph Commons.

sur le DublinCore). À partir de ces fichiers, des manipulations sont réalisées grâce à OpenRefine, l'un des logiciels-phares de ce que l'on appelle les *self service data preparation*, avant que ne soit réalisé un vocabulaire SKOS-XL, permettant de combiner l'approche structurelle du SKOS, et la description formelle des entités et des propriétés.

Pour exploiter ce fichier, nous utiliserons la nouvelle version d'OMEKA publiée en octobre 2017, intitulée OMEKA-S. Ce CMS (Content Management System), très utilisé dans la sphère des GLAMs (Galleries, Librairies, Archives and Museums), permet d'ancrer le projet dans le web de données tout en ménageant une liberté éditoriale forte (Figg. 7-8).

Il est également possible d'exploiter les relations entre ces entités sous la forme d'un réseau permettant de visualiser un maillage entre l'ensemble des termes de l'OMCI. Afin de tester cette approche, nous utilisons le service en ligne Graph Commons (Fig. 9).

Ce travail est encore en cours de consolidation, et l'intérêt est de pouvoir à tout moment rejouer les différentes formes en partant toujours des fichiers tabulés.

En conclusion, de la confrontation entre le champ conceptuel recouvrant le religieux et les productions d'artefacts au Moyen Âge émerge la création d'un modèle propédeutique de connaissances et d'un lexique centrés sur l'ontologie chrétienne, et qui sont la raison d'être de l'OMCI. Dans la mesure où nous anticipons le fait que la durée de vie d'une ressource numérique est faible et que son intérêt réside dans le caractère réutilisable de son modèle sémantique, notre modèle de connaissance est lui-même articulé autour des

concepts de Rubrique, Thématique et Motif, de leurs relations sémantiques et de leurs termes associés, pour former un lexique inédit, qui pourrait servir de modèle à d'autres élaborations numériques, qu'elles relèvent du religieux, du mythologique ou du philosophique et qu'elles soient centrées sur des logiques d'indexation ou sur des modes d'exposition qui restent à inventer.

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## BIBLIOGRAPHIE

- ARNOLDUS LEODIENSIS, *Alphabetum narrationum*, in *Corpus Christianorum Continuatio Mediaevalis*, 160, Turnhout 2015, Brepols (ed. E. Brill).
- BACHIMONT B. 2007, *Ingénierie des connaissances et des contenus: le numérique entre ontologie et documents*, Paris, Lavoisier.
- BASCHET J. 2004, *La civilisation féodale: de l'an mil à la colonisation de l'Amérique*, Paris, Aubier.
- BASCHET J. 2016, *Corps et âmes: une histoire de la personne au Moyen Âge*, Paris, Aubier-Flammarion.
- DE BRUYNE E. 1946, *Études d'esthétique médiévale*, I-II vol., Bruges, De Tempel.
- IOGNA-PRAT D. 2006, *La Maison Dieu: une histoire monumentale de l'Église au Moyen Âge (v. 800-v. 1200)*, Paris, Éditions du Seuil.
- KESSLER H.L. 2000, *Spiritual Seeing: Picturing God's Invisibility in Medieval Art*, Philadelphia, University of Pennsylvania Press.
- KIRSCHBAUM E., BRAUNFELS W. (eds.) 1968-1976, *Lexikon der christlichen Ikonographie*, I-VIII, Roma-Freiburg, Herder.
- LE GOFF J. 1964, *La civilisation de l'Occident médiéval*, Paris, Arthaud.
- MARCHESIN I. 2017, *L'arbre et la colonne*, Paris, Picard.
- SCHEFER J.-L. 2007, *L'hostie profanée: histoire d'une fiction théologique*, Paris, POL.
- SOLÈRE J.-L. 2004, *Nature*, in C. GAUVARD, A. DE LIBERA, M. ZINK (eds.), *Dictionnaire du Moyen Âge*, Paris, PUF, 967-976.
- VITALI-ROSATI M. 2016, *Qu'est-ce que l'éditorialisation*, «Sens Public. Revue Web», 18 mars (<http://www.sens-public.org/article1184.html?lang=fr>).

## SITOGRAPHIE

- AGORHA, INHA: <http://agorha.inha.fr/>.
- Atelier Vincent de Beauvais: <http://atelier-vincent-de-beauvais.irht.cnrs.fr/>.
- Base Caylus, Bibliothèque nationale de France - INHA: <http://caylus-recueil.huma-num.fr/>.
- Base Rothschild, INHA: <http://salons.musee-orsay.fr/>.
- Base Salons, Paris, Musée d'Orsay - INHA: <http://salons.musee-orsay.fr/>.
- Catalogue des œuvres du Musée des monuments français d'Alexandre Lenoir, in AGORHA, INHA: <http://www.purl.org/inha/agorha/001/45/>.
- Digital Montagny, INHA: <https://digitalmontagny.inha.fr/fr>.
- RETIF (Répertoire des tableaux italiens dans les collections publiques françaises, XIII<sup>e</sup>-XIX<sup>e</sup> siècles), in AGORHA, INHA: <http://www.purl.org/inha/agorha/001/4/>.

SKOS (Système Simple d'Organisation de Connaissances Référence): <http://www.sparna.fr/skos/SKOS-traduction-francais.html#labels/>.

## ABSTRACT

The French Institut national d'histoire de l'art (INHA) has launched a project for scholars and the broader public that proposes an innovative way of accessing Medieval Christian images. The relationship between pictorial content and religious ideology in Medieval Christian images is much more nuanced, and more expressive, than simple storytelling. *Ontology of Medieval Christianity in Images* (OMCI) is concerned with this ontological level of analysis. The OMCI team of art historians, graduate students, and technology experts intends to build a web resource that will identify concepts and iconographical themes linked to Medieval Christian knowledge and belief systems. These will be augmented by visual examples from the art of that period. By building nuanced vocabularies, OMCI will allow databases and scholars to better represent how such images depict philosophical and spiritual themes that have been diminished in current approaches.



## EL ARCHIVO DIGITAL DANAEM: DANZA Y ARTE EN LA LARGA EDAD MEDIA

### 1. PRESENTACIÓN DEL PROYECTO Y ANTECEDENTES

En los últimos treinta años la danza se ha convertido en objeto de investigación científica: se han multiplicado las publicaciones y ha crecido el interés por este tema en su faceta histórico-antropológica. En 1991 Seebass publicaba un artículo de capital importancia sobre cuestiones metodológicas (SEEBASS 1991). En aquella ocasión lamentaba sobretodo la escasa aplicación del método iconográfico a los estudios e investigaciones sobre historia de la danza. Desde entonces numerosas aportaciones han llenado esta laguna consolidando un método de análisis efectivo, abierto a las contaminaciones y aproximaciones de otras disciplinas, que enriquece los estudios históricos sobre danza y lleva a conclusiones mucho más articuladas respecto a las aproximaciones tradicionales (BUTTÀ 2014). Los estudios culturales conducidos por Jean-Claude Schmitt en los últimos veinte años, centrados en múltiples aspectos de la realidad medieval y culminados en el reciente ensayo sobre el ritmo en la Edad Media (SCHMITT 1990, 2016), han prestado especial atención al cuerpo, a la danza y al gesto como factores determinantes de la realidad social de una comunidad. En efecto, el debate sobre la danza y sus representaciones pueden contarse entre aquellos fenómenos culturales que por la naturaleza transversal que los denota llegan a contribuir a una lectura más transparente de los hechos históricos en sentido amplio, como ha demostrado Alessandro Arcangeli en múltiples ocasiones con estudios, que han terminado por convertirse en modelos metodológicos de análisis de lo que al baile se refiere (ARCANGELI 2000, 2012).

La danza escrita cobra protagonismo en las palabras de aquellos representantes de la Iglesia que quieren condensar su práctica en los sermones, manuales de confesores, textos didácticos y exegéticos, colecciones de *exempla*, escritos relacionados con las prácticas místicas, pero también está presente en la literatura de carácter cortés, en la novela y en el teatro. Vinculada de varias formas a la narración escrita, la danza representada aparece en artesonados de iglesias y palacios, en capiteles de claustros y naves, en las misericordias de los coros eclesiásticos, en la decoración de residencias privadas y en la ilustración de manuscritos, en enseres cotidianos, en ceremonias litúrgicas, en las puestas en escena relacionadas con los éxtasis místicos, especialmente femeninos (SANMARTÍN, MASSIP 2017), en los ceremoniales oficiales de la realeza y en la vida cotidiana de campesinos y habitantes de las ciudades que la practican tanto en espacios públicos

como privados. La danza popular más genuina es finalmente el lado vivo y persistente de una larga tradición que ha sobrevivido hasta nuestros días. En las piezas y danzas conservadas, se pueden rastrear de esa forma rasgos de la teatralidad tardomedieval europea, y su mayor o menor vigencia y fidelidad. Hay elementos que comparten ciertas pervivencias festivas y espectaculares europeas, y especialmente hispánicas, que se han conservado porque la expresión popular se ha mantenido fiel a su modelo escénico. Un modelo que se consolidó a finales de la Edad Media, que quedó desplazado por el teatro del Renacimiento y del Barroco, y que se orilló hacia los márgenes de la cultura oficial, encastillado en comunidades aisladas o perseverantes que han continuado considerando útiles aquellos parámetros de representación y, sobretodo, que han seguido alimentando su vigencia y funcionalidad social, por encima de la discriminación oficial. Son manifestaciones que se ajustan a aquello que define el hecho folklórico: su carácter popular o colectivo y su cualidad tradicional o generacional.

Es cierto también que las investigaciones sobre actuaciones coréutico-musicales y las disertaciones dedicadas a la iconografía de la danza, rama joven de los estudios visuales, pretenden a menudo reconstruir la praxis coréutica a lo largo de los siglos utilizando bien la música o bien las representaciones de los instrumentos musicales y de los gestos, con la finalidad de clasificar los bailes según el contexto en que venían practicados. De ese modo, múltiples incursiones en el campo especializado de la iconografía se cuentan entre los estudios dedicados a la musicología y a las investigaciones de las formas teatrales en la Edad Media. Emblemáticas en este sentido son las actividades del RidIM-Repertoire International d'Iconographie Musicale, del Research Center for Music Iconography (RCMI) y del International Musicological Society, Study Group on Musical Iconography, principales promotores de un imponente repositorio digital de imágenes musicales de amplia cronología. Centrados en la Edad Media son las bases de datos reunidas online por sendos proyectos de la Université Paris-Sorbonne: *Musiconis. Représentations du son et de la musique au Moyen Âge* y *Musicastallis. Iconographie musicale dans les stalles médiévales*. En el ámbito hispano, la base de datos *Claustro*, dedicada a los temas iconográficos en la escultura románica, ofrece varios ejemplos de representaciones del baile mientras AEDOM Grupo de Iconografía Musical se centra en las performances instrumentales.

Ahora bien, la propuesta de aproximación al tema del equipo *Iconodansa: grupo de investigación internacional sobre iconografía de la danza en la Edad Media* (Fig. 1) de la Universitat Rovira i Virgili de Tarragona, coordinado por Licia Buttà – responsable de la ideación, diseño y desarrollo del archivo digital DANAEM – pretende poner el acento no tanto en la reconstrucción filológica del baile medieval sino sobre su función y significado

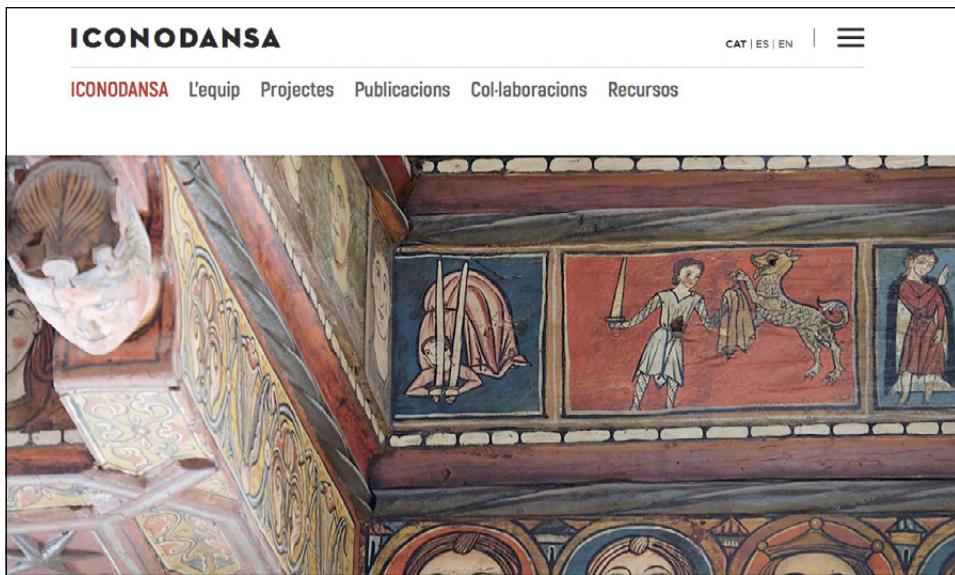


Fig. 1 – Página inicial de la web ICONODANSA.

con el objetivo de contribuir al estudio de la historia cultural de la danza en la península ibérica durante los siglos XI-XVI, sin menoscropio de manifestaciones europeas paralelas. El archivo se organiza siguiendo un proceso de análisis de las imágenes, de estudio de la génesis de su formación, de búsqueda de su significado en relación a la época histórica y al contexto en el que fueron creadas, que corre paralelo al estudio pormenorizado de la cultura literaria que aquellas épocas y sociedades generaron. No se trata evidentemente de leer las imágenes en función de las fuentes escritas ni viceversa, sino de integrar los conocimientos que los dos ámbitos puedan proporcionarse mutuamente. En este sentido los estudios culturales y, en especial modo, los visuales han brindado unas herramientas metodológicas útiles. Así, a través de una aproximación que se ubica en la intersección de varias disciplinas, ha sido posible reflexionar sobre las categorías críticas que más se prestaban al diseño del archivo.

Siguiendo esta metodología los miembros del equipo del proyecto DANAEM han sistematizado, catalogado y estudiado el material analizando sus aspectos históricos, artísticos, filológicos, antropológicos y sociológicos, incidiendo especialmente en el binomio significado/contexto. La definición del corpus iconográfico, textual y etnológico e antropológico de la danza en los territorios de la península ibérica, además, se ha llevado a cabo en todo momento confrontando el material peninsular con otras realidades

geográfico-políticas coetáneas prestando especial atención a los espacios medievales mediterráneos.

El trabajo de investigación conducido por los miembros de *Iconodansa* sobre fuentes medievales, modernas y contemporáneas ha puesto en evidencia el uso simbólico, alegórico y en ocasiones funcional al discurso político que de la danza se hizo durante la larga Edad Media en los reinos peninsulares. Aquí el baile encuentra un lugar destacado, ratificado por las frecuentes referencias en textos literarios, tratados éticos morales, documentos de archivo y testimonios visuales. No de menor importancia son las pervivencias actuales, algunas de ellas declaradas Patrimonio de la Humanidad o en proceso de serlo, como la Patum de Berga – reconocida por la Unesco como Obra Maestra del Patrimonio Oral e Inmaterial de la Humanidad en 2005 – la Danza de la Muerte de Verges (MASSIP 2000, 2009; MASSIP, KOVÁCS 2004) – huella única en el mundo del género macabro – los Cossiers de Mallorca – una de cuyas piezas se baila todavía dentro del templo – los muchos *balls parlats* de la “Catalunya Nova” (MASSIP, NAVARRO, PALAU 2015), el Dance aragonés o las fiestas de Moros y Cristianos peninsulares y americanas, principalmente (SANCHIS, MASSIP 2017). Un legado folklórico-antropológico que procede, por lo menos en parte, de la Edad Media.

DANAEM es, en resumen, un proyecto digital de vocación pluridisciplinar que no tiene precedentes en España y que valoriza la sinergia de informaciones derivadas del estudio de los textos, de las imágenes medievales dedicadas al baile y, en parte, de sus supervivencias actuales. Procedentes de estudios y especialidades diferentes, todos los miembros del equipo de trabajo han adoptado en sus investigaciones una metodología interdisciplinaria que les ha permitido abarcar temas relativos a la danza bajo perspectivas múltiples. Licia Buttà (Historiadora del Arte, Universitat Rovira i Virgili, Tarragona) Investigadora Principal del proyecto y coordinadora del grupo *Iconodansa*, Francesc Massip (Historiador del Teatro y del Espectáculo, Universitat Rovira i Virgili, Tarragona), Lenke Kovács (Filóloga, Universitat de les Illes Balears), Beatriz Aracil Varón (Filóloga especialista en Literatura Hispanoamericana, Universidad de Alicante) y Montserrat Palau (Filóloga, Universitat Rovira i Virgili, Tarragona), con la colaboración de Nicoletta Isar (Historiadora del Arte y Cultura Visual, Copenhagen University), Roberto Fratini (Historiador y Teórico de la danza, Intitut del Teatre, Barcelona), Pierre-Olivier Dittmar (Historiador Cultural, EHESS-Paris) y Lev Arie Kapitaikin (Historiador del Arte Islámico, Tel Aviv University), han conducido la labor de búsqueda, investigación e interpretación de textos, imágenes y performance vivas. El equipo de trabajo cuenta también, entre otros, con la presencia de investigadores en formación. María del Mar Valls Fusté y Sara Sánchez Roig, ambas doctorandas de la Universitat Rovira i Virgili en Historia del Arte Medieval bajo la dirección de Licia Buttà, y Raül Sanchis, doctorando en Humanística bajo la dirección de Francesc Massip.

## 2. DESCRIPCIÓN DEL ARCHIVO DIGITAL DANAEM

El material recogido e inventariado utilizando el programa Microsoft Excel durante los años de ejecución del proyecto, constantemente puesto al día y ampliado, ha dado vida a la creación del archivo *DANAEM: Danza y Arte en la larga Edad Media*. Las categorías bajo las cuales se han distribuido las obras recopiladas en sendas bases de datos dedicadas a los textos y a las obras figurativas, corresponden a otros tantos recorridos interpretativos. De este modo, el usuario construye su itinerario virtual y éste último, se convierte en un instrumento útil para la investigación. Para facilitar este proceso de cross-reference, las bases de datos cuentan con un índice que permite ahondar en el estudio de la danza como significativo fenómeno cultural desde los distintos espacios, reales o imaginados, donde tiene lugar y que, a bien mirar, resultan permeables entre sí: el literario, el performativo y el geográfico.

El espacio literario se presenta en el estado actual como un bloque de contenido textual y documental de 144 entradas referidas en su mayoría a obras y autores que desarrollaron su actividad en los territorios de la antigua Corona de Aragón en la Edad Media. La principal responsable de esta parte del archivo ha sido Lenke Kovács, que a partir de las referencias a la danza en la monografía de Francesc Pujol i Joan Amades (PUJOL, AMADES 1936),

TIRANT LO BLANC: CITA TEXTUAL | 1 2 3 4 5 6 7 8 9 10 11

**AUTOR**  
Joanot Martorell / Martí Joan de Galba

**TÍTOL**  
Tirant lo Blanc

**DATACIÓ**  
ca. 1460-1490

**LLENGUA**  
Català

**LOCALITZACIÓ**  
València

**GÈNERE**  
Novel·la cavalleresca

**EXTENSIÓ**  
ff. 1ra-378vb

**MANUSCRITS**  
1 (Fons Duquesa d'Almodóvar: e.4.1; caixa 15, Arxiu de la Diputació de València, BITECA manif 5061, textid 1754)

Fig. 2 – DANAEM, espacios literarios.

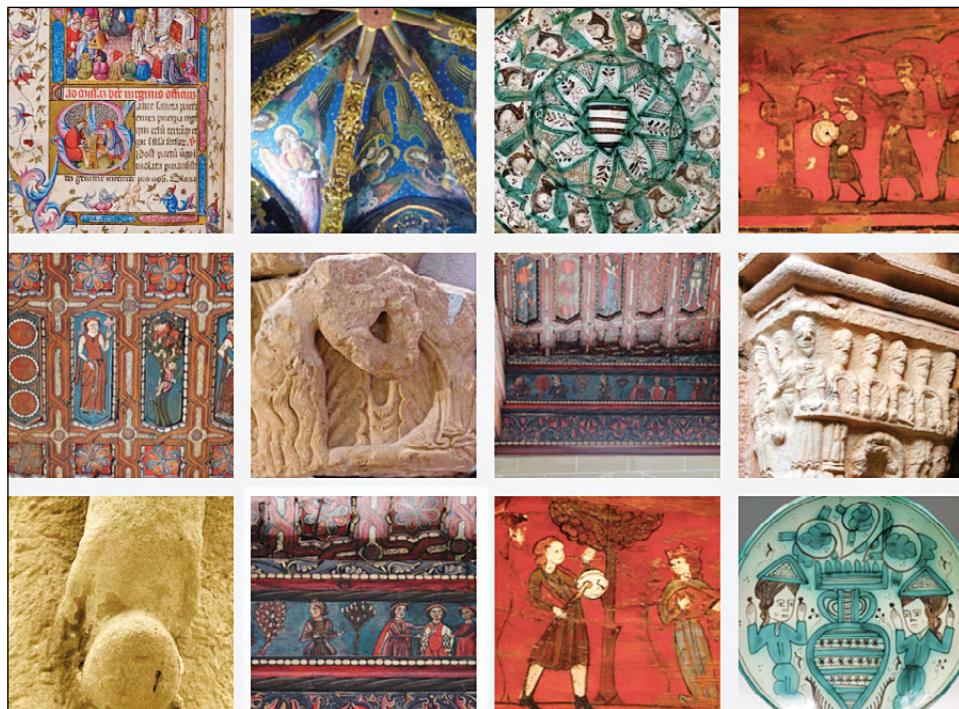


Fig. 3 – DANAEM, escenarios performativos.

ha recogido las citas siguiendo las ediciones filológicas más recientes de obras como la *Vita Christi* de Isabel de Villena, el *Spill* de Jaume Roig, o el *Tirant lo Blanc* de Joanot Martorell (Fig. 2), mientras otra parte de los datos proceden directamente de su tesis doctoral sobre el Teatro de la Pasión en la literatura medieval catalana. Francesc Massip y Raül Sanchis han trabajado también en el mismo archivo, proporcionando datos documentales sobre la danza hallados en los fondos históricos más importantes del territorio y menciones de la actividad coreutica en fuentes historiográficas, memorialísticas, dietarísticas y de contenido religioso. Sin embargo, queda pendiente extender esta labor a la producción literaria de otros reinos hispanos y de al-Ándalus. Los criterios de búsqueda se plasman en función del autor, el tipo de texto requerido, y comparten palabras claves con los otros dos ámbitos.

El escenario performativo (Fig. 3) se plantea como otra herramienta paralela y complementaria al archivo de textos, donde la información sobre las representaciones plásticas del baile se presenta por sub-categorías iconográficas. Esta clasificación organiza un repertorio de 350 imágenes de danza procedentes de obras de arte realizadas entre los siglos XI y XVI en los territorios



Fig. 4 – Músico y bailarina, artesonado, siglo XIV. Marta Villazón, Museo Arqueológico, Llíria.



Fig. 5 – Maestro de los Privilegios, marginalia, carola de hombres desnudos. *Libre dels Reis o Llibre de franqueses i privilegis del Regne de Mallorca*, Còdex núm. 1, fol. 26v., 1336-1361. Arxiu del Regne de Mallorca, Palma, Mallorca.

de los reinos medievales hispanos. La visualización del catálogo se realiza seleccionando las entradas por motivo iconográfico: danza en círculo, *carola*, baile cortesano, danza en pareja, performance acrobático-musical, etc. (Fig. 4); por figuras: personajes bíblicos, personajes literarios, alegorías, bestiario, juglares, campesinos, seres diabólicos y monstruosos, etc. (Fig. 5); y por soporte: capiteles, pintura mural, techos pintados, objetos de cultura material, manuscritos, etc. (Fig. 6). Este recorrido resalta un fenómeno propio de la



Fig. 6 – Maestro de Agüero, músico y bailarina contorsionista, capitel de la portada, finales del siglo XII. Iglesia de San Miguel, Biota.

danza medieval representada: la migración de tipos y motivos de un ámbito cultural a otro, la frecuente recurrencia de algunos de estos como dominantes en la cultura visual de determinados espacios geográficos, la convivencia de series de representaciones que acaban circulando como verdaderos *topoi* narrativos. Responsables de la búsqueda y realización de la base de datos de este espacio son Licia Buttà, María del Mar Valls Fusté y Sara Sánchez Roig.

Finalmente, el espacio dedicado a las geografías contemporáneas muestra una relación de breves documentales sobre manifestaciones folklóricas hispanas y latinoamericanas con raíces y trazas que pueden reseguirse hasta el período medieval, fruto de la investigación de Francesc Massip, Raül Sanchis, Beatriz Aracil Varón y Eloi Ysàs, éste último autor también de los audiovisuales.

La página web integra además una serie de ensayos intertextuales que acompañan el contenido de los tres espacios. En este sentido el proyecto va más allá de una simple recopilación de datos, proponiendo su propia contribución al debate internacional que desde hace algunos años ha centrado su atención sobre los múltiples significados de la actividad coréutica en la sociedad, así como sobre su papel antropológico. Un breve ensayo introduce cada uno de los tres ámbitos y reenvía a las categorías bajo las cuales se pueden visualizar las fichas de las obras con el correspondiente apartado bibliográfico. Estas últimas son accesibles también a través de una búsqueda sencilla o por palabras claves. La web funciona como plataforma de “Open Access to Knowledge”, conforme a los principios de la Declaración de Berlín sobre acceso libre al conocimiento en las Ciencias Sociales y Humanas (<http://openaccess.mpg.de/286432/Berlin-Declaration>).

El diseño y programación ha ido a cargo del estudio Lluís Torres de Castellbisbal (Barcelona). El software utilizado para el desarrollo del proyecto web es una combinación de aplicaciones de Adobe (InDesign, Illustrator, Photoshop, Dreamweaver). Los lenguajes de programación que se han utilizado son: HTML5, PHP y CSS, MySQL y Javascript. La primera fase del proyecto ha consistido en el diseño gráfico de la interficie, tanto del front-office y back-office, cómo de las versiones web-responsives, para una correcta visualización desde dispositivos móviles. Además se ha diseñado y creado una base de datos *ad hoc* empleando MySQL como sistema gestor. Entre sus ventajas, éste ofrece una gran compatibilidad con las funciones PHP utilizadas para implementar las funcionalidades de las páginas. Para la fase de implementación del software web (funcionamiento interno e interrelación de las páginas) se ha utilizado Javascript. Éste lenguaje nos ha permitido poner en funcionamiento las animaciones y muchas de las acciones de la aplicación web.

### 3. COLECCIONES, ARCHIVOS Y MUSEOS

Como se ha mencionado, el material agrupado en esta herramienta informática engloba un catálogo que anticipa la variedad y riqueza del patrimonio artístico medieval hispano relativo al baile. Este acopio de datos se presenta como parcial, puesto que el equipo de *Iconodansa* sigue encontrando nuevas referencias y obras susceptibles de ser catalogadas y divulgadas. Gracias a la tecnología digital el crecimiento de estas bases de datos será continuo, aunque progresivo, y por ello las actualizaciones serán periódicas. Algunas de las obras de arte y referencias literarias presentadas en este proyecto son bien conocidas puesto que han sido publicadas en volúmenes enciclopédicos o en monográficos y revistas dedicados al estudio de la música profana y la juglaría (INGRASSIA-PIGNOLY 1990; ARAGONÉS 1993; CALAHORRA, LACASTA, ZALDÍVAR 1993; YZQUIERDO 1998; SMITH *et al.* 1999; GUARDIA 2000; RIVAS 2002; HUERTA 2007; PORRAS 2007, 2009).

Pero paralelamente a las referencias textuales citadas con asiduidad y las imágenes conocidas, discurre un mundo visual y literario poco conocido y que merece explorarse. El contenido de las bases de datos, además de ser rescatado de varias publicaciones, ha ido creciendo a través del estudio de colecciones museísticas e institucionales, la consulta de fondos fotográficos de archivos, bibliotecas, bases de datos de otros proyectos sobre Humanidades Digitales y sobre todo a partir de un intenso trabajo de campo que ha llevado a algunos miembros del grupo *Iconodansa* a viajar por toda España y, en ocasiones, al extranjero para la realización de las campañas fotográficas. Por un lado, Francesc Massip, Eloi Ysàs y Raül Sanchis se han desplazado a distintos lugares de Europa y América para poder registrar performances tradicionales para la realización de los audiovisuales.

Por otro lado, Licia Buttà y María del Mar Valls han realizado viajes a distintos puntos de la península – Andalucía, Cataluña, Castilla, Valencia, Navarra y Aragón – para fotografiar aquellas obras que aún se encuentran en sus lugares de origen – decoración escultórica monumental y marginal, misericordias de coros catedralicios y tablillas de techos pintados – y cuyas imágenes de danza, en ocasiones, son muy poco conocidas. Campañas fotográficas se han realizado también a Francia (Lagrasse, Montpellier, Perpiñán) e Italia (Sicilia, Toscana). A pesar de este trabajo de investigación aún quedan por explorar rincones de la geografía española, teniendo poca representación en la base de datos el patrimonio artístico norteño, es decir, de Asturias, Cantabria, Galicia y el País Vasco. Así mismo, también quedan pendientes de analizar o revisar algunos archivos de instituciones españolas ya consultadas.

### *3.1 Colecciones museísticas e institucionales, archivos y bibliotecas*

- Gran Bretaña, Londres: British Library, Victoria & Albert Museum, Warburg Institute.
- Francia, París: Bibliothèque Nationale de France, vaciado a través de su biblioteca digital *Gallica*, Bibliothèques d'Amiens Métropole, Musée du Louvre.
- Ciudad del Vaticano: Biblioteca Apostólica Vaticana.
- Italia. Venecia: Biblioteca Nazionale Marciana. Palermo: Biblioteca Centrale della Regione Siciliana, Biblioteca Comunale. Messina: Biblioteca Regionale.
- Portugal, Lisboa: Biblioteca da Ajuda.
- Estados Unidos, Nueva York: The Metropolitan Museum of Art y The MET Cloisters.
- España. Cataluña: Museu Nacional d'Art de Catalunya, Biblioteca Joaquim Folch i Torres, Museu del Disseny y su Centro de Documentación, Museu Diocesà de Tarragona, Museu Episcopal de Vic, Museu i Biblioteca de Montserrat, Biblioteca de Catalunya, Museu Diocesà de Barcelona, Arxiu Fotogràfic Mas i Gudiol - Institut Amatller d'Art Hispànic. Valencia: Museu de l'Almodí de Xàtiva, Biblioteca Histórica de la Universidad de Valencia, Museo Nacional de Cerámica y Artes Suntuarias González Martí, Museo de Cerámica de Paterna, Museo de Cerámica de Manises. Aragón: Museo Provincial de Teruel, Instituto de Estudios Turolenses, Museo Diocesano de Jaca. Navarra: Museo de Navarra. Andalucía: Museo Arqueológico de Córdoba, Museo de la Alhambra. Extremadura: Museo Nacional de Arte Romano. Castilla y León: Biblioteca del Escorial, Biblioteca de la Real Colegiata de San Isidoro. Madrid: Museo Nacional del Prado, Museo Arqueológico Nacional de Madrid, Biblioteca Nacional de España, Instituto del Patrimonio Cultural de España en Madrid. Islas Baleares, Mallorca: Arxiu del Regne de Mallorca.

### *3.2 Bases de datos online<sup>1</sup>*

- Asociación Española de Documentación Musical AEDOM: Catalogo de iconografía musical española.
- Association Internationale de Recherche sur les Charpentes et les Plafonds Peints Médiévaux, Iconothèque (en construcción): MédiHALL.
- The Courtauld Institute of Art, London: Gothic Ivories.
- Independent Scholar Juan Antonio Olañeta: Claustro.
- Independent Scholar Antonio García Omedes: Románico Aragonés.
- Institut d'Estudis Catalans: Corpus des Troubadours.
- Musicastallis. Iconographie musicale dans les stalles médiévales.
- Princeton University: The Index of Medieval Art: Elaine C. Block Database of Misericords.
- Princeton University: The Index of Medieval Art: Romanesque Art.
- Research Center for Music Iconography (RCMI)-International Musicological Society, Study Group on Musical Iconography: RidIM-Repertoire International d'Iconographie Musicale.
- Univérsité Paris-Sorbonne: Musiconis. Représentations du son et de la musique au Moyen Âge.

El material gráfico disponible en las bases de datos está pensado para un uso en investigación y por ello algunas instituciones han cedido las imágenes de forma gratuita, entre ellos: Museo Diocesano de Jaca, Museu Nacional d'Art de Catalunya, Museo Arqueológico Nacional de Madrid y Museo Nacional del Prado, el Museo Nacional de Cerámica y Artes Suntuarias ‘González Martí’, y el Museu del Disseny de Barcelona. Otras instituciones como el Metropolitan Museum of Art de Nueva York y la British Library en Londres se acogen a políticas de “Open Access”, favoreciendo así las colaboraciones en el campo de la investigación.

## **4. DANAEM Y LA DIVULGACIÓN CIENTÍFICA: LAS EXPOSICIONES ITINERANTES “EL TEATRO DEL CUERPO” Y “EL BALL EN DANZA/TANZ NACH MEINER PFEIFE”**

Las dos base de datos han sido fundamentales para la realización de varias publicaciones científicas y ha permitido en el 2016 la edición de dos exposiciones documentales itinerantes en colaboración con el grupo de investigación consolidado y financiado por la Generalitat de Catalunya *LAIREM, Literatura, Arte y Representación en la Edad Media* liderado por Francesc Massip (2014). La primera abarca el tema de la danza en la antigua Corona de Aragón por figuras y ámbitos sociales. *El teatre del cos. Dansa i representació a la Corona d'Aragó* (en coproducción con el Museu Etnològic

<sup>1</sup> Vease Sitografía para los links a las Instituciones.

de Barcelona), ha sido comisariada por Licia Buttà, Francesc Massip y Raül Sanchis y se ha inaugurado el 4 de febrero de 2016 en la Sala de la Caritat de la Biblioteca de Catalunya de Barcelona; seguidamente ha sido expuesta en el Centre Artesà Tradicionàrius, Barcelona (7 marzo-8 abril 2016), Sales d'exposició del Museu Diocesà, Tarragona (1-30 julio 2016), Convent de Santa Clara, Castelló d'Empúries (7-12 septiembre 2016), Campus de Ciutadella, Universitat Pompeu Fabra (13-19 septiembre 2016). Dicha exposición transcurre paralela al proyecto editorial actualmente en marcha de un volumen monográfico titulado *El teatro del cuerpo. Danza y representación en la Corona de Aragón* (IRCUM-Viella) cuya publicación está prevista para el 2018, en coautoría de Licia Buttà, Francesc Massip, Raül Sanchis y María del Mar Valls Fusté.

La segunda, nace de la colaboración internacional de *Iconodansa* con el grupo de investigación liderado por Cora Dietl, del Institut de Germanistik de la Justus-Liebig-Universität Gießen, Alemania. Juntos, los dos grupos han trabajado durante el año 2015 en el proyecto internacional *Estudis interdisciplinaris sobre la dansa a l'Edat Mitjana i Moderna. Fonts, formes, significat i pervivències/Interdisziplinäre Studien zum Tanz im Mittelalter und in der frühen Neuzeit. Quellen, Formen, Bedeutungen und Überlieferungen* del Deutscher Akademischer Austauschdienst, DAAD, convocatoria 2014, Competitive Call for “Acciones Conjuntas Hispano-Alemanas/PPP Spain”, coordinado por Lenke Kovács y Cora Dietl. En el marco de este proyecto se ha realizado la exposición itinerante bilingüe: *El ball en DANSA. Representacions de dansa a l'Edat Mitjana i Moderna/TANZ nach meiner Pfeife. Tanzdarstellungen in Mittelalter und Friher Neuzeit*, expuesta en Gießen, Alemania (18 enero-28 febrero 2016), Schweizer Theatersammlung de Berna, Suiza (18-19 marzo 2016), Gießen, Alemania, Festival de Danza TanzArt Ost (8-13 mayo 2016), International Medieval Congress de Leeds, Inglaterra (6-9 julio 2016), SITM/REED Joint Colloquium and Theatrum Mundi Festival (7-12 julio 2016), Cluj-Napoca (20 septiembre-20 noviembre 2016) y Universidad Eötvös Loránd Budapest (29 marzo-8 abril 2017).

## 5. FUTUROS DESARROLLOS DE ARCHIVO Y CONCLUSIONES

DANAEM se estructura en un mapa web multidireccional, una red de conocimiento fluido, capaz de traspasar las tradicionales barreras disciplinarias entre la historia, el arte, los estudios teatrales o sobre corporeidad poniéndolos bajo el amparo de los estudios culturales. La comunicación entre ideas, imágenes, conceptos y referencias es clave para entender tanto las representaciones visuales de danzas como el fenómeno de la acción de bailar en sí, en tanto que experiencia y elemento de autorepresentación de grupos sociales en las civilizaciones del pasado. La estructura misma del

archivo, su diseño y concepto permiten ampliar los estudios tanto en sentido geográfico, como cronológico, incluyendo en los campos de investigación el análisis diacrónico de algunos temas recurrentes en la historia cultural y literaria europea y mediterránea, como la relación entre danza y muerte, danza y poder, y la danza y la esfera de lo mágico y lo sagrado objeto de nuevos estudios y nueva clasificación por los miembros del grupo *Iconodansa*. De ese modo, el equipo seguirá con el trabajo de sistematización y clasificación de los testimonios coreúticos en la península ibérica, pero, al mismo tiempo ampliará su reflexión científica a la migración de motivos y significados de la danza en el fluido espacio mediterráneo.

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## BIBLIOGRAFÍA

- ARAGONÉS E. 1993, *Música profana en el arte monumental románico del Camino de Santiago, «Príncipe de Viana»*, 199, 247-280.
- ARCANGELI A. 2000, *Davide o Salomè? Il dibattito europeo sulla danza nella prima età moderna*, Roma, Viella.
- ARCANGELI A. 2012, *Cultural History. A Concise Introduction*, London-New York, Routledge.
- BUTTÀ L. 2014, *Danza y paradigma: una introducción*, in L. BUTTÀ, J. CARRUESCO, F. MASSIP, E. SUBÍAS (eds.), *Dances imaginades, danses relatades. Paradigmes iconogràfics del ball des de l'Antiguitat Clàssica fins a l'Edat Mitjana/Dancing Images and Tales. Iconography of Dance from Classical to Middle Age*, Tarragona, Institut Català d'Arqueologia Clàssica, 7-8.
- CALAHORRA P., LACASTA J., ZALDÍVAR A. 1993, *Iconografía musical del románico aragonés*, Zaragoza, Institución Fernando el Católico, Sección de Música Antigua, Diputación de Zaragoza.
- GUARDIA M. 2000, “*Ioculatores et saltator*”. Las pinturas con escenas de juglaría de Sant Joan de Boí, «Locvs Amoenvs», 5, 11-32.
- HUERTA P.L. 2007, *Entre el pecado y la diversión: las representaciones juglarescas en el románico español*, in *El mensaje simbólico del imaginario románico*, Aguilar del Campoo, Fundación Santa María la Real-C.E.R. Monasterio de Santa María la Real, 151-173.
- INGRASSIA-PIGNOLY C. 1990, *Danseurs, acrobates et saltimbanques dans l'art du Moyen Age. Recherches sur les représentations ludiques, chorégraphiques et acrobatiques dans l'iconographie médiévale*, París, [s.n.].
- MASSIP F. 2000, *La mort en dansa: ànalisi de les comparses catalanes de la mort en el context europeu. De la dansa dels vius (Morella) al ball dels morts (Verges): un recorregut de cinc segles*, «Revista d'Etnología de Catalunya», 17, 127-128.
- MASSIP F. 2009, *La muerte en danza: lo macabro en el arte, el teatro y la fiesta popular en la península ibérica*, in R. GEFTER WONDREICH, L. RAMELLO (eds.), *Atti del Convegno “Balla con la Morte: Cultura ed estetica del Macabro dal Medioevo ad oggi”* (Trieste 2007), «Prospero. Rivista di letterature straniere, comparatistica e studi culturali», 15, 11-27.
- MASSIP F., KOVÁCS L. 2004, *El baile: conjuro ante la muerte. Presencia de lo macabro en la danza y la fiesta popular*, Ciudad Real, CIOFF-INAEM.

- MASSIP F. 2013, *Danza y espectáculo en los caminos de peregrinación (siglos XII-XV)*, in S. LÓPEZ MARTÍNEZ-MORÁS (ed.), *Identidad europea e intercambios culturales en el Camino de Santiago (siglos XI-XV)*, Universidad de Santiago de Compostela, Servicio de Publicaciones, 263-300.
- MASSIP F., NAVARRO P., PALAU M. (eds.) 2015, *Teatralitat popular i tradició. Actes del II Congrés Internacional de Balls Parlats* (Tarragona 2014), Catarroja y Barcelona, Editorial Afers.
- PORRAS F. 2007, *La pervivencia del mito de Orfeo en la iconografía del rey David: origen, significación simbólica y aproximación organológica*, «Cuadernos de arte e iconografía», 16, 32, 301-332.
- PORRAS F. 2009, *Iconografía musical en la escultura hispanomusulmana*, «Nassarre. Revista aragonesa de musicología», 25, 39-56.
- PUJOL F., AMADES J. 1936, *Diccionari de la dansa, dels entremesos i dels instruments de música i sonadors*, Barcelona, Elzeviriana.
- RIVAS F.A. 2002, *Fuentes iconográficas en el románico aragonés para el estudio de la danza medieval*, «Seminario de Arte Aragonés», 49-50, 25-57.
- SANCHIS R., MASSIP F. (eds.) 2017, *La dansa dels altres. Identitat i alteritat en la festa popular*, Catarroja y Barcelona, Editorial Afers.
- SCHMITT J.C. 1990, *La Raison des gestes dans l'Occident Médiéval*, París, Gallimard.
- SCHMITT J.C. 2016, *Le rythmes au Moyen Âge*, París, Gallimard Parution.
- SANMARTÍN R., MASSIP F. 2017, *La danza de espada en el Libro de Conorte de Juana de la Cruz*, in L. BUTTÀ, M. VALLS FUSTÉ (eds.), *Danza escritura y teatralidad en la Edad Media*, «Revista de Poética Medieval», 31, 15-38, número monográfico.
- SEEBASS T. 1991, *Iconography and dance research*, «Yearbook for Traditional Music», 23, 33-51.
- SMITH C. et al. 1999, *Fiestas, juegos y espectáculos en la España medieval. Actas del VII Curso de Cultural Medieval* (Aguilar de Campoo, Palencia, 1995), Aguilar de Campoo, Fundación Santa María la Real, Centro de Estudios del Románico.
- YZQUIERDO R. 1998, *Escenas de juglaría en el románico de Galicia*, in M.A. GARCÍA (ed.), *Vida cotidiana en la España medieval. Actas del VI Curso de Cultura Medieval* (Aguilar de Campoo, Palencia, 1994), Madrid, Polífilo, 125-154.

## SITOGRAFÍA

- Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities 2003: <http://openaccess.mpg.de/286432/Berlin-Declaration/>.
- Catalogo de iconografía musical española: <http://iconografia.aedom.org/>.
- Claustro: <http://www.romanicoaragones.com/>.
- Corpus des Troubadours: <https://trobadors.iec.cat/>.
- Gothic Ivories: <http://www.gothicivories.courtauld.ac.uk/>.
- The Index of Medieval Art: Elaine C. Block Database of Misericords: [https://ica.princeton.edu/misericordia/index.php/](https://ica.princeton.edu/misericordia/index.php).
- The Index of Medieval Art: Romanesque Art: [https://ica.princeton.edu/romanesque/index.php/](https://ica.princeton.edu/romanesque/index.php).
- MédiHALL: <http://rcppm.org/blog/pro-et-chercheurs/iconotheque/>.
- Musicastallis. Iconographie musicale dans les stalles médiévales: <http://musiconis.huma-num.fr/>.
- Musiconis. Représentations du son et de la musique au Moyen Âge: [http://www.plm.paris-sorbonne.fr/musicastallis/index.php/](http://www.plm.paris-sorbonne.fr/musicastallis/index.php).
- RidIM-Repertoire International d'Iconographie Musicale: <http://www.ridim.org/>.
- Románico Aragonés: [http://www.claustro.com/OtrosTemas/Danza/Webpages/Catalogo\\_Danza.htm/](http://www.claustro.com/OtrosTemas/Danza/Webpages/Catalogo_Danza.htm).

## ABSTRACT

The digital archive *DANAEM: Dance and Art in the long Middle Ages* is one of the scientific results of the project “Traces and figure of dance in the long Middle Ages. Iconographic, textual and ethnographic corpus in the Iberian Peninsula and its projection in Latin America (FFI2013-42939-P)”, financed by the Ministerio de Economía y Competitividad de España (2014-2017). The archive gathers, in several databases, a literary and artistic corpus of dance in the Iberian Peninsula during the long Middle Ages, as well as five documentary videos of short duration about traditional modern dances whose origin can be traced back to the medieval and post-medieval period. Performances represented in works of art, literary descriptions and references to dance with an ethical-moral character are listed and organised in a webpage based on 3 sections: literary space, performative stage and contemporary geography. The technical specifications of the works of art and literary references go with introductions referring to each field. Once online (from April 2018), the web will work as a continually growing tool for Dance Studies.



RICOSTRUZIONI VIRTUALI  
VIRTUAL RECONSTRUCTIONS



## FIRENZE SCOMPARSA: LE CHIESE DI SANTA CHIARA E SAN PIER MAGGIORE E LA LORO RICOSTRUZIONE DIGITALE PRESSO I MUSEI DI LONDRA

Una delle sfide più difficili per un curatore è come comunicare un contesto storico – e la ricca trama di significati intrinseci – all'interno di un ambiente sensibile al bello come un museo d'arte. Questa difficoltà diventa estremamente marcata di fronte al panorama delle pale d'altare italiane, il cui status di opere d'arte del Rinascimento è attenuato dalla loro latente funzione di devozione liturgica. Quando il cardinale arcivescovo di Westminster, Cormac Murphy-O'Connor, suggerì nel 2008 che la National Gallery di Londra restituisse il *Battesimo di Cristo* di Piero della Francesca ad una chiesa cattolica, non stava del tutto scherzando: «I would like to see this painting taken down from the walls of the National Gallery and placed in a Catholic church in London... It is an expression of the Church's life and a way into prayer. I will willingly offer Westminster Cathedral as the new home for this painting, it should be restored to a religious setting» (MURPHY-O'CONNOR 2008). Tre anni dopo, la National Gallery rispose con un'esposizione dedicata al design funzionale e alla ritualità delle sue pale d'altare italiane (NETHERSOLE 2011), alludendo al contesto storico attraverso la riproduzione di pale fittizie, illuminate da finte candele (Fig. 1).

La mostra *Devotion by Design* del 2011, curata da Scott Nethersole e Jenny Sliwka, ha ottenuto recensioni entusiaste ed un particolare apprezzamento per l'ingegnoso allestimento (DORMENT 2011). Allo stesso tempo, la mostra deve aver spinto questa strategia di rappresentazione contestuale all'interno della galleria fino ai suoi limiti pratici. Un ovvio percorso alternativo per colmare il deficit interpretativo tra lo spazio del museo e la nostra crescente consapevolezza del contesto storico è la visualizzazione digitale, ed adesso anche la realtà aumentata. Questo contributo si focalizza su due progetti in cui sono stato coinvolto, che cercano di ricollocare le pale d'altare del Rinascimento all'interno di una chiesa virtuale. Entrambi riguardano chiese fiorentine che non esistono più, ma che compaiono sulle mappe storiche della città, come quella famosa del 1584 ad opera del Buonsignori: la chiesa del convento delle Clarisse di Santa Chiara nell'Oltrarno e la chiesa del convento Benedettino di San Pier Maggiore nel Borgo degli Albizi. Entrambe le ricostruzioni sono state commissionate da istituzioni museali londinesi: quella di Santa Chiara dal Victoria and Albert Museum (V&A) nel 2009, quella di San Pier Maggiore dalla National Gallery nel 2015. Ma, come vedremo, le due ricostruzioni virtuali sono molto diverse, in parte per la differente natura dei dati disponibili, in parte perché il progetto



Fig. 1 – *Devotion by Design*, London, National Gallery (6 luglio-2 ottobre 2011).

di San Pier Maggiore, assai più recente, è riuscito a superare la più datata ricostruzione di Santa Chiara.

Nel presentare questi due progetti farò anche una valutazione auto-critica, consapevole che, in alcuni aspetti, le ricostruzioni finali non hanno soddisfatto le nostre ambizioni iniziali, ma sperando che il lavoro svolto abbia gettato delle solide basi per essere di supporto ai futuri progetti in questo campo.

Il progetto *Santa Chiara* è stato completato nel 2009 in occasione del rinnovamento delle gallerie medievali e rinascimentali al V&A: il riallestimento più sostanziale delle collezioni museali in quegli ambiti dalla loro reinstallazione dopo la Seconda Guerra Mondiale (MOTTURE 2011). Le gallerie museali hanno integrato la cappella maggiore e la pala marmorea dell'altare maggiore (cominciata da Benedetto da Maiano ma completata dopo la sua morte, nel 1497, dall'intagliatore Leonardo del Tasso) della chiesa fiorentina, spedite dall'Italia nel 1861 e ricostruite a South Kensington pezzo per pezzo (CALAHAN, COOPER 2010, 2013). La mensa d'altare, tuttavia, non fu mandata a Londra e non se ne conosce il destino: i curatori del museo furono cauti nel presentare un allestimento dalle connotazioni troppo marcatamente liturgiche o cattoliche per il pubblico britannico del tempo. Il corpo della chiesa si trova

ancora in Via dei Serragli a Firenze, con il suo interno convertito con sensibilità in spazi di ufficio ed espositivi dai suoi attuali proprietari (titolari della casa editrice d'arte Edizioni Polistampa), che ci hanno generosamente permesso di condurre le nostre ricerche sull'edificio (PAGLIAI 1993). Il progetto ha comportato studi estesi, il monitoraggio e la fotografia delle sezioni della chiesa che ancora esistono a Firenze, come anche la storia della cappella dell'altare maggiore dal suo arrivo a Londra, dove fu smontata e ricostruita svariate volte.

Il risultato è stato una ricostruzione interattiva accessibile tramite un touch screen montato all'interno della galleria – una scelta che data chiaramente il progetto al 2009, immediatamente prima dell'avvento degli iPad. L'intenzione era quella di mostrare la discontinuità tra i frammenti architettonici esposti nel museo e la chiesa originale, nella misura in cui la ricerca storico-artistica ne aveva permesso la ricostruzione (Figg. 2, 3). L'interattività avrebbe stimolato il pubblico a comprendere i diversi livelli di accesso fisico e visivo di cui godevano rispettivamente il clero, le monache di clausura e il pubblico laico all'interno dello spazio ecclesiale (FROST 2013). Il modello digitale è stato creato dal Dipartimento Informatico della University of Sussex (GKION, PATOLI, WHITE 2011) tramite i dati raccolti da me e dai miei colleghi del V&A. Il progetto è stato concepito come una collaborazione non-profit tra il museo e l'università, e molto del lavoro era stato svolto dagli studenti del corso di laurea magistrale della University of Sussex. L'architettura virtuale è stata frutto della modellazione di poligoni con il software Autodesk 3ds Max. La versione cinematografica della visita virtuale è stata consultabile sul sito del museo fino al 2017 (la pagina web è attualmente in fase di aggiornamento mentre il museo rinnova gradualmente il suo sito: <http://www.vam.ac.uk/content/articles/i/interactive-explore-the-church-of-santa-chiara/>).

Quello di Santa Chiara è stato un caso relativamente semplice: una chiesa a navata singola di cui è stato possibile ricostruire i dettagli con notevole cura grazie alle strutture sopravvissute, alle fonti d'archivio e alle descrizioni antiche. Oltre ad essere relativamente ben documentata e di ampiezza facilmente gestibile, Santa Chiara era anche un edificio coerente nella sua struttura, costruito e arredato durante una singola campagna tra gli anni Ottanta e Novanta del Quattrocento, grazie al mecenatismo di un solo uomo, il ricco mercante di lana e simpatizzante savonaroliano Jacopo Bongianni. Passati sei anni, mi ritengo soddisfatto dei risultati, viste le modeste risorse a disposizione, ma è giusto dire che la ricostruzione di Santa Chiara ha svariate carenze comuni a tante architetture virtuali create per l'interpretazione del patrimonio culturale. L'uniformità estetica del modello nasconde le significative differenze tra i dati che lo compongono. L'osservatore non potrà, ad esempio, dire quali elementi sono "ipotesi ragionate" raccolte da edifici rinascimentali analoghi. Ad esempio, non avevamo prove che il pavimento della chiesa di Santa Chiara fosse stato realizzato in terracotta, e abbiamo visualizzato tale materiale in

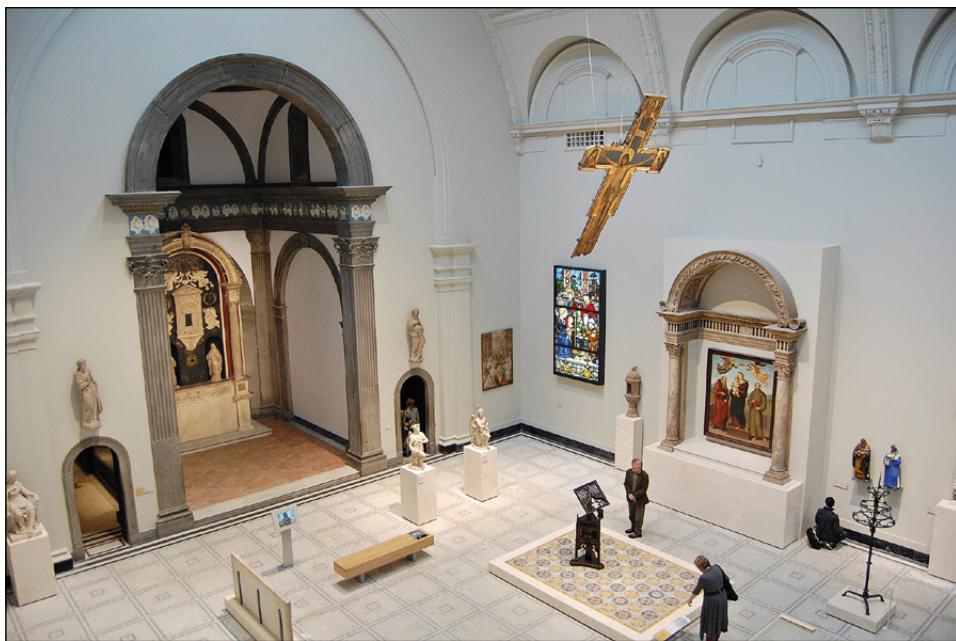


Fig. 2 – La cappella maggiore della chiesa fiorentina di Santa Chiara nelle *Medieval and Renaissance Galleries* (inaugurate nel dicembre 2009), London, Victoria and Albert Museum.



Fig. 3 – Ricostruzione digitale della chiesa di Santa Chiara a Firenze. University of Sussex, Department of Informatics.

analogia a quello dei pavimenti rinascimentali che sopravvivono nelle altre chiese fiorentine. Altri elementi in dubbio sono stati semplicemente omessi. Gli altari nel modello digitale sono stati rappresentati come generici ingombri in muratura, sebbene fossimo certi che si sarebbero dovuti presentare adornati con paliotti di seta e tovaglie di lino (tuttavia, mancavano elementi puntuali per documentare tali scelte a Santa Chiara). La stessa cappella maggiore sarebbe dovuta apparire separata dalla navata per mezzo di una cancellata in ferro (i cardini sono ancora incassati nella muratura) ma si è scelto di non includerla, in parte a causa dell'incertezza sulla sua forma, in parte per i problemi legati alla rappresentazione digitale di complesse geometrie metalliche.

Potremmo andare oltre e sottolineare gli aspetti che, a seguito di ulteriori ricerche, sappiamo non essere corretti. Lo stemma del mecenate era fissato all'apice dell'arco della cappella (l'interruzione nella muratura è ancora visibile nel museo) e inserito anche nella pavimentazione dinanzi all'altare maggiore (a marcare la sua pietra tombale, di cui sopravvive un disegno), ma questi dettagli non sono stati inclusi. Dalla creazione del modello abbiamo scoperto che una porta laterale si apriva sulla navata sinistra per collegare l'interno della Chiesa con Via Santa Maria, parallela alla navata. In questo senso, il modello beneficierebbe di un generale aggiornamento, e senza dubbio nuovi elementi emergeranno dalle fonti in futuro. Un ulteriore punto a sfavore del modello è la mancanza di dinamismo temporale. La visualizzazione non mostra ai visitatori del V&A il sito come si presenta oggi a Firenze, né indica come l'interno della chiesa sia cambiato nel tempo (dunque elementi tardi come le volte aggiunte nella navata ed affrescate da Gian Domenico Ferretti intorno al 1715 – ancora visibili negli uffici di Polistampa – non sono state incluse). Il modello, invece, privilegia una visione della chiesa subito dopo il suo completamento, all'alba del Cinquecento, come momento ideale della sua storia costruttiva.

Il simulacro virtuale di Santa Chiara cattura la completa fiducia dello spettatore, senza lasciar spazio ad incertezza o congetture. Questo può spiegare come mai alcuni osservatori trovano la ricostruzione, sebbene plausibile, in qualche modo sterile e poco coinvolgente. Il modello ottiene scarsi risultati sul fronte del rispetto dei principi della London Charter (<http://www.londoncharter.org/>), specialmente in riferimento alla necessità di integrazione dei cosiddetti “paradata”: «La documentazione di ogni decisione valutativa, deduttiva, interpretativa o creativa fatta nel corso del procedimento di visualizzazione digitale dovrebbe essere resa disponibile in maniera tale che le relazioni tra le fonti della ricerca, la conoscenza implicita, i ragionamenti esplicativi e i risultati basati sulla visualizzazione possano essere compresi» (DENARD 2009). L'importanza di integrare i paradata nella visualizzazione 3D è stata enfatizzata in un importante insieme di saggi degli autori della London Charter (BENTKOWSKA-KAFEL, DENARD, BAKER 2012).

Facendo tesoro di tale esperienza, io e i miei colleghi di Cambridge eravamo desiderosi di affrontare questi problemi nella ricostruzione digitale della chiesa fiorentina di San Pier Maggiore, intrapresa nel 2015 in collaborazione con la National Gallery ed il generoso supporto dell'Università di Cambridge e della Fondazione Kress. In questo caso il pretesto è stato un focus su una delle più importanti ed imponenti pale d'altare fiorentine del museo londinese, l'*Assunzione della Vergine* di Francesco Botticini del 1475-1476 circa, l'opera attorno a cui si è incentrata la mostra temporanea "Visions of Paradise" (SLIWA 2015). Il nostro compito era quello di ricontestualizzare il dipinto nel suo habitat originale all'interno di San Pier Maggiore, accanto ad un'altra opera più antica custodita alla National Gallery proveniente dalla stessa chiesa: l'enorme polittico d'altare di Jacopo di Cione del 1370-1371 circa.

È stato immediatamente chiaro che San Pier Maggiore sarebbe stata una sfida molto più ardua di Santa Chiara, poiché la chiesa era stata soppressa nel 1780 e la successiva demolizione aveva risparmiato solamente l'elegante portico della facciata e poco altro. Il tempo era inoltre pochissimo, poiché eravamo vincolati all'inaugurazione della mostra fissata per il 4 novembre 2015: ricevuti i fondi solo a Pasqua, avremmo intrapreso i lavori sul sito a Firenze tra maggio e luglio, l'ultima parte dei quali nel bel mezzo di una fortissima ondata di calura (il che spiega l'abbigliamento che indosso in alcune parti del filmato prodotto per l'occasione). Alcune fonti storiche, immagini e piante della chiesa e dell'ambiente circostante hanno fornito le basi per la ricostruzione. Fra questi, da notare una serie di immagini che commemorano un noto miracolo del vescovo fiorentino San Zanobi, comprendente una vista topografica della facciata della chiesa e della torre del campanile. Scorcii da altre angolazioni erano più difficili da trovare. Un piccolissimo dettaglio nell'affresco del Vasari sull'*Assedio di Firenze* nella Sala del Cinquecento del Palazzo Vecchio ci ha donato l'unica immagine del lato sud della chiesa. Una pianta con sezione presa poco prima della demolizione della chiesa, adesso a Praga, ha fornito un preziosissimo scatto dell'edificio alla fine della sua vita e il progetto ha poi confermato questa fonte come la più affidabile a disposizione. D'altro canto, le speranze iniziali di poter sfruttare le carte redatte dagli archeologi fiorentini nel 1970 sono state disattese dopo la scoperta di svariate imprecisioni emerse dall'analisi degli spazi interni degli edifici. Se non altro, ci fornivano un indizio su dove andare a guardare per riscoprire gli ambienti della vecchia chiesa.

Arrivati sul sito nel maggio 2015, non avevamo idea di quanto avremmo scoperto. La navata della chiesa era stata trasformata in una strada, ed i nostri sforzi si sono concentrati sugli isolati a nord e a sud. Nella Fig. 4 possiamo vedere la carta conservata a Praga sovrapposta a Google Earth: la grossa struttura sulla destra è l'ufficio postale modernista di Giovanni Michelucci, completato nel 1967, che avrebbe formato una suggestiva cornice per controbilanciare la nostra ricostruzione della chiesa rinascimentale.

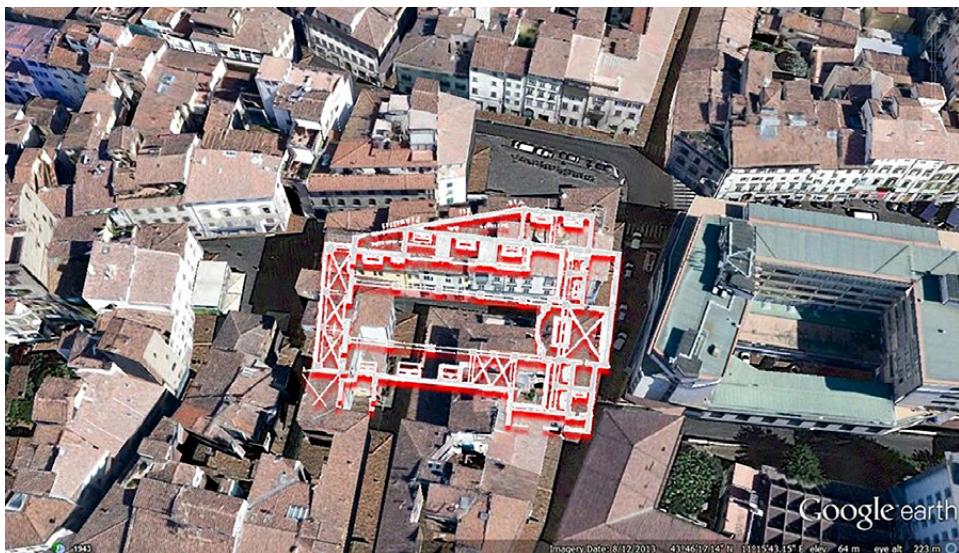


Fig. 4 – Veduta aerea dell'area circostante Piazza Salvemini a Firenze (da Google Earth) con, sovrapposta, la pianta storica di San Pier Maggiore.

Il nostro obiettivo sembrava essere completamente racchiuso in un vivace quartiere nel centro di Firenze. Tuttavia è diventato presto chiaro che la città contemporanea sarebbe stata il nostro maggior alleato, perché la comunità che vive e lavora in questa zona ha partecipato attivamente ai nostri sforzi di ritrovare la chiesa perduta. Gli studiosi che lavorano a Firenze di solito fanno affidamento sul patrimonio di biblioteche, archivi e musei della città. Per noi il bar del luogo è diventato il cuore delle operazioni, fornendo non solo riparo dal calore estivo, ma anche una rete di contatti, poiché i residenti ci hanno messo in collegamento con amici e vicini, desiderosi di raccontare storie o mostrare pietre.

E rapidamente la chiesa ha cominciato ad emergere: un pilastro rinascimentale della cappella situato nel bagno di un caffè; un arco degli inizi del XIV secolo in una cucina, con uno stemma che poteva corrispondere a descrizioni del XVII secolo; e, più straordinario di tutti, una scala a spirale del campanile medievale della chiesa in una soffitta. I privati avevano seguito la moda attuale di esibire tracce di opere in muratura storica durante i restauri delle loro proprietà, ma questi frammenti non erano mai stati collegati l'uno con l'altro. Infatti, nella maggior parte dei casi, i membri della comunità locale non erano consapevoli di vivere e lavorare negli spazi anticamente occupati da una delle chiese più importanti di Firenze. Ogni scoperta confermava il sospetto che la demolizione di San Pier Maggiore nel 1780 fosse stata un'operazione



Fig. 5 – Bozza del modello Maya della chiesa di San Pier Maggiore a Firenze con rendering opaco.



Fig. 6 – Fotogramma della ricostruzione di San Pier Maggiore a Firenze con la chiesa in nuvola di punti nel contesto del quartiere.



Fig. 7 – Fotogramma della ricostruzione di San Pier Maggiore a Firenze con il polittico di Jacopo di Cione collocato nell’attuale Via San Pier Maggiore.

pragmatica, con ampie sezioni della sovrastruttura della chiesa lasciate in piedi per sostenere nuove costruzioni sorte al suo posto. Un esame accurato delle facciate circostanti ha identificato diversi pilastri del transetto e della croce della chiesa, alcuni dei quali ancora con le grondaie a testa di leone intatte. Sono emerse sovrapposizioni completamente incongrue: la Cappella Palmieri, dove la possente *Assunzione della Vergine* del Botticini era collocata, è adesso il retrobottega di un negozio di forniture artistiche.

Ma come sviluppare al meglio queste scoperte in formato digitale? Abbiamo optato per modellare gli attuali edifici attraverso la fotogrammetria, unendo migliaia di foto assieme attraverso l’utilizzo di Autodesk ReCap 360 per creare un quartiere virtuale. Ci sono piaciute le texture fotografiche che ne sono risultate e l'affermazione di obiettività derivante dal reticolo tridimensionale relativo alla modellazione dei poligoni. I frammenti specifici della chiesa che abbiamo trovato sono stati rielaborati in modelli fotogrammetrici che potevano essere poi manipolati e posizionati all'interno della più vasta architettura virtuale della chiesa. Questa schermata del software Maya (Fig. 5) dà un'idea del punto a cui eravamo arrivati ad ottobre con meno di una settimana alla scadenza: l'architettura virtuale della chiesa è collocata nel contesto fotogrammetrico e ha ancora un rendering grigio opaco. Immediatamente dopo, abbiamo cambiato il rendering dell'architettura virtuale con la nube di punti trasparente visibile nel film (Fig. 6). Questo ci ha permesso di mostrare forme e volumi senza la necessità di impegnarci in dettagli architettonici precisi

che i nostri dati non potevano supportare. Suggestiva ma imprecisa, la nube di punti facilita una rappresentazione più onesta e trasparente della nostra incerta e incompleta comprensione del tessuto storico di San Pier Maggiore. Ha anche fornito un'estetica spettrale che abbiamo trovato adatta alle sottili ombre che la chiesa continua a proiettare sul quartiere.

Il modello si adattava specialmente al polittico di Jacopo di Cione, che si ritrovava nel mezzo di una strada, incorniciato dalle volte della nube di punti (Fig. 7). Con più tempo e una strumentazione più sofisticata per il rilievo *in situ*, sarebbe stato possibile estrapolare molto più dell'architettura della chiesa dagli edifici attuali, specialmente nell'area del transetto e delle cappelle laterali, che erano soprelevate rispetto al piano di calpestio della chiesa e della strada che vi era dietro, creando degli spazi simili a delle cripte al di sotto. Il nostro lavoro sul campo ci ha insegnato a non fidarci ciecamente di piante ed elevati pubblicati, che spesso contengono imprecisioni e semplificazioni di strutture complesse ed irregolari.

Solo una piccola frazione della nostra ricerca su San Pier Maggiore compare nella ricostruzione digitale, che in realtà è solo la punta dell'iceberg (<https://www.nationalgallery.org.uk/visions-of-paradise>). Ad esempio, avremmo potuto facilmente ristabilire molti altri dipinti sopra gli altari della chiesa, come l'*Assunzione* di Francesco Granacci del 1515 circa, ora a Sarasota (Florida, USA), o la *Visitazione* di Tommaso Manzuoli del 1560 che si trova, tra tutti i posti possibili, proprio a Cambridge in Inghilterra (Fitzwilliam Museum, in prestito a lungo termine al Trinity Hall, dove funziona di nuovo come pala d'altare nella cappella del collegio). Considerazioni legate ai copyright ci hanno però spinto a includere soltanto le due pale d'altare della National Gallery. Inoltre, il modello corrente non fa distinzione tra fasi diverse della costruzione della chiesa. Infatti, la visualizzazione combina elementi di diversi archi temporali, come ad esempio la facciata seicentesca che ha postdatato la collocazione delle pale d'altare di diversi secoli. Al tempo dell'aggiunta della facciata, il polittico di Jacopo di Cione era già stato rimosso dall'altare maggiore, dunque il modello suggerisce un momento impossibile nella storia della chiesa. La scelta di riproporre la facciata è stata pragmatica: si tratta del più riconoscibile punto di continuità tra passato e presente, e aiuta lo spettatore del filmato a comprendere l'orientamento dell'edificio in relazione all'attuale configurazione dell'area.

Tornando agli aspetti criticati in Santa Chiara, il modello non fa distinzione neanche tra forza o debolezza relativa dei dati che lo supportano. La nostra ambizione per il futuro è raffinare l'attuale ricostruzione e collocarla online in un modo che permetta all'utente di manipolare ed interrogare il modello e anche accedere e valutare autonomamente il materiale originale su cui esso si basa. Col riconoscere incertezza e incorporare nel modello i suoi metadati, la speranza è che le ricostruzioni digitali di questo genere possano

*Le chiese di Santa Chiara e San Pier Maggiore e la loro ricostruzione digitale*



Fig. 8 – Articoli nel «Corriere Fiorentino» sulla ricostruzione virtuale di San Pier Maggiore (martedì 19 gennaio 2016, Anno IX, n. 17, copertina e pagina 13; mercoledì 20 gennaio 2016, Anno IX, n. 18, pagina 7).

raggiungere un grado di credibilità scientifica che rimane – per ora – riservato agli articoli e alle monografie accademiche.

Ma – guardando il lato positivo – il filmato mostra la potenza della storia, della narrativa e della trama per comunicare risultati di ricerca. Il livello di risposta e coinvolgimento del pubblico con il filmato di San Pier Maggiore è stato apprezzabilmente più forte che per Santa Chiara e l’interesse da parte della stampa a Firenze è stato oltremodo soddisfacente (Fig. 8). Il coinvolgimento della comunità locale, in particolare, sembra aver catturato l’immaginazione della gente, ricordandoci che la presentazione di un passato digitale è più coinvolgente quando è combinata con l’esperienza di vita del presente.

Durante il progetto *Virtual San Pier Maggiore* abbiamo beneficiato della generosa collaborazione del team di PRISMA, guidato dal Prof. Franco Niccolucci, direttore del VAST-LAB presso l’Università di Firenze e uno degli autori della London Charter. L’anno seguente, in occasione delle commemorazioni dei cinquant’anni dalla catastrofica alluvione di Firenze del 1966, PRISMA ha realizzato una ricostruzione virtuale del convento delle Murate e della ricollocazione, nel refettorio delle monache, dell’*Ultima Cena* di Giorgio Vasari. Il dipinto, severamente danneggiato dalle acque dell’esondazione, è stato sottoposto ad un diligente restauro da parte dell’Opificio delle Pietre Dure, i cui risultati sono stati presentati al pubblico, alla presenza del Presidente della Repubblica Sergio Mattarella, il giorno dell’anniversario dell’alluvione, il 4 Novembre 2016. Il filmato realizzato da PRISMA adotta un rendering solido per gli spazi storici e non integra l’architettura virtuale del passato con

la resa fotogrammetrica del suo stato odierno, ma è simile al filmato fatto per San Pier Maggiore nell'attenzione alle fonti documentarie, alle fasi del lavoro di ricerca, e alle successive trasformazioni dello spazio fino ai nostri giorni (in questo caso, le successive vite del convento prima come prigione e ora destinato all'edilizia sociale). Un aspetto particolarmente rilevante del filmato di PRISMA è il modo in cui si incorporano le planimetrie storiche all'interno dello spazio virtuale, una tecnica che è stata anche utilizzata con successo dal progetto *Visualizing Venice* (HUFFMAN, GIORDANO, BRUZELIUS 2018: [https://www.youtube.com/watch?v=u\\_YbtTwzux4/](https://www.youtube.com/watch?v=u_YbtTwzux4/)).

Guardando al futuro, la realtà aumentata offre nuove possibilità per giustapporre passato e presente, prossimità e lontananza. Nuove tipologie di dati possono esservi integrati, come ad esempio i risultati di sondaggi con georadar. La recente ricostruzione della basilica di Santa Chiara a Napoli da parte del laboratorio Wired! della Duke University è un esempio brillante di tale approccio olistico (cfr. C. BRUZELIUS *et. al.* in questo volume, pp. 81-103). La trasparenza sui paradata che sostengono la ricostruzione rimane imperativa se la visualizzazione di monumenti storici vuole ottenere consenso dagli ambienti scientifici come valida presentazione della ricerca alla pari di contributi sottoposti a peer review su riviste specialistiche. Nel campo dell'archeologia classica, il progetto *Oplontis*, guidato da John Clarke della University of Texas, dimostra come un vasto database di materiali originali (comprese inedite fotografie degli scavi) possa essere collegato globalmente ad una visualizzazione 3D (<http://www.oplontisproject.org/>). Ciò che attualmente va oltre il dibattito, qualora queste sfide venissero accettate e fossero allocate le necessarie risorse, è che il rilievo e la visualizzazione digitali delle chiese italiane hanno il potenziale di trasformare lo stato della ricerca su questi monumenti e di comunicarne le scoperte ad un pubblico molto più ampio.

### *Ringraziamenti*

Hanno fatto parte del team di *Virtual San Pier Maggiore* l'autore del presente contributo, il Prof. François Penz (Prof. di Architettura e Immagine in Moto, University of Cambridge), il Dott. Miguel Santa Clara (fotografo di architettura e film-maker) e la Dott.ssa Jenny Sliwka (Ahmanson Fellow in Arte e Religione e curatrice della mostra “Visions of Paradise” presso la National Gallery di Londra). La regia del cortometraggio finale è stata di Miguel Santa Clara, che ha anche creato lo spazio digitale. Si ringraziano inoltre Caroline Campbell e Howard Freeman della National Gallery, Joanne Allen, Andrew Chen e Chiara Capulli per il lavoro sul campo e in archivio a Firenze, la Prof.ssa Caroline Bruzelius e i suoi colleghi presso il laboratorio Wired! della Duke University, Franco Niccolucci, Ginevra Niccolucci e i loro colleghi a PRISMA, e i residenti di Via San Pier Maggiore per la generosa collaborazione. Un ringraziamento anche a Ginevra Niccolucci e a Chiara Capulli per la traduzione del testo in italiano.

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## BIBLIOGRAFIA

- BENTKOWSKA-KAFEL A., DENARD H., BAKER D. 2012, *Paradata and Transparency in Virtual Heritage*, Ashgate, Farnham.
- CALLAHAN M., COOPER D. 2010, *Set in stone: Monumental altar frames in Renaissance Florence*, «Renaissance Studies», 24, 33-55.
- CALLAHAN M., COOPER D. 2013, *Sacred space and the modern museum: Researching and redisplaying the Santa Chiara Chapel in the V&A's Medieval and Renaissance galleries*, «V&A Online Journal», 5 (<http://www.vam.ac.uk/content/journals/research-journal/issue-no.-5-2013/>).
- DENARD H. (ed.) 2009, *The London Charter for the Computer-Based Visualisation of Cultural Heritage*, version 2.1 ([http://www.londoncharter.org/fileadmin/templates/main/docs/london\\_charter\\_2\\_1\\_en.pdf/](http://www.londoncharter.org/fileadmin/templates/main/docs/london_charter_2_1_en.pdf/)).
- DORMENT R. 2011, review of *Devotion by Design* (National Gallery) and *Treasures of Heaven* (British Museum), «The Daily Telegraph» (<http://www.telegraph.co.uk/culture/art/art-reviews/8616614/Devotion-by-Design-National-Gallery-Treasures-of-Heaven-British-Museum-review.html/>).
- FROST S. 2013, *Reinterpreting a Florentine Chapel at the V&A*, «Journal of the Social History Curators Group», 37, 51-59 ([http://www.shcg.org.uk/domains/shcg.org.uk/local/media/downloads/Journal\\_037.pdf/](http://www.shcg.org.uk/domains/shcg.org.uk/local/media/downloads/Journal_037.pdf/)).
- GKION M., PATOLI Z., WHITE M. 2011, *Museum interactive experiences through a 3D reconstruction of the church of Santa Chiara*, in *Proceedings of the IASTED International Conference on Graphics and Virtual Reality*, Cambridge, Acta Press, 253-262.
- HUFFMAN K.L., GIORDANO A., BRUZELIUS C. (eds.) 2018, *Visualizing Venice: Mapping and Modeling Time and Change in a City*, London and New York, Routledge.
- MOTTURE P. 2011, *Inspire, engage, preserve, connect, transform: Meeting the aims for the new Medieval & Renaissance galleries at the Victoria and Albert Museum*, in G. CHAMBERLAIN (ed.), *Museum Narrative & Storytelling: Engaging Visitors, Empowering Discovery and Igniting Debate*, London, Museum Identity, 15-32.
- MURPHY-O'CONNOR C. 2008, *Christianity: From Shadows and Images into Truth*, Lecture, Emmanuel College, Cambridge, 26 November (UK television broadcast on Sky Arts 2, 8 December).
- NETHERSOLE S. 2011, *Devotion by Design: Italian Altarpieces before 1500*, London, National Gallery.
- PAGLIAI A. 1993, *Dove nasce questa rivista: dapprima chiesa inserita in un complesso conventuale, poi studio dello scultore Pio Fedi, oggi Tipografia Polistampa*, «Amici dei Musei», 57, 77-79.
- SLIWKA J. 2015, *Visions of Paradise: Botticini's Palmieri Altarpiece*, London, National Gallery.

## SITOGRAFIA

- Interactive: Explore the Church of Santa Chiara: <http://www.vam.ac.uk/content/articles/i/interactive-explore-the-church-of-santa-chiara/> (attualmente in fase di aggiornamento).
- The London Charter for the Computer-Based Visualisation of Cultural Heritage/La Carta di Londra per la visualizzazione digitale dei beni culturali: <http://www.londoncharter.org/>.
- PRISMA: L'Ultima Cena di Giorgio Vasari: <http://www.prisma-cultura.it/l-ultima-cena-del-vasari/>; YouTube version: <https://www.youtube.com/watch?v=P1Uv4Zf5xKk/>.
- Reconstructing the Destroyed Church of San Pier Maggiore: A film made to accompany the exhibition *Visions of Paradise: Botticini's Palmieri Altarpiece*, 4 November 2015-28 March 2016: <https://www.nationalgallery.org.uk/visions-of-paradise>; YouTube version: <https://www.youtube.com/watch?v=zUXa1nDtOB0/>.

University of Texas at Austin, Oplontis Project: <http://www.oplontisproject.org/>.  
Visualizing Venice. The Complex of Santa Maria della Carità: A change over time (2008-1794):  
[https://www.youtube.com/watch?v=u\\_YbtTwzux4/](https://www.youtube.com/watch?v=u_YbtTwzux4/).

## ABSTRACT

This paper focuses on two digital projects that have attempted to reconstitute Renaissance altarpieces within virtual church interiors. Both concern Florentine churches that are no longer extant: the Clarissan nunnery church of Santa Chiara in the southern Oltrarno quarter and the Benedictine convent church of San Pier Maggiore to the east of the Cathedral. Both reconstructions were commissioned in conjunction with London institutions: Santa Chiara for the Victoria and Albert Museum in 2009; San Pier Maggiore for the National Gallery in 2015. The two virtual reconstructions were, however, very different – in part because the nature of the available data suggested different solutions in each case, in part because the more recent project on San Pier Maggiore was able to build on our experience of the older reconstruction of Santa Chiara. As well as presenting these projects, the paper offers an auto-critical evaluation of them, acknowledging where the final reconstructions could not realize their authors' original ambitions, and hopefully drawing some lessons to help future work in this area. Key concerns remain the embedding of “paradata” and degrees of uncertainty within 3D visualizations following the guidance of the London Charter, a widely shared but rarely realised aspiration. Meanwhile, new opportunities are offered by the integration of photogrammetry, LIDAR scanning, augmented reality and geo-radar data.

## L'ECO DELLE PIETRE: HISTORY, MODELING, AND GPR AS TOOLS IN RECONSTRUCTING THE CHOIR SCREEN AT STA. CHIARA IN NAPLES\*

### 1. INTRODUCTION

Digital technologies are transforming historical research in multiple ways. As the authors of this essay demonstrate, digital technologies as research tools can bring to light evidence hitherto unavailable. Because technologies require various types of expertise, however, digital projects usually entail teamwork and collaboration, as is represented in this multi-authored and multi-lingual essay that describes the creation of a model of the choir screen at Sta. Chiara in Naples (Fig. 1).

In the seventy or more years since the end of World War II, many scholars have studied the architecture and decoration of this massive Franciscan church. Our article interrogates an aspect of the church that had only been hypothesized (VITOLO 2014), the choir screen destroyed at the end of the sixteenth century and for which there exists neither physical nor documentary evidence. Our research initiative began as a Master's thesis by Lucas Giles centered on two questions: would it be possible to utilize radar scanning to identify the location and dimensions of the choir screen of Sta. Chiara? And, if evidence of the foundations were found, would it be possible to develop a three-dimensional model? The answer to both questions was an emphatic "yes".

The identification of the location of the screen and our hypothesis of its appearance change our understanding of the church as a whole, its liturgy, ceremonial spaces, and burials. The questions prompted by our work are deep and complex, however, and require further research by scholars of medieval Naples and the mendicant orders.

Although now almost entirely lost, choir screens were once essential features of medieval church interiors, separating clergy from laity and creating a form of hierarchical zoning within religious space (JUNG 2000, 2012). These monumental structures excluded laity from physical and visual participation in the liturgy at the high altar (BRUZELIUS 1992). On their front (usually west) face towards the public, they were the setting for secondary altars adorned with paintings and liturgical textiles, decorative programs that were bright with images. Altar screens were the setting for some of the most beautiful works of art of the high Middle Ages, which survive in decontextualized fragments

\* This article is a collaborative effort with Caroline Bruzelius and Andrea Giordano as the authors of sections 1 and 2, Emanuela De Feo of section 3, Leopoldo Repola of section 4, Lucas Giles of section 5, Andrea Basso and Elisa Castagna of section 6, Caroline Bruzelius of section 7.

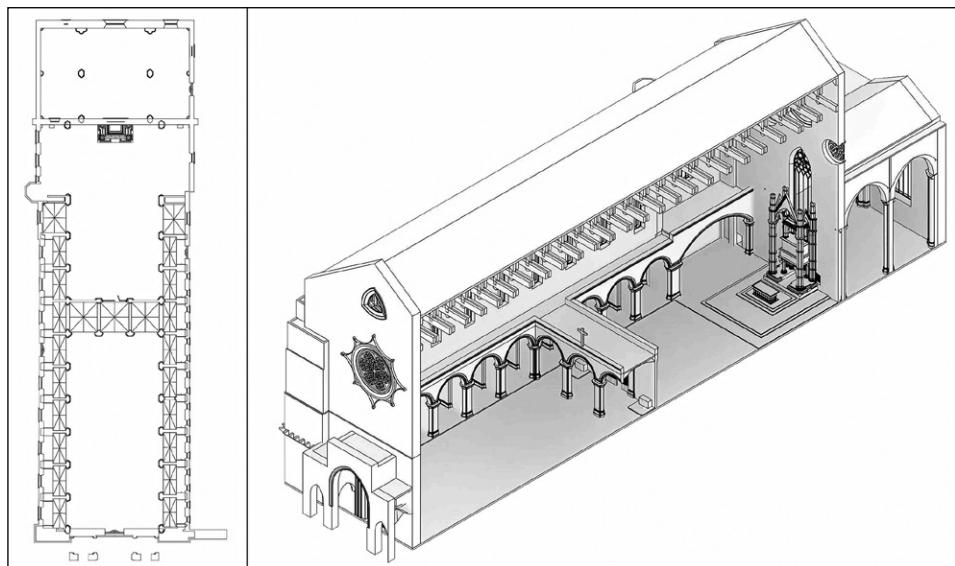


Fig. 1 – Views of the hypothetical screen, church plan (left) and axonometric view (right).

in museum settings. For most laymen, the altars of the choir screen were the primary locus of spiritual transactions as sites for the veneration of popular saints. In the mendicant orders, these were altars dedicated to the founders: Dominic, Francis, Claire, and saints of particularly intense devotion, such as Anthony. Association of their altars with the choir screen focused the attention of the public on the exemplary lives and intercessory powers of these new saints of *recent* memory, remarkable accomplishment, and profound spiritual potency. Choir screens were thus labile and sensitive indexes of popular piety, reflecting the social and economic realities of patronage and the co-dependence (in spiritual and financial terms) of friars with donors; this was an important area of connection between the laity and the religious community (BRUZELIUS 2014, 24, 30-31, 40, 57 and 135). In addition, the veneration of these new and immensely popular saints stimulated requests for burial near their altars, as attested in wills (BRUZELIUS 2014, 144-146, 151-152 and 157-158). In both life and death, however, noble and wealthy patrons, were often permitted *beyond* and *inside* the screen to the area reserved for the friars; the chapels of those donors (such as the Peruzzi, Bardi, or Strozzi families in Florence), benefitted from a privileged position by the liturgical choir. Indeed, at Sta. Chiara, the geo-radar scan revealed a longitudinal stretch of underground elements from the central door of the screen up to the main altar and the tomb of Robert, a “red carpet,” as it were, of privileged burials towards the royal tombs.

## 2. THE MULTIPLE CHOIRS AND THE TRAMEZZO OF STA. CHIARA

Sta. Chiara in Naples, founded by Robert the Wise and Sancia of Mallorca in 1310, was a double convent of Clarissan nuns and Franciscan friars. There were two cloisters, one attached to the south (far) end of the church for the female community, and one to the right side of the nave for the friars. The nuns' cloister gave access to their strictly enclosed choir behind the main altar, a choir visible to the rest of the church only through three grated openings. After the death of Robert the Wise in 1343, the Bertini brothers of Florence created a double tomb that soared above the main altar; in the nuns' choir there was an additional effigy above the grated openings (D'OIDIO 2015). The effigies present the king in a Franciscan habit yet crowned; each was an incentive for intercession and remembrance from the two separate and *separated* religious communities that could hear, but not see, each other, doubling the power of intercessory prayer.

The object of our study, however, is the second division within the church: the choir screen that separated the lay public from the Franciscan community, a division destroyed in the late sixteenth century. By the time it was redecorated in the Baroque style, the church had long since been transformed into one enormous internal volume; the post-war reconstruction obliterated any possible surviving traces of the screen, with the exception of some relief panels depicting scenes from the life of Sta. Catherine.

Excavation might have provided a solution for identifying the foundations and perhaps architectural fragments. But this would have been expensive and disruptive. Indeed, it is precisely because the research team wanted to experiment with non-invasive technologies that we proposed using ground-penetrating radar (GPR) to identify the location and dimensions of the screen and develop a model of its appearance. We began with the hypothesis that the screen would logically have been located between a public entrance on the east (left) flank of the church and the entrance from the friars' cloister in the penultimate chapel towards the altar to the west (right) side. As will be seen in Repola's section (Section 4), the radar scans revealed substantial foundations of a transverse wall that extend across the full width of the nave, with two forward supports aligned with the piers of the lateral chapels one bay forward of the transverse wall. The second set of foundations are evidence of two forward piers: as will be seen below, the structure would therefore have consisted of three bays as deep as the side chapels.

The data from the radar scan had to be interpreted within correct measurements of the church, yet it had become clear that the dimensions of the post-war plans and sections were deeply flawed. We were fortunate in being able to collaborate with De Feo, who offered us the use of a precise laser scan (Fig. 2). With this evidence in hand, we were thus able to conclude that

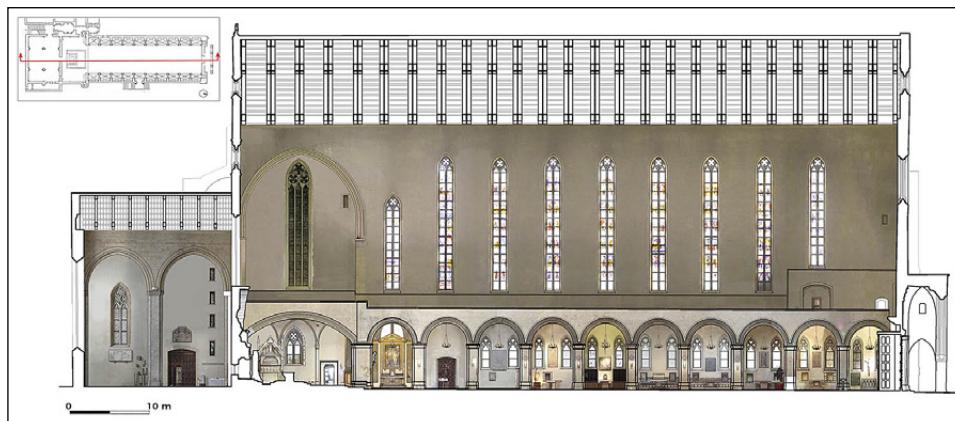


Fig. 2 – Longitudinal section of the church created using the initial laser scan data (De Feo).

the *tramezzo* reproduced the rhythm, depth and height of the side chapels, at upper level creating a transverse gallery that connected the wide tribunes over the nave chapels. The choir screen therefore united the lateral galleries across the immensely wide space of the nave, generating an “H” plan at the upper level (Fig. 1). A choir screen with three openings suggests of course that the central bay had a portal towards the friars’ choir and tomb of Robert the Wise, and the side bays contained altars. As we shall see in the section authored by Giles (Section 5), the two altars were almost certainly dedicated to Francis (left side), and Claire (right side). The screen thus divided the nave of the church into two separate but interconnected sections, with a vast nave containing the altars of Claire and Francis, and an almost equally large pre-cinct reserved for the friars as well as for royal and noble burials.

### 3. UNA NUOVA DI PUNTI PER LO STUDIO DI SANTA CHIARA: UN DATABASE DI INFORMAZIONI

Nell’ultimo decennio il rilievo tridimensionale ha visto il laser scanning quale metodologia indiscussa alla base di studi, ricerche e progetti di valorizzazione, recupero e restauro, specialmente nel settore dei beni culturali. L’ottima affidabilità del dato metrico acquisito e restituito dallo strumento, unita alla sua buona versatilità negli ambienti interni ed esterni hanno spesso compensato alcuni dei limiti più evidenti della metodologia e della tecnologia legati, ad esempio, al costo del sistema e alla complessità di gestione delle nuvole di punti. La possibilità di raggiungere un alto dettaglio nella restituzione grafica in situazioni di particolare complessità, di abbattere i tempi del rilevamento e della restituzione rispetto alle metodiche tradizionali, di acquisire

contemporaneamente nuvole di punti e foto a colori e di integrare i risultati ottenuti con sistemi di modellazione 3D CAD e BIM hanno modificato e, sotto alcuni punti vista, migliorato la lettura e l'analisi critica dell'oggetto (DOCCI, GAIANI, MIGLIARI 2001; CLINI 2008; APOLLONIO 2010; BIANCHINI 2012; BERTOCCI, PARRINELLO 2015).

La complessità morfologica e le notevoli dimensioni della chiesa di Santa Chiara hanno rappresentato l'occasione per applicare una metodologia di rilievo già sperimentata con esiti positivi per lo studio della chiesa di Sant'Eligio al Mercato a Napoli (D'AURIA, DE FEO 2017), il primo edificio religioso angioino partenopeo. Il rilievo è stato finalizzato ad ottenere un riferimento metrico scientificamente affidabile per la successiva fase di modellazione parametrica dell'edificio e delle ipotesi ricostruttive del tramezzo e anche per creare un archivio digitale da cui poter attingere informazioni in qualsiasi momento.

La tecnologia utilizzata dagli attuali laser scanner, operando in modo quasi automatico, consente di acquisire dati metrici e colorimetrici di oggetti sotto forma di nuvole di punti tridimensionali: ogni punto della superficie colpito dal raggio laser emesso dallo strumento viene tradotto in un punto digitale identificato numericamente da una terna di coordinate spaziali riferite al sistema di riferimento del laser scanner; il contestuale impiego di sensori ottici di immagine (CCD o CMOS), generalmente integrati nello strumento, fornisce al punto anche l'informazione cromatica, consistente in un'altra terna rappresentativa dei valori RGB. Una sola scansione non è sufficiente a rilevare l'intero edificio e risulta necessario fare stazione in vari punti di presa per eliminare possibili coni d'ombra, dovuti sia a limiti legati al campo visivo dello strumento sia alla presenza di oggetti interposti tra questo e le superfici da rilevare, sia alla eventuale complessità della geometria del manufatto. Per ottenere un corretto modello 3D è necessario, quindi, che ogni scansione rilevi almeno il 30% di superficie comune tra nuvole consecutive al fine di agevolare il loro allineamento in fase di post-processamento. Quest'ultima viene condotta con specifici software che, in modo controllato, individuano punti omologhi tra le varie scansioni oltre che elementi caratterizzati da geometrie note, come target piani o sferici.

Per il rilievo morfologico dell'intera chiesa è stato utilizzato un laser scanner Faro Focus 3D X 130 che, in condizioni ambientali ottimali, garantisce un range di scansione tra i 60 cm e i 130 m, una velocità di misurazione fino a 976.000 punti al secondo e un errore di linearità compreso tra i -2 e i +2 mm. Al fine di agevolare le successive fasi di elaborazione dati (registrazione delle nuvole), sono stati utilizzati target sferici (sei, collocati di volta in volta su superfici orizzontali) disposti a quote differenti e in zone intervisibili in più acquisizioni. Sono state eseguite in tutto 74 scansioni, 26 all'esterno e 48 all'interno della chiesa (Fig. 3), con risoluzioni variabili a seconda della

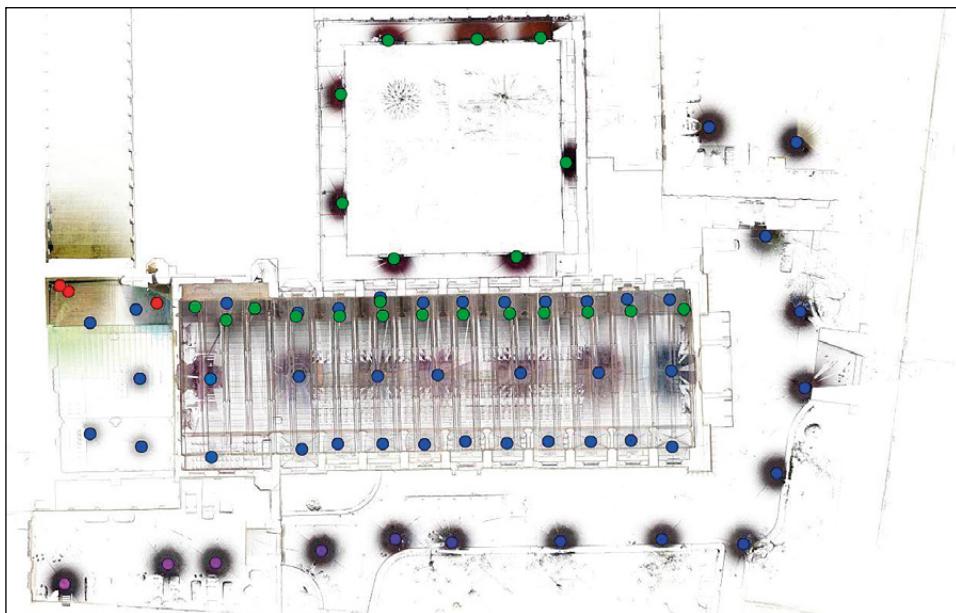


Fig. 3 – Indicazione planimetrica delle stazioni laser.



Fig. 4 – Modello a nuvola di punti del complesso religioso.

distanza del laser dalle superfici, in media pari a un punto battuto ogni 6 mm circa ad una distanza della sorgente emittente di 10 m dall'oggetto. Il modello infografico tridimensionale dell'intera chiesa (Fig. 4) è stato generato gestendo e applicando procedure software e algoritmi informatici di allineamento e

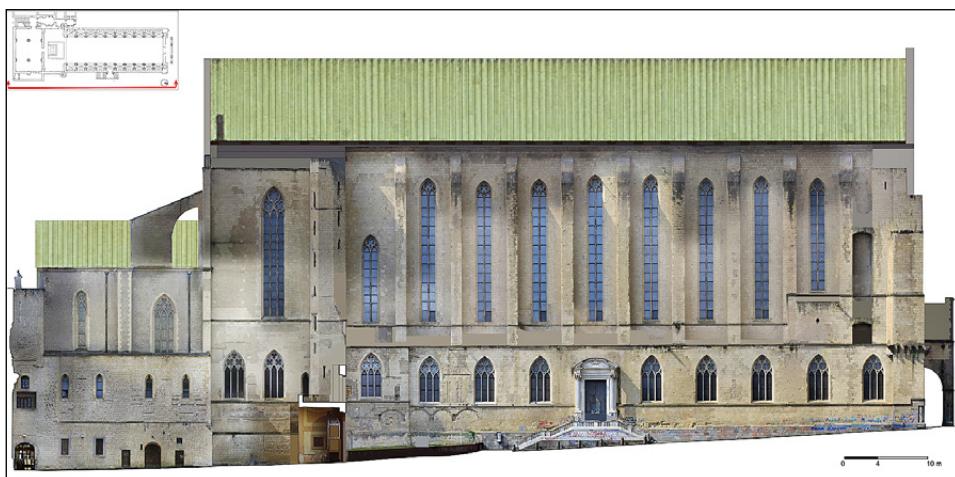


Fig. 5 – Ortoimmagine del fianco orientale.

filtraggio ormai consolidati e affidabili. La nuvola ottenuta, opportunamente decimata dei punti ridondanti e delle informazioni non utili ai fini della ricerca, è caratterizzata inoltre dai valori cromatici RGB acquisiti dal contestuale impiego del sensore ottico durante le scansioni. Tale parametro costituisce un importante arricchimento fornito dal modello 3D, soprattutto in ordine alla comprensione dei materiali che caratterizzano le superfici della chiesa.

La nuvola di punti, di volta in volta opportunamente trattata, ha consentito di visualizzare piante a più quote, sezioni trasversali e longitudinali, elevati interni ed esterni, dettagli architettonici e di effettuare misurazioni (lineari, superficiali e volumetriche) con elevata precisione (Fig. 5). In questo modo è stato possibile compiere una prima analisi critica direttamente sulla replica tridimensionale dell'edificio. L'accurato rilievo ha consentito di dare ragione anche dell'irregolarità costruttiva dell'edificio, che non deve essere considerata il “degrado” di un’idea progettuale dovuto all'imprecisione dell'accidentale realtà del cantiere, ma una peculiarità degli edifici medievali. La geometrizzazione e la rettificazione che si applicano di consueto nella rappresentazione grafica di strutture prive o quasi di pareti rettilinee o di rigorose simmetrie, infatti, possono essere fuorvianti per lo studio degli edifici storici. L'esatta digitalizzazione formale dell'architettura si rivela indispensabile per far emergere informazioni altrimenti non deducibili, come variazioni anche minute di allineamenti e di spessori murari, anomalie esistenti, o presunte tali, e aspetti cromatici delle superfici (CARBONARA 2012). La loro individuazione e interpretazione sono fondamentali per l'analisi dell'architettura, della sua storia e della sua evoluzione. L'avanzamento rispetto alla tradizionale

metodologia di ricerca è notevole sia per accuratezza del dato finale, sia per quantità e qualità di informazioni a disposizione.

#### 4. THE ECHOES OF THE STONES: THE GEO-RADAR PROCESS

The remarkable potential of digital technologies is evident as an entire process of knowledge-making and knowledge-diffusion, from the initial steps of structuring data to the methodological concepts entailed in developing public-facing components. Through the transformational potential of digital tools, learning and the creation of historical narratives can take on forms that far surpass the traditional roles of pure research. In addition, this transformational potential extends to methods of archiving data as well as the re-use of the data for future projects. In an era in which the digital has blurred the distinctions between the real (physical) and the virtual (imaginative) worlds, it has become essential to differentiate between acts of perception, the quality of information (data), and methods of interpretation and representation. The qualitative variations between context and actual object of study have fused the processes of perception and representation as part of cognition. Digital technologies surpass the limits of traditional perception and permit the use of contextual information to extend far beyond the limits of conception, generating different levels of critical interpretation that are valid for various types of users.

With these premises as a point of departure, the relation between diagnostic tools, parametric software and systems of representation is now the foundation for our research method. To ensure an accurate and critically supported process in the production of our data, this requires co-ordination between all aspects of our research. In this project, evidence from Ground Penetrating Radar (GPR) was correlated with a laser survey, allowing us to locate the GPR evidence and providing precise co-ordination between the GPR data and the new measurements of the church.

Georadar is a non-invasive methodology used in geophysics for the study of the upper level of subsoil, and is based on the analysis of electromagnetic wave reflections generated by the resistance to invisible, sub-pavement elements. This technology uses short and continuous high frequency electromagnetic pulses generated by an antenna located near the surface. When the electromagnetic impulse intercepts the layer between two surface materials with different physical characteristics, one part of the incident energy is reflected and one part continues into a second layer. The portion of waves reflected off the first layer, returns to the surface and is detected by the receiving antenna. Conversely, the portion of energy which passes through this first layer, produces additional reflections on surfaces found deeper underground, thus providing a representation of a sequence of layers. This

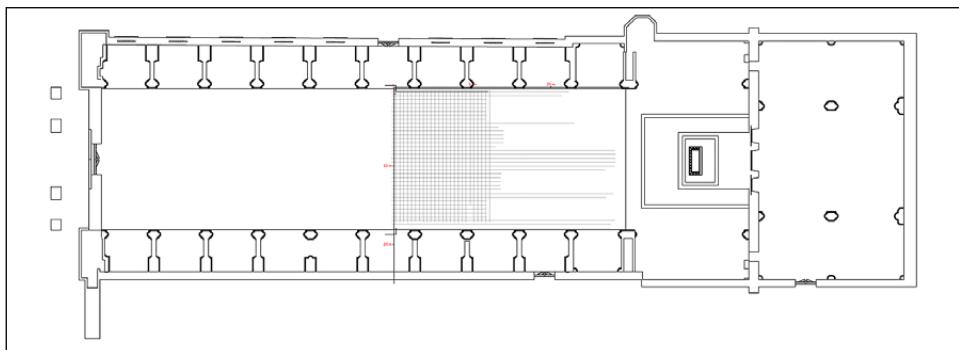


Fig. 6 – Location of acquisition paths.

method creates a sectional plan of the subsoil, with depth ranging from a few centimeters to several meters depending on the nature of the materials (subsoil, walls, objects) and the frequency of the antennas used. In the case of Sta. Chiara, an IDI HI-MOD instrument was employed, using K2FastWave software and a 200 MHz and 600 MHz frequency antenna, which obtained a depth investigation of 17.4 m and 8.5 m respectively. Significant preparatory work took place prior to the scanning process, such as the creation of a grid on the floor of the basilica. This corresponded with the survey area and was composed of a series of orthogonal lines arranged along the longitudinal and transversal axis of the nave at a distance of 50 cm apart. The point of origin of the acquisition path was identified according to the intersection between the nave and the side chapels in correspondence with the side entrance of the church. The sequence of scanning was conducted according to these parallel lines, firstly along the longitudinal axis (L axis) and then along the transversal axis (T axis). We recorded 24 transversal pathways across the entire width of the nave, and 36 longitudinal pathways within the area between the 6<sup>th</sup> and 8<sup>th</sup> chapels of the church (Fig. 6).

For the 14 longitudinal paths at the corridors between the stalls beyond the survey area, prospection was continued up to the steps of the presbytery, to check for additional evidence in the subsoil in front of the chapels near the altar. Radargram processing procedures were made using IDS Launch GRED HD software, which indicated discontinuities present under the pavement through geometric shapes in space, better characterized by the application of noise elimination filters. Subsequently, on each radargram, these were indicated as red lines, in correspondence with the diffraction plans of the signal. Proportional to the intensity of the return signal, and corresponding to more discontinuous plans, we used lines of different thickness, in order to better visualize possible underground elements within the sections. The

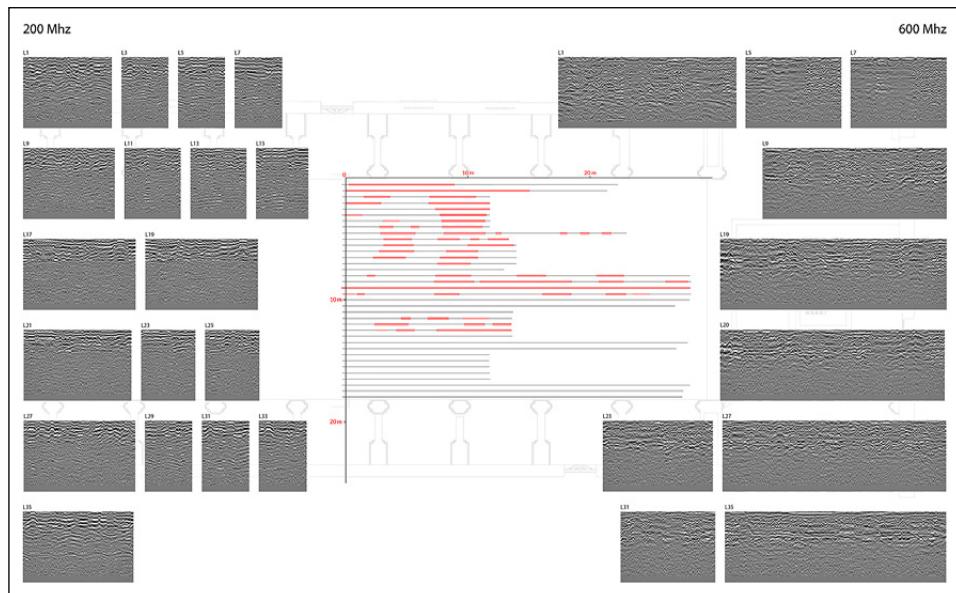


Fig. 7 – Representative framework of some radargrams.

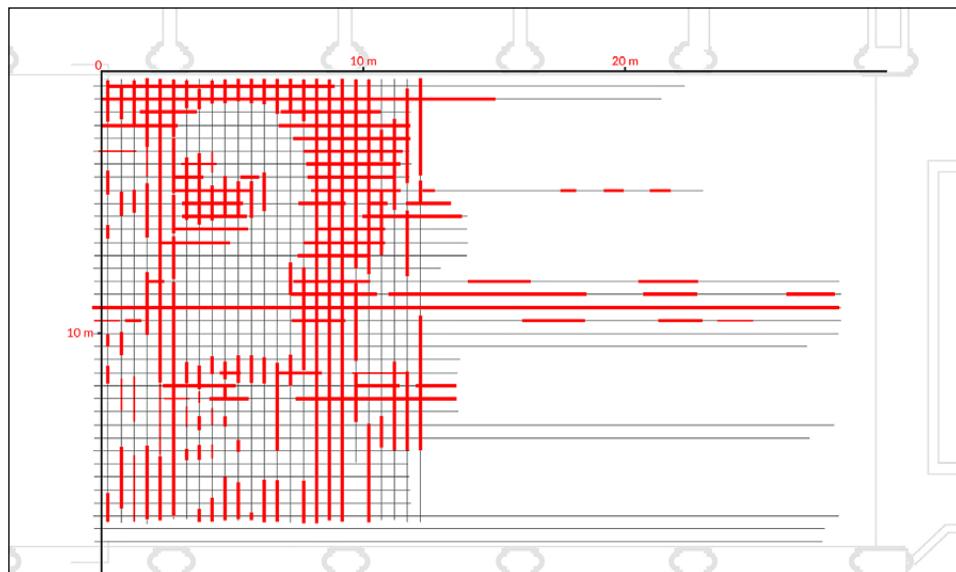


Fig. 8 – Map of the targets.

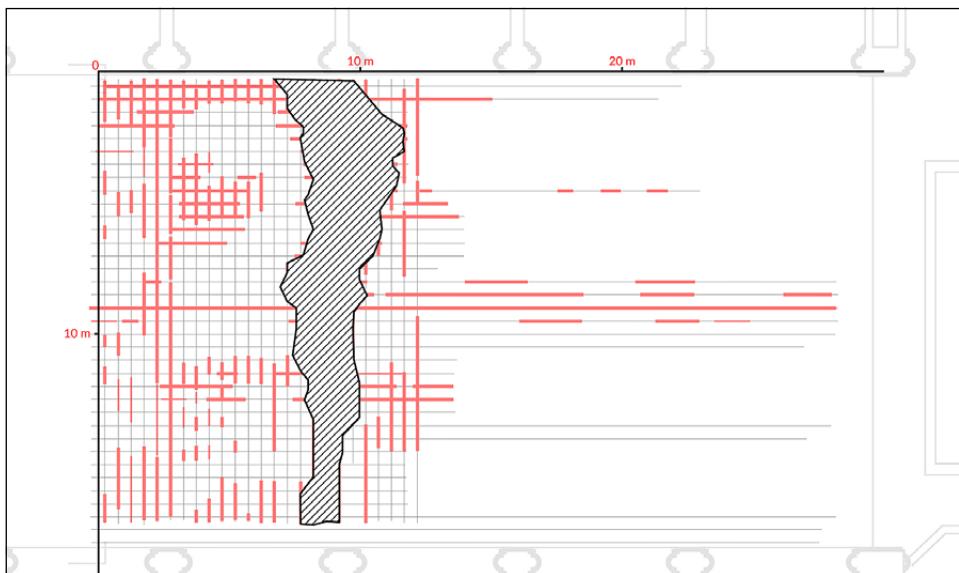


Fig. 9 – Map of areas with greater number of targets.

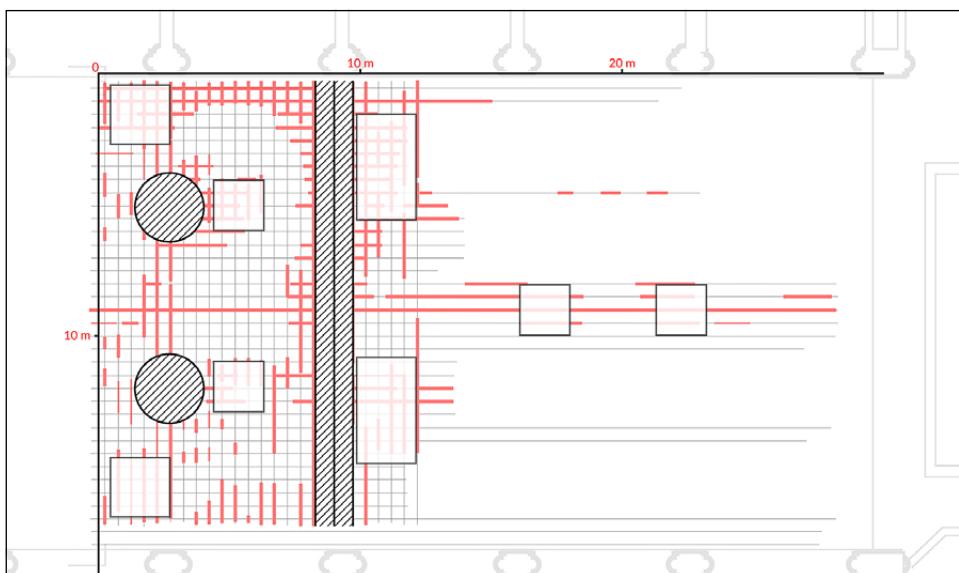


Fig. 10 – Characterization of areas with a greater number of targets.

122 radargrams, relative to their position in relation to the zero point of the grid, are displayed three-dimensionally in 3D Viewer-GRED HD in order to verify the coherence of possible masses through simultaneous interpolation of multiple sections (Fig. 7).

All the lines were then represented on plan and referred to the geometric survey of the church, producing a representative target map of the possible underground elements (Fig. 8).

Finally, based on the occurrences and proximity of targets in some areas, the return signals and the ripples of radargrams, were verified.

Using a map of targets on a CAD-drawn plan, we highlighted the areas with a higher and more intense concentration of underground disruptions (Fig. 9). With this evidence, the historians, working closely with the architects, were able to generate the hypothetical reconstruction (Fig. 10).

## 5. MAKING VISIBLE THE “INVISIBLE”: THE RECONSTRUCTION OF THE CHOIR SCREEN

The radar scans conducted in June 2016 covered a 16×6 m rectangular area between the mid-point of the 6<sup>th</sup> and 8<sup>th</sup> bays of the nave. As previously outlined by Repola (Section 4), a grid was formed on the surface of the pavement, providing a scanning path for the geo-radar instrument. These data points were then processed and subsequently mapped out on a plan of the basilica (Fig. 11): the black lines represent areas of concentrated material, most likely stone, which are located roughly 0.5 m underground. The grey lines represent sections where no noteworthy data points were deciphered.

The most significant form is discernible between the 7<sup>th</sup> and 8<sup>th</sup> bays of the church (disruption 1 – highlighted in dark grey). This is evidence of a substantial foundation that traverses the width of the nave, and roughly intersects with the base of the adjoining side chapels. Its diameter also closely resembles the width of the chapel pilasters (1 m). This provided compelling evidence for the presence of a considerable structure located above this traversing wall foundation. The second notable feature is the pair of disruptions in front of the traversing wall (disruption 2 - highlighted in light grey), significant both in form and positioning. The foundations not only stop between the 6<sup>th</sup> and 7<sup>th</sup> bays of the church, but also intersect the transverse wall at two equidistant points. This suggested some key findings about the screen:

- 1) it was probably a transversal wall which split the nave in two;
- 2) it was divided into three bays;
- 3) it was a deep structure – as deep as the side chapels;
- 4) it probably included two side chapels and a central opening towards the altar;
- 5) and it probably incorporated a vaulting system.

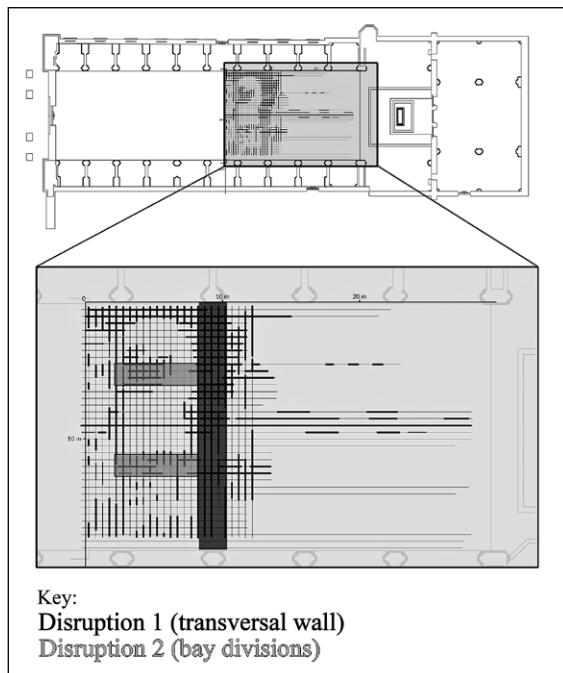


Fig. 11 – GPR data plotted on a church plan.

Based on this evidence, we created a preliminary hypothesis consisting of a deep, three-bay structure located between the 7<sup>th</sup> and 8<sup>th</sup> bays of the church (Fig. 1), a position that correlated with the two significant entrances into the church:

- 1) the door from the Franciscan cloister in the 9<sup>th</sup> bay of the western flank (positioned two bays behind the hypothetical screen);
- 2) the lay side entrance to the church in the 6<sup>th</sup> bay on the eastern flank (positioned a bay in front of the hypothetical screen).

Additional evidence visible in the church supported the creation of our hypothetical model. Thanks to the point cloud model, we acquired accurate measurements of the building that revealed a correlation between the dimensions of side chapels (around 6 m) and the width of the nave (around 18 m). This supports a hypothesis of a three-bay structure, as indicated by the geo-radar data. It also suggests that the nave chapels were consistent with the design of the screen, both structurally and visually. The resulting effect would have created a visual continuity within the church, with the pattern of arches producing a seamless transition between the choir screen and the side flanks of the nave.

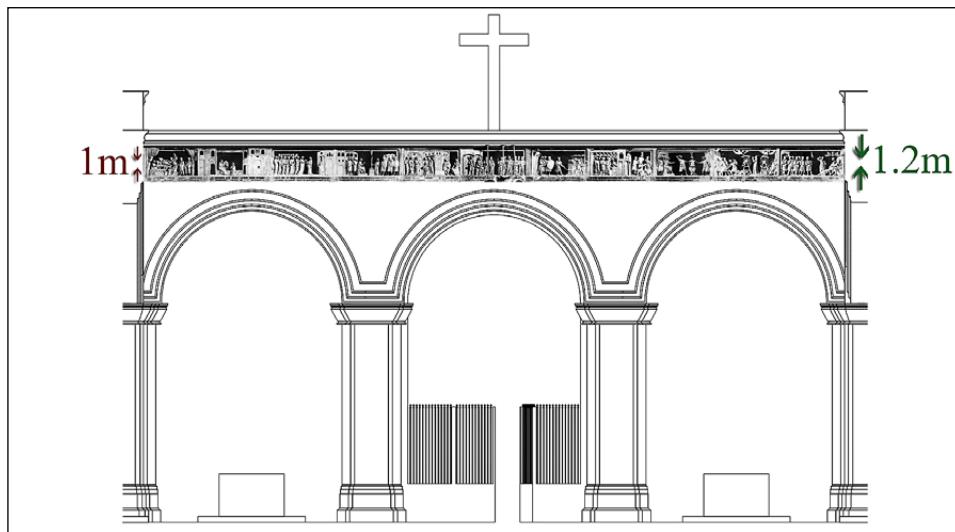


Fig. 12 – Hypothetical screen, measurements of Sta. Catherine reliefs (1 m) and apex of screen (1,2 m).

The GPR, laser, and modelling evidence indicate that the screen would have been an enormous masonry structure, measuring 10 m high to reach the level of the tribune. It would have incorporated two chapel spaces that probably contained important altars dedicated to Saints Francis and Claire (the founding saints of the Franciscan order). These chapels are currently located at the 7<sup>th</sup> bay of the nave, a puzzling position because of their distance from the high altar. Our proposed choir screen provides a strong historical explanation for why the altars are located here: they were once positioned in the two side chapels of the screen for the veneration of the lay public, and rotated 90 degrees when the screen was destroyed.

The scale of the screen would have integrated well with the enormous, barn-like nave of Sta. Chiara. It would also have supported a wide upper tribune to bridge the gallery spaces over the side chapels. In the present configuration of the church these are completely separate from one another, accessible only through independent stairwells at opposite ends of the nave. However, in our model, a screen as tall and approximately as wide as the lateral chapels, provided access across the nave at gallery level, a space perhaps used for sermons, preaching and theatrical liturgical performances.

The proposed height also provides a possible location for the relief panels depicting scenes from the life of Sta. Catherine (Fig. 12). The height of the screen could have incorporated the 1 m tall horizontal relief between the apex of the arches and upper cornice. The relief (located either on the



Fig. 13 – Counter-façade prior to 1943 church bombing showing Sta. Catherine reliefs on a structure similar to the hypothetical screen.

lay or clerical side) would thus have become the crowning component of the screen; a magnificent decorative feature that differentiated the screen and its arches from the rest of the church.

Our hypothesis that the relief was positioned in the upper part of the screen is possibly confirmed by pre-war photographs that show the reliefs on a gallery attached to the counter façade, an architectural structure similar to our model (Fig. 13). This structure was used as a liturgical choir for the Franciscans after the destruction of the original choir screen in the Counter-Reformation. The similarities of these structures is compelling: in addition to the mirrored location of the Sta. Catherine reliefs, the balcony incorporated three bays of comparable dimensions and vaults supported by two free standing piers.



Fig. 14 – View of hypothetical screen (left), hypothetical screen as a visual frame for Robert of Anjou's tomb (right).

The creation of a model of the screen within the church transforms the spatial dynamic of the interior space (Fig. 14). It interrupts the rhythm of the nave chapels and becomes a focal point of the interior. The height of the vaulted chapels and high springing arches neither inhibit the visual thrust towards the high altar nor impede a view of the monumental tomb of Robert of Anjou behind the altar. To the contrary, the alternating open and closed arches enhance the dramatic visual effect of the tomb by focusing attention on the open central axis. The screen therefore acts simultaneously as both a facilitator and as an inhibitor of visual access, an effect that incites a desire for what lies beyond by governing and controlling the visual contact with the sacred.

In addition to its visual impact, the screen probably had a significant liturgical function, acting as a critical site for promoting lay spirituality. While the GPR data revealed traces of fragments of tombs under the pavement, altar dedications, especially by prominent lay patrons, attest to the importance of this area within the church. Most notable are the chapels associated with important individuals and noble families (RULLO 2014, 377). For instance, the tomb of Gagliardo Primario (d. 1348), the master mason attributed with overseeing the construction of Sta. Chiara, was located in the 6<sup>th</sup> bay on the south side. On the opposite side was the chapel shared by the Gianvilla and

Sanseverino families, noted for their devotion to the Franciscan order and for their close ties to the Angevin family (BRUZELIUS 2004, 177-180).

Equally significant is the presence of a coat of arms attributed to the Mansella family on the first two panels of the Sta. Catherine reliefs. These are located within a series of circular shapes in the lower region of the panels and serve as a boundary for the accompanying text for each episode. Similar circles (now, however, devoid of any heraldry) are visible along the length of the entire set of twelve panels, although it is not clear whether they contained the Mansella coat of arms or those of other families. This heraldry also correlates to the location of the Mansella chapel in the first bay beyond the screen on the left side, as well as documentary evidence of Tommaso Mansella's tomb being located in the church.

GPR technology has enabled the recovery of a crucial element of this monumental church. The evidence changes our perception of how the building would have functioned and been experienced in its original context. The geo-radar data permitted the creation of a hypothetical 3D model of the screen, making tangible its profound visual and liturgical impact. This "rediscovery" now offers the opportunity to explore new aspects at Sta. Chiara as well as re-examine pre-existing research in a new light.

## 6. DALL'INDAGINE STORICA ALLA CREAZIONE DI UN MODELLO TRIDIMENSIONALE INTEROPERABILE

La ricostruzione del passato da parte degli storici si è sempre basata su fonti materiali, scritte, orali; negli ultimi anni però, con lo sviluppo delle nuove tecnologie, sono subentrati ulteriori strumenti in grado di fornire delle risposte ai molti quesiti che la storia pone. La sfida è stata prendere in considerazione strumenti informatici e tecnologici e andare alla ricerca di un'interoperabilità tra di essi che permetesse di dialogare con la ricerca storica all'interno dell'arco temporale di tre mesi.

In particolare la scelta di utilizzare un software BIM di modellazione parametrica, in questo caso Revit, ha permesso di analizzare in tempi brevi le varie ipotesi relative alla forma e alla dimensione dell'ipotetico tramezzo e ha dato la possibilità di esplorare il mondo della realtà aumentata e virtuale, al fine di trovare maggiori conferme della ricerca svolta e di avere uno strumento di conoscenza fruibile a un pubblico più vasto. Sovrapponendo i dati della chiesa di Santa Chiara provenienti da laser scanner, si è potuto ricostruire all'interno di un software di modellazione BIM il manufatto con le dimensioni corrette, e non basate su vecchi rilievi. Si è scelto di optare per questo strumento poiché permette la creazione di oggetti parametrici facilmente modificabili attraverso la definizione dei parametri ad essi associati al fine di adattarsi al meglio alle fasi dello sviluppo della ricerca storica. Inoltre è stato possibile

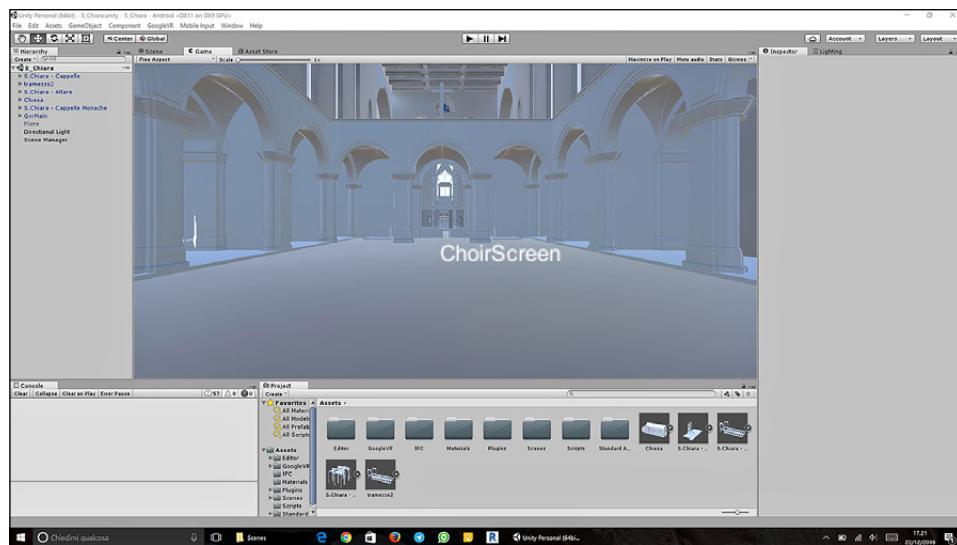


Fig. 15 – Il modello della chiesa di Santa Chiara inserita all'interno del motore grafico Unity con la sua interfaccia.

mantenere un costante controllo della modellazione dello spazio attraverso l'utilizzo di viste 3D all'interno del modello. L'uso di uno strumento BIM ha permesso anche di elaborare un catalogo di tipologie dei vari elementi come monofore, bifore e trifore, grazie alla possibilità di modellare i diversi tipi attribuendo loro caratteristiche geometriche e non.

La modellazione attraverso software BIM della chiesa di Santa Chiara e del suo ipotetico tramezzo è stata effettuata di pari passo con il progredire della ricerca storica sul manufatto, ma non si è limitata a sviluppare un modello che potesse corroborare le ipotesi storiche. Infatti, fin dall'inizio, e da qui la scelta di questo tipo di software, l'intenzione è stata quella di importare il modello all'interno dell'ambiente della realtà virtuale. La possibilità di esportare dati grafici e informazioni non geometriche in un motore grafico come Unity (Fig. 15) è stata fondamentale per avere un modello interattivo della chiesa di Santa Chiara. Oltre alla possibilità di prendere visione degli spazi architettonici attraverso l'uso di mouse e tastiera, si è potuto osservare il manufatto con o senza l'ipotetico tramezzo e interagire con gli elementi architettonici per conoscere le informazioni ad essi associati nella fase di modellazione.

La fase finale del progetto consiste nel trasferimento dell'applicazione creata in Unity a partire dal modello BIM all'interno del DiVE, uno spazio immersivo virtuale presente nei laboratori della Duke University che fa uso della tecnologia CAVE (Cave Automatic Virtual Environment). Tale tecnologia è costituita da



Fig. 16 – Il modello della chiesa di Santa Chiara all'interno del DiVE presso i laboratori della Duke University.

proiettori puntati sulle sei pareti che vanno a comporre una stanza a forma di cubo, una sorta di cinema 3D dove è possibile muoversi al suo interno (Fig. 16).

Proprio al fine di garantire una maggiore fruibilità del modello sviluppato e nell'idea di far conoscere questo progetto anche a tutti quei visitatori che ogni giorno affollano la chiesa di Santa Chiara, si è voluto cercare di riproporre in scala ridotta l'esperienza immersiva. Nello specifico è stata sviluppata un'applicazione per smartphone Android che, attraverso un semplice ed economico dispositivo come il Cardboard, un visore di cartoncino rigido dotato di due lenti focali e un magnete, combinato a un cellulare, permettesse di far arrivare l'esperienza della realtà virtuale a più soggetti, indossandolo semplicemente

come un paio di occhiali. A partire dal modello tridimensionale importato nell'ambiente Unity è possibile trasformare il proprio progetto in VR-ready attraverso l'utilizzo di un pacchetto preconfezionato scaricabile dal sito di Google Cardboard. La codifica all'interno di Unity permette all'applicazione di riconoscere i movimenti della testa in modo che la vista all'interno del visore possa seguire i movimenti dell'utilizzatore. È stata poi aggiunta la possibilità di interagire direttamente con il modello che permette, attraverso l'utilizzo del tasto capacitivo, di passare dalla vista con l'ipotesi del tramezzo di Santa Chiara a quella della chiesa odierna.

Lo studio delle possibili applicazioni delle nuove tecnologie a servizio dell'indagine ha portato successivamente allo sviluppo di una applicazione, sempre per Android, che facesse uso della realtà aumentata. Sempre partendo dall'ambiente Unity e integrando all'interno del software il pacchetto VUFORIA, è stato possibile creare un'applicazione che permettesse, attraverso l'utilizzo della fotocamera dello smartphone, di riconoscere l'immagine della pianta di Santa Chiara e di sovrapporre a tale immagine il modello tridimensionale della chiesa: in questo modo, ruotando e spostando lo smartphone attorno all'immagine, è possibile esplorare il modello nello spazio reale attraverso il filtro dello schermo del cellulare. Il risultato ottenuto è prova di come sia possibile avere una modello che unisca dati geometrici provenienti da laser scanner con dati storici basati su ipotesi di forme e dimensioni di elementi non più esistenti e come esso possa essere strumento di valorizzazione di un manufatto storico attraverso la realtà virtuale e aumentata. L'uso di un software BIM ha permesso in una prima fase di aiutare gli storici nella elaborazione di informazioni tecniche e di dati scientifici, e in una seconda fase ha permesso, grazie all'interoperabilità di questo strumento BIM, la visualizzazione del manufatto con l'ipotetico tramezzo all'interno della realtà virtuale per verificare se le ipotesi avanzate potessero essere conformi o meno con l'esistente.

Il lavoro svolto è in realtà un progetto in continuo divenire, che ha come fine ultimo quello della divulgazione della ricerca storica anche attraverso mezzi non convenzionali quali sono appunto la realtà aumentata e la realtà virtuale. In conclusione la scelta iniziale di preferire un software BIM ad altri di semplice modellazione è proprio dovuta al fatto che la sua natura parametrica e la sua interoperabilità permette di sviluppare al meglio un progetto come questo che è e sarà oggetto di continue revisioni ed evoluzioni, attraverso un processo dinamico che si dirama in molteplici direzioni.

## **7. CONCLUSION: TECHNOLOGY AS A FORM OF HISTORICAL REASONING**

The development of models and visualizations is an important component of the intellectual process. In our study, the creation of a model based on evidence derived from geo-radar and a laser scan generated a convincing

hypothesis for the choir screen of Sta. Chiara. The model, in turn, stimulates numerous reflections, some of which emerged most powerfully when it was experienced in a virtual full-scale immersion environment. At this point the research team became aware of several topics for further reflection and research:

- 1) the wide central gallery of the choir screen united the two sides of the church, creating a new raised area for liturgical and state ceremony;
- 2) the central opening of the choir screen served as “visual funnel” that focused attention on the tomb of Robert the Wise at the far end of the church;
- 3) the experience of the dimensions of Robert’s tomb in relation to the choir screen suggests that the height of the tomb was perhaps conceived in relation to the pre-existing *tramezzo*;
- 4) the choir screen may have been incorporated into state ceremonies, such as coronations. Thus the reader may be able to imagine that prior to its partial destruction in 1943, the image of King Robert enthroned with orb and scepter in the highest part of the tomb existed in a dialectical relationship to the choir screen and as the locus of the scenography of royal ritual and possibly coronation (Figs. 1, 14).

Although the model, as well as any conclusions, remain of course hypothetical, and may change with the discovery of new evidence (if such can be found), identification of the location and the hypothetical reconstruction present important additions to knowledge about this major building. The 3D model not only permits preliminary reflections on the spatial, liturgical and social organization of the interior of the church, but also serves as an experimental setting for fragments of sculpture, including the Sta. Catherine relief. The research team hopes that the model may become a point of departure for further discussion, debate, and experimentation, as well as a stimulus for new research by others.

It is important to conclude with a few brief statements on the benefits of new technologies and Digital Humanities. In our project, technology generated new knowledge (the geo-radar and laser scans) that allowed the development of a 3D model and permitted, indeed *incited*, new reflections on the spatial organization of the church, a topic that includes the sites of special veneration, and possible new research on patronage and burials.

There are, in addition, several distinct benefits to the application of modern visualization technology to historical questions. Models are of course used in many disciplines (medicine, economics, finance, and engineering, to name only a few) to achieve insights that would not otherwise be possible. The benefits of models apply every bit as much to art history and to the other humanities, as they enable us to imagine a contingent, or possible, past, one that no longer exists, one that may have conditioned the position and character of what does remain.

The use of technology requires the collaboration of experts in a variety of disciplines, and with different types of expertise, from that of the historian. In the case of our project, no single individual working alone could have accomplished what was achieved as a team. This kind of work, deeply embedded within disciplinary expertise, yet at the same time using technology to expand research questions, is the wave of the future for certain kinds of problems. Technology and its benefits drive us to work together, and this will in time change notions of authorship and individual research.

Finally, technology used in the history of art and material culture can engage the public through the creation of publicly accessible websites and Apps. In a world that often seems to ignore the humanistic disciplines, public-facing digital projects in the forms of models, animations, and apps, offers new means of public involvement in historical research.

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## REFERENCES

- APOLLONIO F.I. 2010, *La modellazione digitale*, in G. BRAGHIERI (ed.), *Architettura 38. Aldo Rossi. Due progetti*, Bologna, CLUEB, 13-17.
- BERTOCCI S., PARRINELLO S. 2015, *Digital Survey and Documentation of the Archaeological and Architectural Cities*, Firenze, Edifir.
- BIANCHINI C. 2012, *Rilievo e metodo scientifico*, in L. CARLEVARIS, M. FILIPPA (eds.), *Elogio della teoria. Identità delle discipline del disegno e del rilievo*, Roma, Gangemi Editore, 391-400.
- BRUZELIUS C. 1992, *Hearing is believing: Clarissan architecture, ca. 1213-1340*, «Gesta», 31, 2, 83-91.
- BRUZELIUS C. 2004, *The Stones of Naples: Church Building in Angevin Italy 1266-1343*, New Haven-London, Yale University Press.
- BRUZELIUS C. 2014, *Preaching, Building, and Burying. Friars in the Medieval City*, New Haven-London, Yale University Press.
- CARBONARA G. 2012, *Disegno e documentazione per il restauro: un impegno interdisciplinare*, «Disegnare CON», 5, 10, 9-20.
- CLINI P. 2008, *Il rilievo dell'architettura, metodi, tecniche ed esperienze*, Firenze, Alinea Editrice.
- D'AURIA S., DE FEO E. 2017, *La chiesa di Sant'Eligio al Mercato a Napoli. Storia, indagini documentarie, rilievi, analisi critica*, Salerno, CUA.
- DOCCI M., GAIANI M., MIGLIARI R. 2001, *Una nuova cultura per il rilevamento*, «Disegnare Idee Immagini», 23, 37-46.
- D'OVIDO S. 2015, *Osservazioni sulla struttura e l'iconografia della tomba di re Roberto d'Angiò in Santa Chiara a Napoli*, «Hortus Artius Medievalum», 21, 275-312.
- JUNG J.E. 2000, *Beyond the barrier: The unifying role of the choir screen in Gothic churches*, «The Art Bulletin», 82, 4, 622-657.
- JUNG J.E. 2012, *The Gothic Screen: Space, Sculpture, and Community in the Cathedrals of France and Germany, ca. 1200-1400*, Cambridge, Cambridge University Press.
- RULLO A. 2014, *Patronato laico e chiese mendicanti a Napoli: i casi di S. Chiara e S. Lorenzo Maggiore*, in F. ACETO, S. D'OIDIO, E. SCIROCCO (eds.), *La Chiesa e il Convento di Santa Chiara. Committenza artistica vita religiosa e progettualità politica nella Napoli di Roberto d'Angiò e Sancia di Maiorca. Atti del Convegno (Napoli 2012)*, Battipaglia, Carlone & Laveglia, 361-384.
- VITOLO P. 2014, «Ecce rex vester». *Christiformitas e spazio liturgico*, in F. ACETO, S. D'OIDIO, E. SCIROCCO (eds.), *La Chiesa e il Convento di Santa Chiara. Committenza artistica vita religiosa e progettualità politica nella Napoli di Roberto d'Angiò e Sancia di Maiorca. Atti del Convegno (Napoli 2012)*, Battipaglia, Carlone & Laveglia, 227-274.

## ABSTRACT

This essay describes the use of Ground-Penetrating Radar (GPR) to establish the location and dimensions of the destroyed choir screen at the church of Sta. Chiara in Naples. On the basis of this new evidence, inserted within a laser scan of the church that provides its exact dimensions, the authors have been able to reconstruct a hypothetical model of the screen's original appearance. The model, if correct, suggests that the choir screen not only contained altars to Saints Francis and Claire (now present in the flanking side chapels), but also that it supported an upper gallery that connected the wide tribunes on either side of the nave. It is hoped that this hypothetical model will stimulate new research on the décor, liturgy, and ceremonial functions of this important Neapolitan church.



ARCHITETTURA MEDIEVALE:  
TIPOLOGIE, FUNZIONI, DECORAZIONI E CONTESTI  
MEDIEVAL ARCHITECTURE:  
TYPOLOGY, FUNCTION, DECORATION AND CONTEXT



## CAROLINGIAN CULTURE AT REICHENAU & ST. GALL

The Plan of St. Gall (hereafter the Plan) (Stiftsbibliothek St. Gallen, *Codex Sangallensis*, MS 1092) is the earliest preserved and most extraordinary visualization of a building complex produced in the Middle Ages (SCHEDL 2014). Drawn and annotated on five pieces of parchment sewn together, the Plan includes the ground plans of some forty structures as well as gardens, fences, walls, a road, and an orchard (Fig. 1). Three hundred thirty three inscriptions identify the buildings and their uses, including a main church, a church for the novices and the ill, a scriptorium, lodgings for visiting monks, a monastic dormitory, refectory, kitchen, bake and brew house, guest house, abbot's residence, and an infirmary, and numerous fields and industrial out-buildings. One of the inscriptions on the Plan itself states that it was designed for Gozbert, the abbot of St. Gall (816-837 C.E.) and the person responsible for building the monastery's great Carolingian church in the 830s.

The pre-history of the digital project focused on the Plan (<http://www.stgallplan.org/>) began in 1998 when Bernard Frischer, then a professor at UCLA and a pioneer in digital archaeology and virtual reality modeling, suggested that it might be possible to create a virtual reality model of the Plan. Initially, we thought that it might be possible to use the elaborate architectural reconstructions of the St. Gall monastic Plan by Walter Horn and Ernest Born ([http://www.stgallplan.org/en/horn\\_born.html](http://www.stgallplan.org/en/horn_born.html)) to create a virtual reality model of the ninth-century monastery (HORN, BORN 1979). At the time, I was Director of the UCLA Center for Medieval and Renaissance Studies, and together with Professor Frischer, I began to look into the possibilities of such a project and the possibilities of finding funding for it. Initially the latter proved impossible: one suggestion provided by UCLA's development office was to attempt a joint venture with a gaming company that would pay for the digital production in return for being able to use the resulting model as the environment for a computer game platform. This proved unrealistic since, at the time, as one gaming industry executive explained, their primary market was children and they saw no value added to creating a scientifically accurate reconstruction (today more realistic digital games attract a more mature and educated audience).

We thus dropped the idea for several years until the Andrew W. Mellon Foundation's Donald J. Waters, the Senior Program Officer for Scholarly Communications, expressed interest in a digital project within the scope of that division that seeks to use digital technologies to expand and equalize access to cultural and scholarly resources across sectors of society. In 2003, we received a grant from the Mellon Foundation in the amount of \$24,000 to

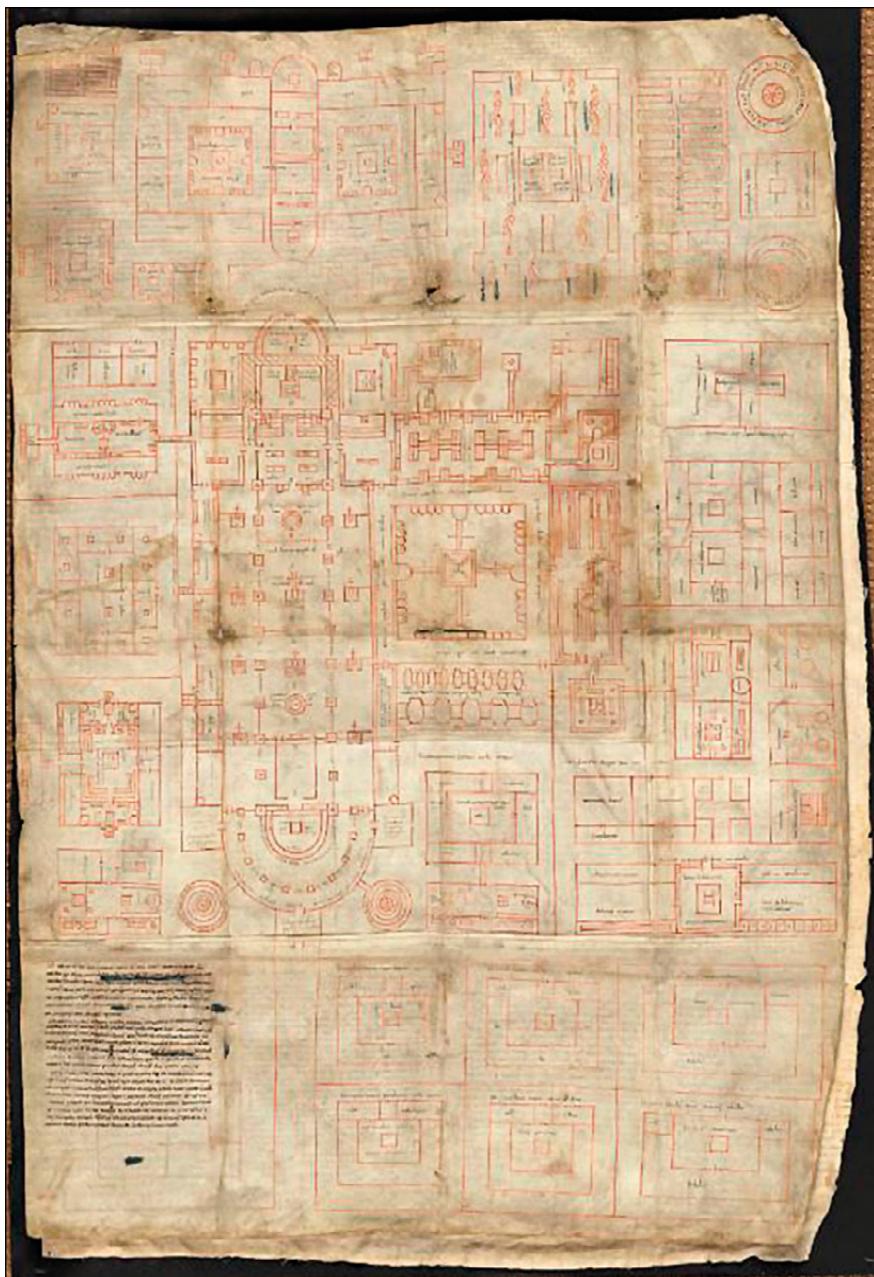


Fig. 1 – The Plan of St. Gall. Stiftsbibliothek St. Gallen, *Codex Sangallensis*, MS 1092 (reproduced with permission of the Stiftsbibliothek St. Gallen).

explore the possibility of creating a virtual reality version of the manuscript with related digital scholarly databases. With this grant, we were able to begin a serious evaluation of the potential of digital approaches to the study of the Plan and subsequently received funding for the first phase of what became the Stgallplan.org website. Hans Rutimann, a Senior Advisor at the Mellon Foundation, began to follow the project and provided invaluable advice throughout both phases.

Early on in the project, we reached a major conclusion, namely that constructing a virtual reality model of the St. Gall Plan based on the architectural renderings of Horn and Born was not only impossible but also ultimately undesirable. The Plan, we realized, is not an architectural rendering of a complex of buildings as they ever existed or perhaps were meant to exist. The Plan provides no elevations; it does not indicate materials, wall dimensions, roofing, or any structural information. Nor does the layout of the buildings correspond to a realistic geographical arrangement. The individual buildings are not placed in a real space and the layout does not correspond to the actual terrain of the river valley in which St. Gall is located, but simply placed in approximate distance one from the other in order to include as many as possible within the dimensions of space created by five parchment sheets. While the suggestions by Horn and Born of what such buildings might have looked like are an impressive feat of erudition and imagination, the latter is more powerful than the former and offers but one way of imagining the monastic complex. More importantly, we realized that the scholarly consensus concerning the Plan has largely rejected the hypothesis advanced by Horn and Born that it represented a standard model for Carolingian monasteries emanating from the imperial court that was to be carried out across the Empire. Rather it developed in stages at the monastery of Reichenau, as can be seen in the changes in the drawings themselves, and should be seen more as an imaginative reflection on what an ideal monastery might have contained than as a builder's blueprint. We thus decided that if we were to attempt to build a virtual reality model of the complex we would be participating in a deception – inviting the user to experience an imaginary building complex as though we were presenting what a monastic complex actually was in the ninth century.

One of our earliest advisors on the project, Eric Fernie, made an additional observation, one that came to guide the entire project. He observed that there were two fundamentally different types of Digital Humanities projects. The first was a project that offered a wide public the opportunity to experience a past reality virtually. Such projects could be innovative and educational, and their production might demand considerable scholarly investment. However, they were not actually tools for generating new knowledge about a topic. The second type of Digital Humanities product was one that aimed to produce

a research tool – one that would allow scholars to conduct experimental or scholarly analysis and thus generate new knowledge not otherwise available through traditional textual methodologies. If our goal was the former, that is, to create an exciting and novel experience for students and the general public, he wished us well but wanted no part in it. If, on the other hand, it were to be a genuine tool of scholarly research, then he would be interested in participating in the enterprise. Of course, as Fernie well knew, these two purposes are more poles on a continuum than diametrically opposed possibilities, but we determined early on to be sure that we were developing a set of digital tools that would advance our understanding of Carolingian monastic culture and not simply a digital environment in which to experience it.

The actual project took place in two separate phases with two objectives and two different project directors. Under the guidance and supervision of project director Dr. Barbara Schedl, we began to develop a realistic approach to the first phase of our project, which we defined as a series of interrelated models, high-resolution, manipulatable images, and databases that allow the user to study the Plan and, through it, the material culture of Carolingian monasticism. The key element was the creation of an extremely high-resolution photograph of the recto and verso of the Plan itself. We were extremely fortunate to obtain the unlimited support and assistance of the Director of the Stiftsbibliothek St. Gallen, Professor Ernst Tremp, and his assistant, Dr. Karl Schmuki. Together they gave us unprecedented access to the Plan itself for high-resolution photographs and supported the project throughout its entire history.

By the time that the project was actually under way, Professor Frischer had taken a position at the University of Virginia, and as a result this university's Institute for Advanced Technology in the Humanities (IATH: <http://iath.virginia.edu/>) developed the software and interface under the direction of Professor Worthy Martin.

The completed first phase was composed of the following elements.

First, we provided online access to the extremely high-resolution scans of the Plan itself, both recto and verso (Fig. 2). The size of the Plan, whose five pieces of parchment sewn in a whole has the dimensions of 112x77.5 cm, posed the challenge of presenting both an impression of the entire Plan and sufficient detail for scholarly examination of the drawing elements, the textual notations, minute markings, parchment and stitching textures (Fig. 3). We took grids of images (six rows of five each) with a digital camera and "stitched" them together into two individual images. The resulting resolution is approximately 180 pixels/cm (470 pixels/inch) over the whole manuscript, yielding an image file 1GByte for each surface. The original photography and stitching were done by Rudolf Gschwind and Lukas Rosenthaler, Imaging & Media Lab, University of Basel (<http://dhlab.unibas.ch/>). Of course, such an

**Carolingian Culture at Reichenau & St. Gall**

Codex Sangallensis 1092: Content and Context

[Site Home](#)
[About the Project](#)
[Search](#)
[Resources](#)
[Explore the Plan](#)
[Library](#)
[Deutsch](#)

### The Plan of St. Gall

The Plan of St. Gall is the earliest preserved and most extraordinary visualization of a building complex produced in the Middle Ages. Drawn and annotated on five pieces of parchment sewn together, the St. Gall Plan is 112 cm x 77.5 cm and includes the ground plans of some forty structures as well as gardens, fences, walls, a road, and an orchard. Three hundred thirty three inscriptions identify the buildings and their uses, including a church, a scriptorium, lodgings for visiting monks, a monastic dormitory, refectory, kitchen, bake and brew house, guest house, abbot's residence, and an infirmary, and numerous fields and industrial out-buildings.

**Codex Sangallensis 1092**

recto
verso




Click on an image to get a higher resolution Zoomify (in a new window).

#### Why was it made?

One of the inscriptions on the Plan itself states that it was designed for Gobert, the abbot of St. Gall (816-827 A.D.) and the person responsible for building the monasteries great Carolingian church in the 820s. The donor, probably Hatto, the abbot of Reichenau (806-822), explains that the purpose of the Plan is for Gobert to "exercise your ingenuity and recognize my devotion", suggesting that the Plan was not a blueprint in the strict sense. Furthermore, the design does not fit the actual terrain of the river valley in which St. Gall is located, nor does the Carolingian church of St. Gall reflect the design of the church on the Plan. These facts have caused scholars to see the Plan as a generic solution for the ideal monastery. When, why and how this ideal was developed has been the focus of Plan research during the last fifty years.

While our inability to pinpoint the Plan's author and his motivation is frustrating, the conclusion that the Plan was not created for a specific time and place paradoxically makes it more valuable: the Plan might be fairly characterized as a two-dimensional meditation on the ideal early medieval monastic community, created at a time when monasticism was one of the dominant forms of political, economic, and cultural power in Europe.

#### What's on our site?

This site will provide access to the results of our long-term project of creating an extensive data base to aid research into the Plan and Carolingian monastic culture. Besides a variety of digital representations of the Plan itself, the site includes a graphic representation of how the Plan was physically made, detailed information on each of the elements of the Plan, and transcriptions and translations of its inscriptions. In addition, the site contains resources for understanding the material culture context of the Plan. A series of extensive data bases include one presenting physical objects found across Europe that add to our understanding of Carolingian monasticism, one devoted to the terminology of Carolingian material culture, descriptions of all known Carolingian religious edifices, and an extensive bibliography on both the Plan itself and Carolingian monastic culture generally. All these databases are searchable individually and collectively.

Fig. 2 – Portal to Plan images and databases.

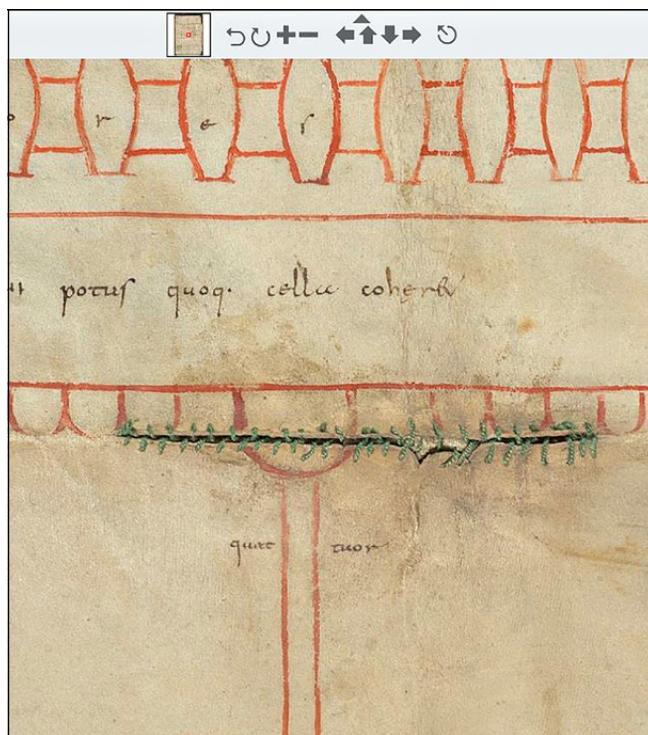


Fig. 3 – Zoomified view of Plan.

image is too large for convenient display via the web, so we used Zoomify to create numerous versions of the overall image (each at a different level of resolution) and to “tile” each level for efficient, interactive pan and zoom displays of the Plan. This technology also makes it possible to zoom into any portion of the manuscript, rotate it in any direction, and move across the entire manuscript at the same magnification, without actually downloading the entire image.

Second, we conceptualized the Plan as having 45 separate plan components, e.g., the Church, the Cloisters of the Novitiate, the Kitchen, Bake and Brew House for Guests, etc., with each having sub-components, e.g., the Nave, Cloister of the Novices, and the Cooling room for Beer, respectively, comprising over 1000 separate elements in all. For each element we provided a close-up image with the name of the element, the Plan Notation (in Latin and English) evident in the component, any Rule of St. Benedict (if any) relevant to activities transpiring in the component, and Literature reference(s) relevant to the component.

To provide access to this extensive analysis of the architectural components of the Plan, we created two interactive methods. One is a map of the Plan having pan and zoom options with each of the 45 plan components outlined by a rectangle. As the cursor moves over these rectangles, the name and notations are presented. Clicking on the rectangle for a component causes the map to zoom to the bounded area and present the rectangles for the sub-components. Again, moving the cursor over the areas displays name/notations, but in this case, clicking on the rectangle creates a new window with the specific close-up image and detailed information. The other access method is via a textual search (of Latin or English or both) of the notations recorded for the plan components which provides a search term results in a list of the plan components that contain that term with the list displaying the name, Latin notations, English translations, and a thumbnail image of the associated part of the Plan. Clicking on the thumbnail yields the new window with detailed information.

In addition to the databases specifically drawn from the Plan, we created a series of other databases that contextualize the information on the Plan and allow one to explore Carolingian monastic material culture. These include a database of objects and architectural components excavated from Carolingian era monastic sites; a database of the vocabulary of material objects taken from a wide variety of Carolingian texts; and ground plans, brief information, and bibliography on Carolingian era churches in German speaking regions of Europe.

We then created a series of search engines to explore the Plan, its components, notations, and the objects, vocabulary, and architectural databases. The first provides a drop down list of plan components, which takes one to the specific portion of the Plan. A second takes one to the specific plan notations with Latin and English (or German), which can then take the user to a detailed, zoomable image of the relevant portion of the Plan. Two other search engines allow one to search simultaneously the Plan and the material culture, architectural, and object databases. One provides a list of major terms in English or German; the other is a free-form search that can find any term in English, German, or Latin in these three databases.

The site also contains additional resources for the study of Carolingian monastic culture. These include a link to the rule of Benedict and a bibliography of primary and secondary literature on Carolingian history and culture. It also includes the Latin text of the widely circulated Commentary on the Rule of Benedict by Hildemar, a ninth century exposition of practices common to contemporary Carolingian monasticism; the complete text of Walter Horn and Ernest Born's study of the Plan, and Werner Jacobsen's *Der Klosterplan von St. Gallen und die karolingische Architektur*.

Finally, the site contains several elements to help understand the history of the manuscript itself and its preservation and analysis through the centuries. To illuminate the processes by which the Plan might have been created, we

designed an interactive HTML display to allow one to investigate a collection of hypotheses about the sequence of steps in that process. A step-by-step graphic shows how the Plan was actually constructed, beginning with a single sheet of parchment, the preliminary drawing, and moving to subsequent additions of sheets as additional components were added. Since the exact order is uncertain, the graphic allows the user to explore different scenarios of how this process might have taken place. We also provided a means to understand how the Plan was folded for storage among manuscripts at St. Gallen. We modeled the overall parchment as a surface in 3D animation system, Maya. We “textured” the surface with images of each side of the Plan, and then deformed the surface to correspond to folding actions that turned the multi-part parchment into a manuscript-sized unit.

Finally, the site contains images of the 2D models of the Plan drawn since 1876 and provides manipulatable 3D images of the five attempts to create physical models of what the monastery might have looked like had it actually been constructed according to the Plan. To present those models we created Quicktime Panoramas that allow one to view interactively all visual perspectives of the extant models.

The personnel involved in this first phase at UCLA consisted in addition to the co-Principal Investigator, one full time Project Manager for three years, Dr. Barbara Schedl, and seven half-time graduate research assistantships spread over two years. These were held by Melissa Cocks, Hannah Friedman, Leanne Good, Jennifer Ng, Ned Schoolman, Erica Westhoff, and Sarah Whitten. At the University of Virginia the personnel were, along with the co-Principal Investigator, a project leader, Professor Worthy Martin, working at 75% for two years and at 40% in the third year of his IATH effort, and a support staff member who worked at 70% for the first two years and at 40% the final year. Additional expenses included hardware, software, a digital camera and camera stand for photographing the Plan, consultant fees, and travel to St. Gall. The total budget came to \$1.065.215.

For the first phase of the project, various technologies were used in the development of the overall information architecture: Javascript, CSS, and Ruby-on-Rails. The technical team at the University of Virginia initially maintained that multifaceted information architecture for several years while the planning for Phase Two was carried out. As Phase Two began implementation, that team then worked closely with the new technical team at UCLA to make the transition from Phase One to Phase Two manageable and to test thoroughly the new implementation to assure successful transition.

Phase One of our project provided a tool for studying the material environment of Carolingian monasticism. During the course of a feasibility study for the second phase, funded by the Mellon Foundation in the amount of \$493.000, we determined to concentrate on the intellectual and textual

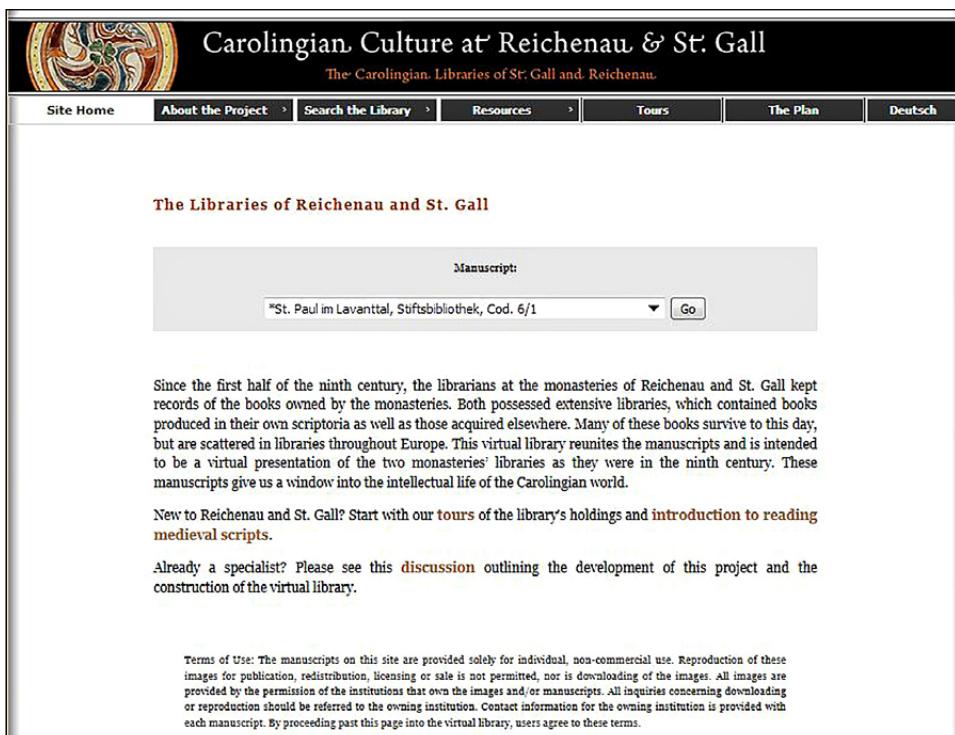


Fig. 4 – Portal to Manuscript images and databases.

aspects of the Plan and of monasticism. It accomplished this by identifying and providing access to the contents of the specific manuscripts containing the texts that informed the world of those who produced the Plan, and those for which the Plan was prepared (Fig. 4). The Plan was produced at the island monastery of Reichenau, and thus we sought to include as many Reichenau manuscripts from the ninth century as possible. Since the Plan was intended for St. Gall, we likewise sought to include all extant ninth-century St. Gall manuscripts so that one could understand the intellectual milieu in which the Plan was studied and preserved. Catalogues of the library holdings of these two monasteries exist from the ninth century and many of the actual manuscripts that they list are still extant and can be identified. Approximately 95 manuscripts at the monastery of Reichenau that appear in its transmitted catalogues from the ninth century have survived into the twenty-first century. Since the suppression of the monastery, these have been scattered across Europe. Most of them are in Karlsruhe, but isolated manuscripts from the catalogue have been found across Europe and in the US. Approximately 81

extant manuscripts have been identified as those listed in the catalogues of St. Gallen. Most are still in St. Gallen, although a few are currently elsewhere in Switzerland, Europe, and the US. We determined to digitize as many of these Reichenau and St. Gall manuscripts as we could, as well as providing detailed metadata on the manuscripts themselves, their content, and literature on the codicological history of the manuscripts.

This phase of the project was conducted entirely at UCLA, with the software design being produced by the Digital Library Project at UCLA directed by Stephen Davison. Dr. Julian Hendrix was the project coordinator for this phase of the project. His responsibilities included the identification of extant manuscripts from the two institutions, obtaining permissions for their digitization when possible, coordinating the actual digitizing, the preparation of metadata for each, and the elaboration of the hypertext. In this he was initially assisted by graduate research assistants. After UCLA changed its funding requirements for graduate assistance in ways that were incompatible with the conditions specified by the Mellon Foundation, the project hired postdoctoral researchers who completed the work.

At the same time that our project was beginning, Professor Christoph Flüeler was beginning his project E-codices, a virtual manuscript library of Switzerland (<http://www.e-codices.ch/en/>). Since the St. Gall manuscripts were to be an important part of this project, we were able to provide funding for his team to digitize the ninth-century St. Gall manuscripts for both projects. Thomas Aigner, Director of the Diocesan Archives of St. Pölten, Austria, and director of Monasterium.net (<https://icar-us.eu/cooperation/online-portals-monasterium-net/>), had developed a mobile digital platform for photographing medieval manuscripts and we were able to contract with him to digitize manuscripts from other institutions lacking their own photographic facilities. In each case, as in the Badische Landesbibliothek in Karlsruhe, we provided institutions with copies of the images, making it possible for them to put digital images of their manuscripts on their own Internet sites. We had anticipated that our contribution of these images would be acknowledged on the institutions' websites, but unfortunately, this was rarely done. Ultimately, we were able to digitize 170 manuscripts from Bamberg, Trinity College, Cambridge, Einsiedeln, Geneva, Karlsruhe, Leiden, London, Naples, Paris, Schaffhausen, St. Gallen, Zurich, Stuttgart, Vienna, Wolfenbüttel, and St. Paul im Lavanttal. Regrettably, a few institutions holding Reichenau and St. Gall manuscripts declined to allow us to include their manuscripts in the project. An additional criterion for selection of Reichenau and St. Gallen manuscripts when we had to make a choice was to digitize manuscripts held in libraries that were difficult to access or unlikely to be digitized by other large projects such as e-Codices. Thomas Aigner's mobile photography laboratory was particularly invaluable in accessing manuscripts from smaller institutions.

The core of the database consists of these manuscripts. Although some institutions required that we simply mirror the images of their manuscripts already available on their own Internet sites, for the most part the images reside at the UCLA Digital Library. Once the team had obtained the images, the UCLA Library used the Text Encoding Initiative P5 Guidelines to develop a method for encoding scholarly description and page facsimile information for each manuscript. The TEI standard uses eXtensible Markup Language (XML) to represent information in machine-readable and interoperable manner for long-term use, and in particular it has a detailed chapter related to manuscript description. The XML files for each manuscript provided structured data that was then transformed using eXtensible Stylesheet Language Transformations (XSLT) to create a web interface that presented the scholarly description and allowed for user to page through the manuscripts as well as click on any of the enumerated works in the scholarly description to skip forward to the relevant folio in the manuscript. The images and XML files are managed in a relational database (Oracle 10g) with a web application that provides an administrative interface to allow non-technical staff to upload new files, make corrections, and review data before publication. The database schema and web application were custom-developed to serve as the digital library infrastructure for the UCLA Digital Library. It was designed in 2005 and built actively during the period of 2006-2009. At present, the UCLA Library is planning to migrate content to a new digital library infrastructure, and the St. Gall Virtual Library will be one of the many projects that will be migrated during the next two years.

As in Phase One, we decided to use Zoomify as the primary interface for two reasons. The first is practical: while it allows one to see a low-resolution image of a whole folium, it also allows one to zoom to see the finest details in the manuscript. The other was in order to protect the rights of the libraries where the manuscripts are deposited. While some libraries readily make high-resolution scans of their manuscripts available, others would have required very high licensing fees to allow us to provide access to high-resolution images of whole manuscripts. With Zoomify, one may examine manuscripts in detail, but it is not possible to download whole manuscripts or even whole pages. Users who wish to have such images must contact the libraries directly.

The metadata for each manuscript (Fig. 5) consists first of a table of contents, with hyperlinks to the folio in the manuscript on which each text begins and includes incipits and explicits taken directly from the manuscripts. The contents were determined not simply by copying existing catalogue entries, some of which are out of date, lacunose, or even erroneous, but by independent verification by the team of graduate assistants and postdoctoral researchers. The metadata also include links to standard editions, translations when such exist, and bibliographies for each text. The site provides a description of the

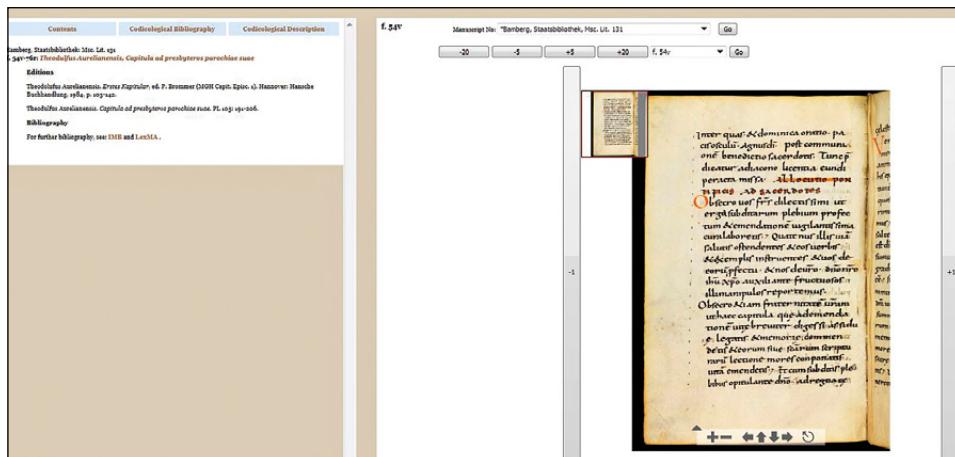


Fig. 5 – Bamberg, Staatsbibliothek, Msc. Lit. 131. Example of manuscript metadata and folio image (reproduced with permission of the Staatsbibliothek Bamberg).

editorial conventions governing collation, titles, incipits/explicits, and index reference numbers. Originally, we had intended to provide transcriptions and translations of the text as well. We do provide links to standard edition of texts but of course these texts do not represent the specific version contained in the manuscript and thus may vary considerably from available editions.

The metadata includes a technical description of the manuscript, its material, dimensions, collation, page layout, script, hands, date, and origins, all according to the current literature. The team did not independently verify date and provenance. Finally, the metadata includes a basic codicological bibliography for each manuscript.

Markup for the metadata was created using custom XML tags created by the staff of the Digital Library designed to conform to TEI standards. The academic staff then had to master XSL, which allowed them to enter the data in such a manner that it could translate the XML for display.

A series of search engines and supplemental resources provide access to the manuscripts. It is possible to search the collection by manuscript or by key word appearing in the metadata.

In addition to the access to the manuscripts and their metadata, this phase also created a series of resources for their study (Fig. 6). These include an introduction to reading Carolingian manuscripts by Richard M. Pollard; links to related digital libraries; and a series of “Tours,” specialized introductions to particular issues related to the manuscript cultures of Reichenau and St. Gall solicited and edited by Dr. Richard Pollard and written by specialists for this project. These include:

The screenshot shows a website page with a decorative header featuring a colorful, abstract design. The main title "Carolingian Culture at Reichenau & St. Gall" is displayed prominently, along with the subtitle "The Carolingian Libraries of St. Gall and Reichenau". Below the title is a navigation menu with links: "Site Home", "About the Project", "Search the Library", "Resources", "Tours", "The Plan", and "Deutsch". The main content area begins with a section titled "An Introduction to Reading Carolingian Manuscripts" by Richard M. Pollard. This section contains text about the nature of manuscripts and their script. It follows with a section titled "Letter Forms and Ligatures", which provides a comparison table between Carolingian script and modern letters. The table lists the following pairs:

Carolingian	Modern
ȝ (rare, usually g)	= g
ƿ	= r
ſ	= s
æ	= ae
œ	= oe
čt	= ct
ſt	= st

Below this is a section titled "Word Separation" with text explaining the historical lack of word spacing in manuscripts.

Fig. 6 – Introduction to Carolingian manuscripts.

- 1) The Libraries and Library Catalogues of Reichenau and St. Gall by Prof. David Ganz, King's College, London.
- 2) Book Production and Illuminations from Reichenau and St. Gall by Prof. Adam Cohen.
- 3) Monastic Life at Reichenau and St. Gall by Dr. Julian Hendrix.
- 4) Carolingian Literature at Reichenau and St. Gall by Dr. Richard M. Pollard.
- 5) Classical texts at Reichenau & St. Gall by Dr. David Butterfield.
- 6) The Use of German in Reichenau and St. Gall manuscripts by Prof. Anna Grotans.
- 7) Reckoning Time at Reichenau and St. Gall: Computistics by Prof. John Contreni.
- 8) Law and Formularies in Reichenau & St. Gall manuscripts by Dr. Alice Rio.

A fundamental condition for funding the second phase was to develop a sustainability Plan to ensure that the project would not become obsolete or “orphaned” over time. At the request of the Mellon Foundation, we hired a consultant to look into how the project might generate sufficient income to pay a part time staff member who could maintain and correct the site as needed. None of the consultant’s suggestions, such as charging for access or soliciting voluntary contributions, proved feasible. However we were able to ensure sustainability for the technical aspects of the project from the assurance of the UCLA Digital Library that it would maintain the website, make minor corrections, repair broken links, and translate the entirety to new platforms should this become necessary in the future. The Medieval Institute of the Austrian Academy of Sciences agreed to undertake future changes in the intellectual content of the site as necessary.

Professor Patrick Geary served as sole PI of the second phase, assisted by Dr. Julian Hendrix and as project manager. Graduate student research assistants Tamar Boyadjian, Kate Craig, Kristina Markman, and Natalia Rusnac undertook preliminary coding and sample manuscript analysis. Henry Chiong, Stephen Davison, Parinita Ghorpade, and Elizabeth McAulay of the UCLA Digital Library designed the software. During the actual phase, Dr. Hendrix served as project manager and manuscript specialists Drs. Richard Pollard and Joshua Westgard analyzed the manuscripts and produced metadata; the latter also edited the Tours mentioned above, and oversaw a redesign of the project website.

During the first phase an advisory committee consisting of Professors Karl Brunner, Eric Fernie, Carolyn Malone, and Werner Jacobsen, helped guide the project. During the second phase, a committee consisting of Professors Karl Brunner, David Ganz, Rosamond McKitterick, and Barbara Schedl provided direction. The budget for the feasibility study was \$493.000. The total budget for Phase Two of the project including the feasibility study was \$1.160.392.50. The UCLA Center for Medieval and Renaissance Studies provided the accounting, personnel monitoring, office space, and other necessary infrastructure for the project through both phases, and the project would have been impossible without the resources of this Center and its staff, particularly Karen Burgess, who administered the project, Benay Furtivo who ensured its financial soundness within UCLA, and Brett Landenberger, who contributed photography and design expertise.

Ultimately, we believe that the St. Gall project accomplished a number of objectives beyond its primary goal of providing a unique research tool for the study of the material and intellectual contexts of Carolingian monasticism. It virtually reunited manuscripts that would never have been reunited otherwise, and thereby made it possible to get a detailed impression of the intellectual environment of Reichenau/St. Gall in the ninth century. It demonstrated the

feasibility of obtaining permissions from multiple libraries as well as the existence of an audience for manuscript text and not only decorative elements. In this way, it may have inspired other, subsequent projects such as the digital recreation of the Lorsch library (<http://www.bibliotheca-laureshamensis-digital.de/en/index.html>). Virtual manuscripts and manuscript collections expand the potential audience for these materials, but they also enable professional scholars to navigate such familiar challenges as the difficulty of studying large manuscripts such as the Plan in detail, travel to distant libraries, the potential damage to manuscripts from repeated handling, and the challenge of comparing multiple manuscripts housed in distant depositories.

Second, it offered a possible solution to the major challenge of sustainability of such digital projects without the necessity of providing continuing funding by splitting, incorporating the hosting of the data at the UC Digital Library while entrusting the scholarly responsibility to the Austrian Academy.

Third, it resolved problems inherent in combining teams of information technologists and humanists to reach a common goal. The necessary collaboration between IT technicians and humanists to identify and solve problems together made the project at once more demanding and more satisfying. In particular, the differences in training and research methods were a routine challenge between the two groups, however rather than seeing this as a problem, it should be recognized as a positive feature of such endeavors. The need for frequent discussions and cross-disciplinary communication enriched the horizons of members of both disciplines. We discovered, for example, that we had budgeted too little for the IT and digital library support in the later stages of the project, while our budget for permissions was greater than we actually needed.

At the same time, the project uncovered challenges in standard approaches to digital texts. For example, we found an important gap in the mark-up created by the Text Encoding Initiative (TEI), which was initially designed for coding printed material with a more stable content than manuscripts. TEI does not sufficiently handle variability within different sections of the same manuscript. This problem, which caused some friction between the scholars creating the metadata and the IT specialists responsible for creating the TEI, points out the impossibility of simply taking technology designed for print culture and applying it to manuscript culture.

A more fundamental and yet unresolved challenge in collaborations such as the St. Gall project remains the conflict between the nature of collaboration in which it is difficult to parse out the contribution of a single individual on the one hand and the need for the assigning of individual credit for professional advancement. This remains a challenge that goes beyond the technical capacities of Digital Humanities and must be resolved at the level of institutions of higher education and research.

### Acknowledgments

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### REFERENCES

- HORN W., BORN W. 1979, *The Plan of St. Gall: A Study of the Architecture & Economy of, & Life in a Paradigmatic Carolingian Monastery*, California Studies in the History of Art 19, I-III Volumes, Berkeley, University of California Press.
- JACOBSEN W. 1992, *Der Klosterplan von St. Gallen und die karolingische Architektur: Entwicklung und Wandel von Form und Bedeutung im fränkischen Kirchenbau zwischen 751 und 840*, Berlin, Deutscher Verlag für Kunswissenschaft.
- SCHEDL B. 2014, *Der Plan von St. Gallen: Ein Modell europäischer Klosterkultur*, Wien, Böhlau Verlag.

### SITOGRAPHY

- Bibliotheca Laureshamensis - digital: Virtual Monastic Library of Lorsch: <http://www.bibliotheca-laureshamensis-digital.de/en/index.html>.
- Carolingian Culture at Reichenau and St. Gall: <http://www.stgallplan.org/>.
- E-codices - Virtual Manuscript Library of Switzerland: <http://www.e-codices.ch/en/>.
- ICARUS (International Centre for Archival Research) - Monasterium.net: <https://icar-us.eu/cooperation/online-portals/monasterium-net/>.
- University of Basel, Imaging & Media Lab: <http://dhlab.unibas.ch/>.
- University of Virginia, Institute for Advanced Technology in the Humanities (IATH): <http://iath.virginia.edu/>.

### ABSTRACT

Carolingian Culture at Reichenau and St. Gall is a digital research tool providing access to the material and intellectual cultures of Carolingian monasteries. The website was produced at the University of California, Los Angeles between 2003 and 2009 with the financial sponsorship of the Andrew W. Mellon Foundation. The first phase focuses on the Plan of St. Gall (CSG 1092) and provides high-resolution imaging of the Plan and related data bases on Carolingian material culture. The second phase reconstitutes virtually the ninth century libraries of St. Gall and of Reichenau including 170 complete manuscripts today found in 17 European libraries. For each manuscript, in addition to high-resolution access to the manuscript itself, metadata provides information on the contents, codicology, and bibliography. Finally, a series of commissioned essays introduce users to Carolingian monastic culture.

## CENOBIUM 10 YEARS AFTER: AN EVOLVING PLATFORM FOR DIGITAL HUMANITIES

### 1. INTRODUCTION

#### 1.1 *Photography and art history*

More than any other of the Humanities, art history is an image-based academic discipline. Before 1839 – the year when various experiments in photographic processes were published – those interested in the fine arts had just their own memory, sketches or reproduction prints at their disposal. Only photography with its visual memory made possible the method of comparative visual analysis of artworks or works of architecture in different locations which is so fundamental to art history (BADER, GAIER, WOLF 2010). Although the debate on the objectivity, evidence, indexicality, and materiality of (also digital) photographs requires a discourse of its own, we can say that art history established itself as a discipline in its own right only by dint of photography and associated projection techniques. Likewise, one can speak of an art historical perspective, which is informed by photography and tied to reproduction technologies (EDWARDS, HART 2004; CARAFFA 2009; DASTON, GALISON 2010; EDWARDS 2014).

##### 1.1.1 From the image projector (“Bildwerfer”) to 3D simulation

In the nineteenth century – following the camera obscura, the magic lantern and the peep show (zograscope) – stereoscopy became very popular not just with art-loving travellers, as various photographic processes and reproduction technologies were developed (MANODORI 2016). Stereoscopy is based on the principle that two images (e.g. photographs, engravings, drawings) capture a subject with a deviation of approx. 6-7 cm and, when viewed through separate lenses, create the impression of three-dimensionality in the human brain (HICK 1999; GRONEMEYER 2015). In doing so, stereoscopy conveys three-dimensional depth, albeit without reproducing the various perspectives of an object. Moreover, this technical simulation of spatial perception is – unlike the magic lantern or the skioptikon – tied to individual use and as such subject to the viewer’s subjective sensory impression (STIEGLER 2006, 57-85). Stereoscopy was mostly superseded only with the introduction of film which, though not (yet) offering the spatial depth effect of stereoscopy, at least made it possible to visually circle an object or convey a representation of movement in space. Ever since the 1830s, the scientific use of photographs of photo series was always emphasized (KEMP, AMELUNXEN 1980-2000; SIEGEL 2014).

Harnessing technological progress, art history also adopted, aside from photography, the use of physical-technical instruments. Without damaging the object, X-ray machines and CT scanners can reveal what lies underneath a surface, such as underpaintings or the armature of a plaster figure, and thereby visualize a creative process in the form of “pentimenti”, preparatory sketches or different versions and states of an artwork. Traditional analogue and electronic imaging techniques as well as their cataloguing were expanded to include digital work tools into a Virtual Research Environment. These allowed for the creation of structural models based on plans for unbuilt or hypothetical architecture, for unrealized monuments and art objects, arrangements of historical, no longer extant complexes, temporary installations such as exhibitions – with possible applications ranging from the visualization of the hidden to the creation of mock objects.

Of course, these technologies as well as computer simulations, computer-generated imagery and virtual photography in general are not primarily developed for cultural heritage purposes. Nevertheless, their applications as non-invasive techniques are indispensable in this field – not least to make the visualization of an artwork or architecture available in multiple places at the same time, adjustable in size and colour and independent of the time and space of their original locations.

## *1.2 The specific research and study domain of the CENOBIUM project*

Such a vision is the starting point of the web-based, publicly accessible project CENOBIUM which was developed by the Kunsthistorisches Institut in Florenz, Max-Planck-Institute (KHI-MPI) by Ute Dercks, and Gerhard Wolf and the Istituto di Scienza e Tecnologie dell'Informazione “Alessandro Faedo” (ISTI-CNR), by Federico Ponchio, Massimiliano Corsini, Marco Callieri, Matteo Dellepiane, Claudio Montani, and Roberto Scopigno, together with various international cooperation partners.

The central aim of this project is to illustrate and analyse the complex interconnections of cultural and artistic exchange in the twelfth and thirteenth centuries through the example of architectural sculpture (Fig. 1). The focus is on cloisters with series of especially historiated capitals, that is, on column and pilaster capitals with reliefs depicting stories. These usually biblical, hagiographic or allegorical narratives wrap in several scenes around the capital, so that the stories can only be comprehended in the sequence, meaning by physically moving around the column.

Three of the most important centres of Romanesque cloisters are located in the Languedoc-Roussillon region in France, in Northern Spain and in Sicily. Architects and sculptors who were active superregional usually realized the complex and ambitious decorative concepts. They reflect the art of the time which, as a result of increasing mobility, was disseminated via pilgrimage and



Fig. 1 – The homepage of the CENOBIUM project.

trade routes within Europe as well as between the metropolises and monasteries in the Mediterranean region.

### 1.2.1 The historiated capital

Shortly before the turn of the twelfth century, a type of capital emerged in Romanesque sculpture which profoundly influenced the overall character of sacred spaces and monastic cloisters and became a primary element of medieval sculptural decoration of architecture. Previously, capital decoration had confined itself mainly to ornamental, vegetative, zoomorphic, or anthropomorphic forms. Now, however, it broadened its spectrum to include narrative cycles, thus taking on the added function of depicting stories from the Old and New Testaments, historical events, exempla, satirical scenes, and allegories. As an integral architectural component, the Romanesque capital incorporated this new narrative element into its particular physical character. Its three-dimensional aspect lent itself particularly to cloisters, where free-standing columns could be viewed from all sides. Thus, they provided the possibility of telling stories through a series of relief compositions, while facilitating a dialogue among and between capitals and other decorative elements of the cloister (DERCKS 2006).

Of additional importance is the spatial interrelation between the capital and the functional design of the cloister complex. The arrangement of themes and motifs on the capitals permits, in some cases, an aesthetic and functional

interaction on the part of the viewer and gives an idea about the liturgical role and ritual practices associated with the cloister.

### *1.3 Goals and polices endorsed*

Through modern technologies such as high-resolution digital photography, 3D digitization as well as an interactive web application it is possible to overcome barriers such as distance from the object, unfavourable light conditions, architecture-related obstacles or preventive conservation measures obstructing on-site examination of the capitals. They allow to study the architectural sculpture in its surface structure, colour, material texture and relief work in the way the sculptors envisioned and at the same time in the way they relate to the architectural context. Going beyond art historical questions, the CENOBIUM project is also a useful tool for the conservation and restoration of the capitals, which are exposed to all environmental influences at the open cloister. Because the photographs not only make material details visible, but the 3D models also create a virtual form by means of active or passive surface-scanning, which could be compared to 3D reconstructions made in the future, e.g. to evaluate potential conservation issues.

In the past ten years, a total of six cloisters in Italy, France and Spain have been made accessible for the project and recorded in more than 2000 digital photographs by the photographer Roberto Sigismundi on behalf of the KHI-MPI (Photo campaigns: 2006 in Monreale; 2008 in Aosta; 2009 in Cefalù; 2014 in Moissac; 2015 in Tudela and Estella). Assistance and post-processing: Andrea Marinello (2006-2015), Dagmar Keultjes (2006-2008), Silvia Campanella (2009), Nathalie Voß (2014), Barbara Gallas (2015), Christian Ceccanti (2014-2015), Stefano Fancelli (2014-2015). The 3D models in Monreale and Cefalù were made by ISTI-CNR with a Konica-Minolta scanner (3D scanning and post-processing in Monreale: Marco Callieri, Massimiliano Corsini, Matteo Dellepiane, Valentino Fiorin, Guido Ranzuglia, Marco di Benedetto, Andrea Spinelli; in Cefalù: Marco Callieri, Massimiliano Corsini, Matteo Dellepiane). In Aosta, on the other hand, the 3D scans were made as part of a project of the Institute for Technologies Applied to Cultural Heritage (ITABC) of the National Research Council, Rome, Italy in cooperation with the Superintendence for Cultural and Environmental Heritage of the Valle d'Aosta and were subsequently integrated into the CENOBIUM project (SALONIA *et al.* 2009). This productive cooperation with ITABC-CNR should become a business model for CENOBIUM or other similar projects.

In the past ten years, the digital 2D or 3D recording of many cloister capitals has been financed with public project funds from regional or State governments or by grants at the European level. Yet it is still very difficult to convince those responsible for these projects to make their usually high-quality photographs or 3D scans available for the CENOBIUM platform and thereby

make their products also accessible to the public and become a partner in the project. The obvious fear of misuse or loss of control over data or rights of use as well as some internal organizational problems, including issues of responsibility, are not always plausible. Moreover, they prevent an extended publication and access to the expensively produced digital photographs or scans (usually with public money). The excellent cooperation with ITABC-CNR and the Superintendence of the Valle d'Aosta has so far been a laudable exception and it was beneficial for both sides.

From the very beginning, CENOBIUM was conceived at an international level as a multilingual, interactive work-in-progress project, which should be freely accessible on the Internet. The project's website (<http://cenobium.isti.cnr.it/>) presents the various cloisters according to a user-friendly system of images and written information, video footage and 3D models. The arrangement of the capitals has been translated into a schematic diagram based on the ground plan, so they can be explored and viewed intuitively or via the accompanying text which explains what the images show and, along with the transcribed inscriptions, indexes the information and makes it searchable by means of keywords. The identification tag assigned to the individual capitals consists of two parts, with the first part indicating the cardinal direction and position; the second part takes into account an alternative numbering from the research references.

While browsing in the various cloisters, the user can also put together individual photographs or 3D models on the so-called LightTable, which allows to view the capitals of different cloisters side by side, using interactive inspection functions (zooming for photographs and rotating and tilting for 3D models as well as the simultaneous illumination of models). By means of computer simulation, the latter imitates "advantages of torchlight illumination" for viewing sculptures, which Goethe already had praised during his "Italian Journey" in 1787 (MEYER 1989, 352-353).

Through a combinations of the technologies provided, users can inspect capitals not only up close, but also from all sides; this is a kind of analysis of the cloisters that is not possible *in situ*. However, while placing the individual capital in a context and allowing comparative viewing, this kind of analysis at the same time involves a separation of the object from its "natural surroundings". The video recordings made in the cloister of Moissac by the documentary filmmaker Pascal Rehnolt and integrated into the website are an attempt to counteract this isolation through the addition of another medium. The online viewing of digital images in high resolution is no longer a major problem, since multiresolution methods can be implemented quite easily, reducing loading times and implicitly contributing a bit to aspects of security and copyright. By contrast, the 3D models in high resolution are quite heavy and took very long loading times, so that at the beginning of the project they

were shown only using reduced resolution models and a specific plug-in. In the process, users not only had to install a program on their computers (the 3D browser plug-in), but the low-resolution models also had to be downloaded and stored on the hard drive. Navigating the capitals in 3D and in high resolution, on the other hand, was only possible at locally installed “kiosk” computers which had a copy of the 3D graphics installed on their hard drives. This 3D visualization technology used in the early phase of the CENOBIUM project was developed on an open-source basis and was freely available for downloading at ISTI-CNR (CIGNONI *et al.* 2008). But CENOBIUM has been an evolving system: various technologies and instruments developed in the context of EU projects participated by ISTI-CNR have been then feed into CENOBIUM, with the KHI-MPI covering the residual costs for the modifications required.

The photo campaigns were organized and funded by the KHI-MPI. Besides being used for the project, all images have also been integrated into the holdings of the Photothek, or Photo Library, at KHI-MPI, thus allowing them to be viewed online in the digital photo library (<http://photothek.khi.fi.it/>).

The preparatory work, such as the development of specific work flows for the photographer and the 3D scanning, the procurement of permits, the organization of the multi-week campaigns on site, is costly and time-consuming and requires patience. Once the 2D photographs and 3D scans are completed, the post-processing of the digital images, the writing and translating of the texts as well as the configuration and preparation of the newly added website begin. Even when the integration of additional or updated new tools is often done concurrently, the addition of a new project stage can take a couple of years.

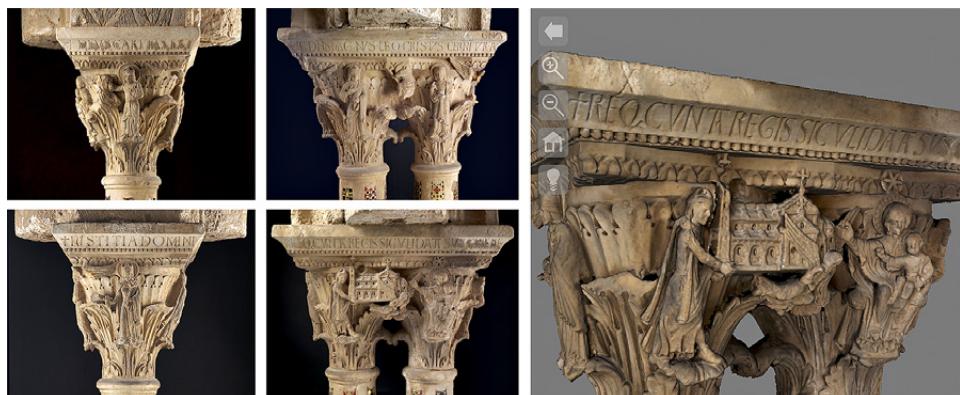


Fig. 2 – An example of the Monreale cloister, west side, capital no. 8; left: the set of photos acquired; right: the related 3D model, produced with active 3D scanning technology.

## 2. TECHNOLOGICAL DESIGN OF THE CENOBIUM PLATFORM

### 2.1 *Technologies endorsed at the initial design stage*

The initial CENOBIUM system was designed more than 10 years ago, around 2005-2006 (BARACCHINI *et al.* 2006, 2007). Our belief was that multimedia resources were (even ten years ago) regular research instruments in the service of various potential users (art experts, scholars, students, amateurs, tourists, etc.). Yet those resources were usually scattered and not easy accessible. The acquisition of content for the planned case study started in 2006 with the digitization of the capitals in the cloister of Monreale. We opted to sample both high-resolution 2D images and 3D scanned models. We decided to digitize in 2D all capitals, while producing 3D models only of those that are more important based on artistic quality and impact as well as figurative value (Fig. 2). 2D digitization was planned to sample all capitals from the canonical 4-sides directions (four photographs taken from a direction orthogonal to the 4 lateral sides of each capital; in several cases, the sides of the capitals were also photographed at diagonal, 45 degree angles). Each photograph was taken by isolating the capital as much as possible from the surroundings and masking the major sources of reflected ambient light with foils of non-reflective material. In Monreale, Aosta and Cefalù the photographer used a digital camera consisting of a Sinar P3 (optical bench) and a 22 megapixel 54H back (sensor resolution 5440×4080 pixel), and in Moissac, Tudela and Estella he used a 39 megapixel Hasselblad H3D. Each capital side was illuminated with at least two flashlights. At the same time the camera position and the distance to the capital always remained the same. Photos were taken with multiple exposures and using colour calibration units. Raw images were post-processed to calibrate colour. The quality of the photographs also impacted the 3D models, as the latter will subsequently be “overlaid” (textured) with the digital photographs.

3D models of the selected capitals have been produced initially by adopting active 3D scanning, using a laser triangulation system (Konica Minolta V1910). In the case of the Monreale cloister, twenty capitals were selected for 3D acquisition. The on-site 3D scanning campaign took one week, and was followed by extensive post-processing work done remotely in the ISTI-CNR lab. Each capital was sampled at a density of c. 10 samples/sq.mm. with a sampling error lower than 0.05 mm. All sampled data have been processed using software tools developed by ISTI-CNR. Initially, those tools were isolated components, which have been incorporated later on in the MeshLab tool (CIGNONI *et al.* 2008). For each sampled capital, we produced a master 3D model composed of around 4-6 million triangles.

Since we wanted to offer 3D models representing both the shape and colour of the original artworks, all 3D scanned models have been textured using

as input the high-resolution photographic images acquired by KHI-MPI. The back-projection of those photographs over the 3D models and the subsequent mapping was performed again using ISTI-CNR technologies (CALLIERI *et al.* 2002; FRANKEN *et al.* 2005). Colour information was encoded by adopting the colour-per-vertex approach.

This multimedia material was made accessible to experts and the public by designing the first version of the CENOBIUM system (Fig. 3a). This was initially implemented as a local system, a kiosk installed in the KHI-MPI in 2007. Even from the very first stages of the project we aimed at pairing the kiosk with a web-based system (to make the data accessible to external users). In designing the system we thus decided from the outset to support web technology as much as possible. Hence the specification of the basic information

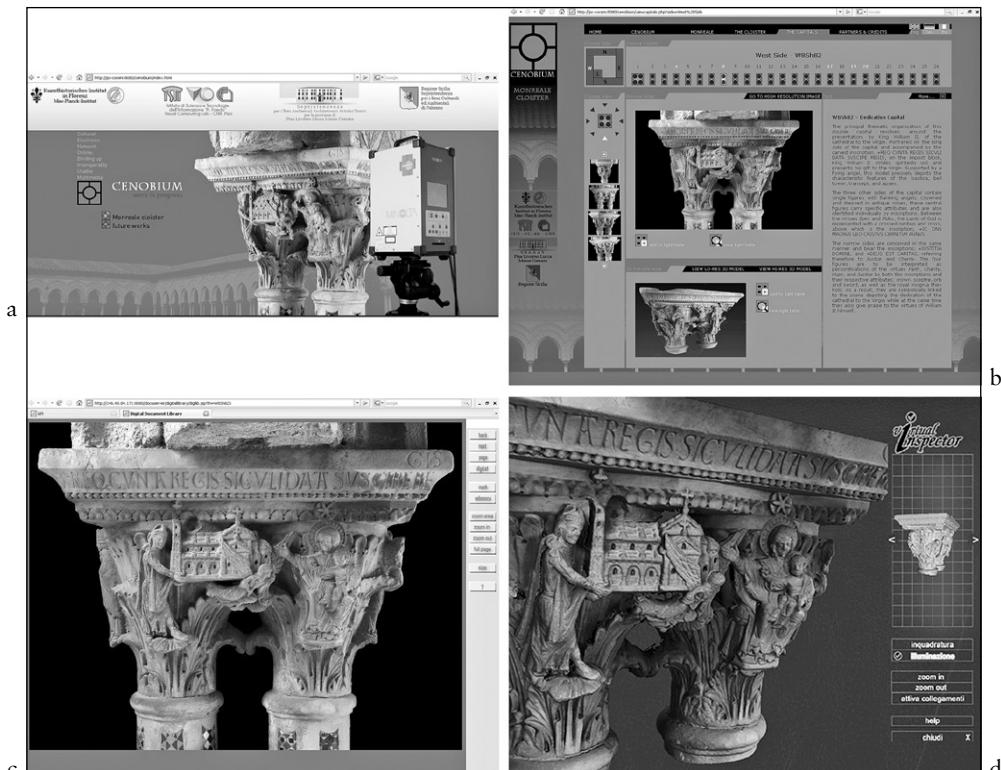


Fig. 3 – The first kiosk-based version of CENOBIUM; (a) the homepage of the kiosk; (b) the main page to browse and access the capitals of the Monreale cloister (note the buttons for activating the visualization of high-resolution images of 3D models); (c) the interface of the Dilib tool for browsing high-resolution photographs; (d) the Virtual Inspector tool for visualizing high resolution 3D models.

pages was implemented with HTML, thus using a standard web browser to manage the navigation of the content even in the first kiosk-based version of CENOBIUM.

The system interface is quite simple. The user may select a specific cloister directly from the CENOBIUM homepage (Fig. 1). Some standard web pages present the project, the selected cloister, and discuss how digitization was carried out. All multi-media information regarding each single capital can be explored in an integrated manner with the interface provided on “The Capitals” page (Fig. 3b). This web page allows the user to browse the capitals of the selected cloister by means of a stylized representation of the cloister, which appears at the top of the page. The capitals are arranged according to their spatial disposition in the real cloister (along its four sides), and the icon of the one selected is highlighted (e.g., in Fig. 3b the user has selected the west side of the cloister and the active capital is no. 8). The left part of the page contains interactive icons which allow the user to navigate through all the images acquired in the photographic campaign (users can view each requested image on the current page in low-resolution or, alternatively, open it at full resolution, see below). The 3D model was presented with a reference still image in the bottom of the capital page. In the first kiosk-based version, the visualization of the full-resolution multimedia data was implemented as follows:

- High-resolution 2D photographs were managed by adopting the image server Digilib (<http://digilib.sourceforge.net/>), which enabled local or remote visualization of high-resolution images (Fig. 3c);
- 3D models were visualized interactively by adopting the ISTI-CNR Virtual Inspector tool (Fig. 3d), supporting easy inspection and virtual manipulation of complex 3D models.

Another innovative component of CENOBIUM, already available in the kiosk version, was the LightTable tool (Fig. 4). This tool works as a shopping cart in an e-commerce website: the users select items (2D images or 3D models) during the navigation in the website, even from different cloisters. The selected items become the potential input of the LightTable tool which is aimed at supporting comparative visual analysis. It allows the user to put together individual photographs or 3D models in a single visual space and view the capitals of different cloisters side by side, using the interactive functions of zooming/panning for photographs and rotating/zooming and directed illumination for 3D models. CNR technologies are used for both image and 3D models visualization.

The architecture of the original kiosk version thus consisted of a number of web pages providing textual descriptions, and the pages providing access to the multimedia material as well as three applications (Digilib, Virtual

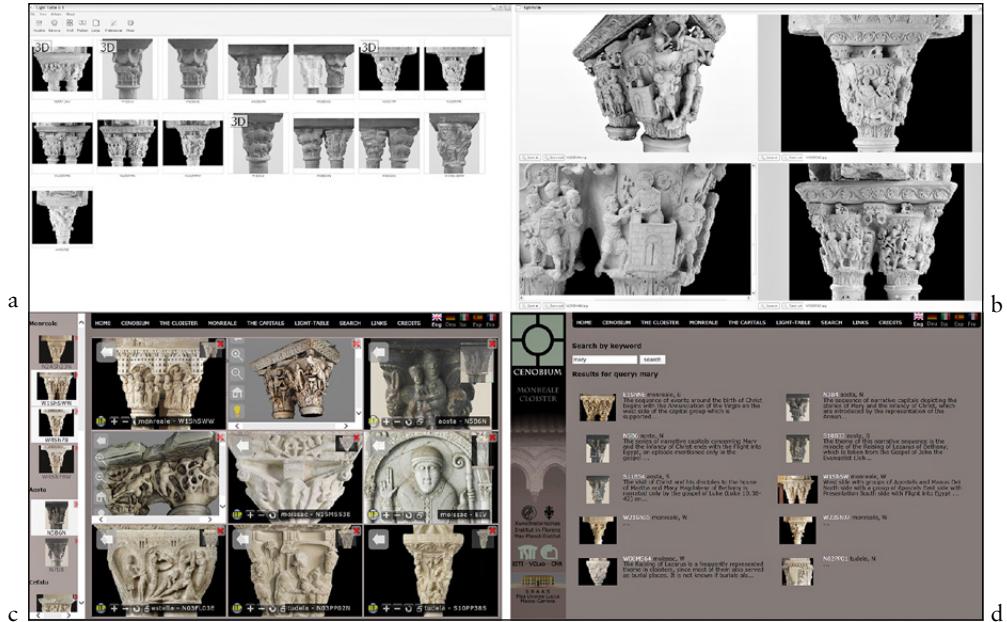


Fig. 4 – The first kiosk-based version of CENOBIUM - the LightTable application, which uses a different screen layout to adjust to the number of visual objects selected by the user; (a) a set of digital assets selected by a user; (b) a session of the LightTable with four assets visualized (three images and one 3D model seen in the upper left panel). Below (c), the current versions of the CENOBIUM LightTable and (d) the query page displaying the results of a term-based search (in this specific case, the term “Mary”).

Inspector and the LightTable) inter-operating with a standard web browser. The overall organization of the related content and the structure created over the content were quite similar to the structure of the current CENOBIUM system. A major difference with the current version was the interactive visualization of multimedia files (2D images or 3D models), which was dependent of external applications (Digilib, Virtual Inspector and the LightTable). These applications were pre-installed in the kiosk version and prompted a change of context each time a user moved from a descriptive web page to the analysis of a single full-resolution visual document (from the web browser to the specific visualization tool and then back to the browser once the visual inspection session was terminated by the user).

## 2.2 Ten years later: evolutions in digitization

The acquisition of content progressed along with the life of the system. The initial Monreale testbed was followed by five acquisition campaigns,

focusing on Aosta-S. Orso (Italy), Cefalù (Italy), Moissac (France), Estella and Tudela (Spain) (full content published between 2009 and 2018). Digitization procedures and technologies evolved considerably in the last ten years. We kept up with technological progress by adopting enhanced technologies (hardware and software) and revising our procedures. With regard to the acquisition of 3D models, we experimented new passive acquisition methods. The image-based approach by means of stereo matching was used to produce the 3D models of the Aosta testbeds (SALONIA *et al.* 2009). We also experimented with newer and more accurate active 3D scanners (such as the GOM ATOS system). Finally, post-processing of sampled 3D data supported new algorithms, following the incremental updates and innovation proposed in the MeshLab tool and other software instruments. Major advances have been introduced in the course of the project: in the reconstruction from range maps, with the use of the Poisson reconstruction method (KAZHDAN *et al.* 2013); mapping of colour data evolved (CALLIERI *et al.* 2008; CORSINI *et al.* 2009), and new approaches were used for the simplification and multi-resolution encoding of the 3D meshes (PONCHIO, DELLEPIANE 2016) also aiming at fulfilling the requirements of a web application.

### *2.3 Ten years later: evolutions in web delivery and visualization of visual media*

CENOBIUM moved from the kiosk jail to the web in 2009 (CORSINI *et al.* 2010). This was a major accomplishment, since our aim from the very beginning was to provide the service to the entire community of possible users. The first release of the web version included content from Monreale and Cefalù and it was very similar to the one already running on the kiosk computers. People interested in using the system on the web had to download and install three software components (Digilib, Virtual Inspector and the LightTable).

The Virtual Inspector tool was expanded to work on the Internet by introducing a component required for on-demand transmission of the multiresolution model to the remote rendering client. The same applied to the LightTable which was redesigned to allow each requested item (high-resolution photos or 3D models) to be downloaded on a remote computer.

Another major subsequent landmark in CENOBIUM life, occurring in 2012, was the extensive redesign intended to adapt the system to new developments in HTML5 and web-based renderings (WebGL). WebGL is a cross-platform web standard for 3D graphics, exposed through the HTML5 Canvas element. It allows 3D models to be rendered on standard web pages, without requiring the installation of plugins and it is now supported by all commercial browsers. The introduction and consolidation of the standard WebGL library provided the possibility of removing the three plug-in applications devoted to visualization (Digilib, Virtual Inspector and the LightTable),

implementing their functionalities inside standard web pages. This was a major advance, as the need to install specific software components to just see the content of a resource linked by a web page is a main reason for abandoning the navigation. This is especially true in fields that tend to be less literate in computer-related issues and technologies, such as Cultural Heritage (CH) or Digital Humanities (DH).

In 2012 we therefore started a radical re-design and a new implementation of the visual components of the CENOBIUM system (Fig. 5). This was part of a larger research project which led to the 3DHOP platform (POTENZIANI *et al.* 2015). 3DHOP (3D Heritage Online Presenter) is an advanced solution for easy publishing 3D models on the web. It has been expressly designed to facilitate the accessing, spreading, and sharing of high-resolution/high-fidelity 3D models of real CH artworks, presenting them directly inside HTML pages. 3DHOP allows a performant and intuitive web exploration over high-resolution 3D models, mixing a powerful multiresolution streaming and rendering engine with a user-friendly interface. Hence the re-design of the CENOBIUM pages devoted to the visualization of 2D images and 3D models including transferring a number of methods and technologies designed for the 3DHOP platform to the CENOBIUM platforms. We decided to develop a new component for the visualization of high-resolution images, aiming to providing an integrated management of the visualization component both in the capital visualization window and in the LightTable (so as to provide a unique interface in both cases). This was implemented by adopting the IIPImage server, a tile-based solution that allows users to navigate and zoom in real-time large images, initially by means a Flash client which was subsequently replaced with a more standard HTML5 interface (Fig. 4a).

The second main addition was the adoption of the 3DHOP multiresolution rendering engine, which employs on-demand progressive transmission of the data to optimize transmission lags and to provide prompt visualization (since data are visualized as soon as they are transmitted to the remote client; the data resolution of the model presented to the user improves progressively as the data are received). Each single view the system retrieves from the server (and transmits over the net) only the pieces needed for the current view, at the most appropriate level of resolution. The result is a fast and immediate visualization, starting with a low-resolution representation which is automatically refined as the user explores the model. The original Nexus multiresolution rendering engine, adopted in Virtual Inspector and originally coded in C++, was completely rewritten in JavaScript to run on the web, becoming a core component of 3DHOP. Major revisions have been also introduced into our data streaming component, first in the 2012 version and more recently in the latest version released in 2016 (PONCHIO, DELLEPIANE 2016). The latter also

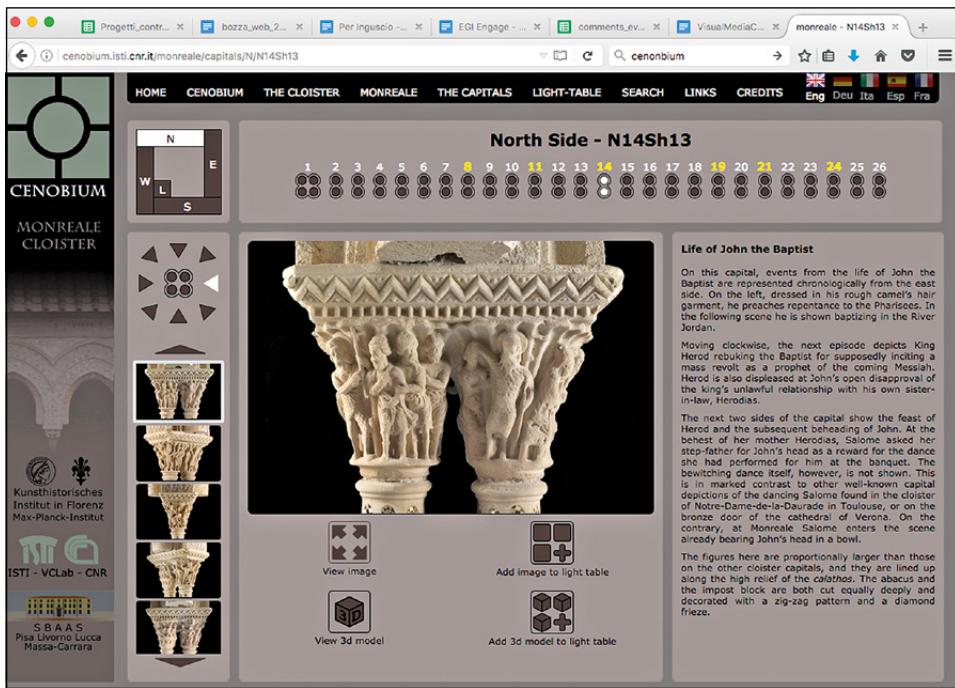


Fig. 5 – The current interface for browsing and selecting capitals in CENOBIUM (web version, available since 2012).

entails improved compression and decompression algorithms working over the geometry files, which contributes to the optimization of the data transmission time. Moreover, the rendering engine has been expanded to support the management of 3D textured meshes (while the rendering engine used in Virtual Inspector was only able to render 3D meshes with colour-per-vertex encoding).

Another new feature added to CENOBIUM in 2012 is the *search by keywords* page (Fig. 4d). The term(s) typed by the user is matched with a large set of terms defined while adding metadata to each capital. For each single item (capital) represented in CENOBIUM, the platform allows users with editorial rights to specify terms/tags which qualify the specific capital; these tags can be introduced in several languages (English, German, Italian, French and Spanish) and are part of the content stored in the CENOBIUM system. Once a normal user accesses the Search interface, the user enters the search terms and the set of results is presented by listing the name of the related capital(s) that match the search, the link to the respective page(s) and a representative iconic image for each resulting item.

### **3. DISCUSSION AND EVALUATION**

The wide range of applications of CENOBIUM for research, teaching and cultural heritage preservation, as well as in museum or pedagogic contexts, is reflected in the frequent references to the project in monographs on the various cloisters, in the use of the photographs in scholarly publications (as reported in citations or acknowledgment text) and in the website statistics which might also indicate didactical use in seminars.

Some figures on the geographic locations of CENOBIUM users are shown for the time period 2014-2016. About 60% of users are returning visitors. Going back of the issue of potential didactic use, if we restrict the analysis to the location data of just 2016, we find that Canada (22.5%) was a close second to Italy (22.8%). Users from Germany, England and Spain ranged between 8% and 10% and users from the USA, France, Russia and Austria between 3% and 4%. The large number of users from Canada in 2016 may be explained by intense use of CENOBIUM as a didactical tool, as we noted that accesses from Canada in that year were from two universities located close to one another. Many scholars used CENOBIUM for studies in art history and mentioned the website in their publications or wrote articles about the project from a user's perspective (e.g. KLÜVER 2009; HOMMERS 2010; KAUFMAN 2011, 51-52, 356; DOMAINE, VALLET 2011; LÓPEZ-MENCHERO BENDICHO 2013; QUEYREL 2014, 10; CUSIMANO 2014; DERCKS 2015). The project has been presented in numerous conferences and meetings devoted to medieval studies, cultural heritage and computer science (*inter alia* BARACCHINI *et al.* 2006; CORSINI *et al.* 2010; DERCKS 2008, 2012; DERCKS *et al.* 2012). Aside from these publications, several presentations of the CENOBIUM project were made: in the 2008 exhibition "Sicily. From Ulysses to Garibaldi" Bonn and the 2010-2013 exhibition at the German Museum (Zentrum Neue Technologien) in Munich, at the 2010 International Congress on Medieval Studies in Kalamazoo, MI, at "Moving in Three Dimensions" 2012 Conference on Sculpture and Change at the Courtauld Institute in London, at the closing event of the 2013 project BW-eSci(T) in Tübingen, at the 2014 "DigitalSpecimen" conference in Berlin. They have shown that the objectives of the project have been met. According to both interested laymen and academic experts, this way of presenting and accessing multimedia data related to the capitals is useful and has great potential for conducting in-depth studies.

But just as photography is no substitute for the study of the artworks on site, 3D models do not replace the actual objects; the aim is, instead, to make an additional, if not different, instrument available to research. A complete inventory of the Romanesque cloisters is not the intention of the project. CENOBIUM is conceived as a work-in-progress where the integration of new technologies and contents is part of the program and based on

the cooperation of two different disciplines, art history and informatics. New impulses from research in both fields are mutually absorbed. The potential for innovation is thus in the interest of both partners, in order to tap new ideas from the inspiration and the capabilities the other offers. The expansion steps and improvements proceed in waves, with the number of cloisters as well as the type of applications being continuously expanded in order to enhance a functioning VRE.

As we already mentioned in the Introduction, CENOBIUM should be a platform allowing any research lab or conservation institution to add content. This is by no means complex technically (we can easily ingest data produced by third parties, and we may grant “curatorial” access to any other selected contributor and allow a user to add related metadata and descriptive texts). Sometimes, however, it does become complicated, because a democratic and open attitude to the distribution of good quality multimedia content is still not common. In a few cases, we tried to convince colleagues to share the results of a 3D scanning campaign featuring one of the cloisters we have selected, unfortunately without success. Of course, the production of good quality visual content costs money and effort. But in some cases, owners of digitized data have an exaggerated sense of ownership over the results (especially when considering that in most cases those digitization efforts were fund with tax-payers’ money). The DH community should offer a contrast to this type of approach by pushing the strong advantages of the open data approach. Moreover, we probably need to do more than cite and offer gratitude to those who share data on open platforms. Doing so should be rewarding for data producers as well. Like most, if not all, other scientific institutions, we cannot offer money for this. The reward should be scientific in career evaluation for example, we need to start taking into account and give proper weight to the efforts undertaken by a scholar in sharing results and digital resources incorporated in his research activity. Data should be treated the same way as papers, with proper indicators (citations) of who is using them.

### 3.1 *Plans for the future*

Firstly, we are planning to increase the number of capitals in cloisters and museums in France and Spain. An interesting challenge could also be the virtual reconstruction of cloisters that are no longer extant or that have undergone extensive rebuilding and can now be usefully compared with capitals preserved in museums, just as it may be possible under certain circumstances destroyed structures.

Secondly, we are planning to extend the technology behind CENOBIUM by:

- increasing the flexibility of the 3D models rendering engine. One possible suggestion is to allow removal of the colour/textures from the rendered 3D

mesh, in order to be able to visualize the digital model using only geometry, thereby providing a more informative view of small-scale shape variations;

- adding buttons in the GUI of the 3D viewer for the selection of prescribed standard views (e.g. the canonical four-side views);
- expanding the viewing experience by adding more features to perform shape-based analysis of the 3D models, such as interactive measuring features (point-to-point distances).

Finally, a redesign of the website that is under implementation is aimed at making CENOBIUM a *responsive* website. CENOBIUM was designed 10 years ago to conform to standard computer screens and thus to support a standard page size (1280\*1024, i.e. 5:4 aspect ratio). The goal now is to allow resizing and using the screen aspect and resolution of different devices (tablet screens, smartphones, or very high-res computer screens).

#### 4. CONCLUSIONS

The initial aim of the CENOBIUM project was to cater to different user populations and their particular needs: academic research, conservation of historical monuments, teaching as well as the curiosity of amateurs. This original objective has remained unchanged and served as the driving force in the evolution of the system (moving from an institution-confined resource, to a system freely accessible on the web). It also provided and consolidated a model for the effective cooperation between heterogeneous, international organizations and research institutes. The CENOBIUM project is an example of a successful cooperation between two very different disciplines: art history and computer science. The aim is for impulses from the research of both disciplines to mutually enrich one another, in order to visualize the research materials on the one hand and highlight the findings and interconnections between them on the other. Therefore, a main aspect of the CENOBIUM project is the shared interest of the two main partner institutions in creating a joint platform, maintaining it over time and developing new ideas by drawing on each other's inspiration and potential. This goes beyond the usual time limits associated with the life span of a specific funded project.

So far CENOBIUM has been supported in an implicit manner by many funded projects (mostly related to technology innovation and funded by EC); the technological transfer of the related results has been the focus of the (limited) funds specifically dedicated to CENOBIUM. We are convinced that this approach works quite well: short-term projects (with a finite duration, e.g. three years) should be devoted to specific technological innovation goals; longer-term projects should be devoted to the technological transfer to the CH/DH community and the consolidation of good practices. The latter are usually much less demanding in terms of dedicated resources (as was the case

with CENOBIUM) and could provide ideal instruments not only for assessing the effectiveness of new technologies, but also to produce durable results and consolidate the use of specific platforms in the CH/DH domain.

#### Acknowledgements

CENOBIUM incorporated results and technologies produced by several research projects: the early prototype was based on the outcomes of the EC “ViHAP3D” project; more advanced scanning technologies and visualization instruments, outcomes of EC 7thFW IP “3DCOFORM” and EC 7thFW NoE “V-Must.Net”, were incorporated into CENOBIUM at a later time.

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#### REFERENCES

- BADER L., GAIER M., WOLF F. (eds.) 2010, *Vergleichendes Sehen*, München, Fink.
- BARACCHINI C., CALLIERI M., CORSINI M., DELLEPIANE M., DERCKS U., KEULTJES D., MONTANI C., SCOGNAMIGLIO M., SCOPIGNO R., SIGISMONDI R., WOLF G. 2006, *Starting the CENOBIUM Project: The cloister of Monreale (Sicily) revealed*, in M. IOANNIDES, D. ARNOLD, F. NICCOLUCCI, K. MANIA (eds.), VAST06: *The 7<sup>th</sup> International Symposium on Virtual Reality, Archaeology and Intelligent Cultural Heritage*, Budapest, Archaeolinguia, 100-110.
- BARACCHINI C., CALLIERI M., CORSINI M., DELLEPIANE M., DERCKS U., KEULTJES D., MONTANI C., SCOGNAMIGLIO M., SCOPIGNO R., SIGISMONDI R., WOLF G. 2007, *CENOBIUM-Cultural Electronic Network online: Binding up interoperably usable multimedia*, in V. CAPPELLINI, J. HEMSLEY (eds.), *EVA (Electronic Imaging & the Visual Arts) Florence Conference, Training & Exhibition*, Bologna, Pitagora, 72-77.
- CALLIERI M., CIGNONI P., SCOPIGNO R. 2002, *Reconstructing textured meshes from multiple range RGB maps*, in *7<sup>th</sup> International Fall Workshop on Vision, Modeling, and Visualization, Erlangen (D)*, Amsterdam, IOS Press, 419-426.
- CALLIERI M., CIGNONI P., CORSINI M., SCOPIGNO R. 2008, *Masked Photo Blending: Mapping dense photographic dataset on dense 3D models*, «Computer & Graphics», Elsevier Science», 32, 4, Aug., 464-473.
- CARAFFA C. (ed.) 2009, *Fotografie als Instrument und Medium der Kunstgeschichte*, Berlin, Deutscher Kunstverlag.
- CIGNONI P., CALLIERI M., CORSINI M., DELLEPIANE M., GANOVELLI F., RANZUGLIA G. 2008, *MeshLab: An open-source mesh processing tool*, in V. SCARANO, R. DE CHIARA, U.ERRA (eds.), *Sixth Eurographics Italian Chapter Conference 2008 Proceedings*, Genève-Goslar, Eurographics Association, 129-136.

- CORSINI M., DELLEPIANE M., DERCKS U., PONCHIO F., CALLIERI M., KEULTJES D., MARINELLO A., SIGISMONDI R., SCOPIGNO R., WOLF G. 2010, CENOBIUM - Putting together the Romanesque cloister capitals of the Mediterranean region, in S. CAMPANA, M. FORTE, C. LIUZZA (eds.), Space, Time, Place. Third International Conference on Remote Sensing in Archaeology (Tiruchirappalli, Tamil Nadu, India 2009), British Archeology Reports, Oxford, Archaeopress, 189-194.
- CORSINI M., DELLEPIANE M., PONCHIO F., SCOPIGNO R. 2009, Image-to-geometry registration: A mutual information method exploiting geometric and illumination-related properties, «Computer Graphics Forum», 28, 7, 1755-1764.
- CUSIMANO F. 2014, Claustrum praefert paradisum. La geografia della salvezza nel monachesimo di tradizione latina occidentale, «Geografie del mondo altro. Studi e materiali di storia delle religioni», 80, 1, 258-281.
- DASTON L., GALISON P. 2010, Objectivity, New York, Zone Books.
- DERCKS U. 2006, Das historisierte Kapitell in der Oberitalienischen Kunst des 12. und 13. Jahrhunderts, Dissertation, Weimar, VDG.
- DERCKS U. 2008, Cenobium - ein Projekt zur multimedialen Darstellung und Erforschung romanischer Kreuzgangkapitelle im Mittelmeerraum, in Sizilien. Von Odysseus bis Garibaldi. Katalog der Ausstellung (Bonn 2008), München-Berlin, Deutscher Kunstverlag, 301-302.
- DERCKS U. 2012, Medioevo interattivo: CENOBIUM - un progetto per i capitelli romanici nel Mediterraneo, in R. ALCOY (ed.), Contextos 1200 i 1400. Art de Catalunya i art de l'Europa meridional en dos canvis de segle, Barcelona, Universitat de Barcelona, EMAC, 383-391.
- DERCKS U. 2015, Le chapiteau de la dédicace à Monreale et les chapiteaux historiés des cloîtres d'Italie méridionale et de Sicile, «Les Cahiers de Saint-Michel de Cuxa», 46, 107-118.
- DERCKS U. 2016, Kapitellskulptur des 12./13. Jahrhunderts in multimedialer Vision, «Rechtsgeschichte - Legal History», Rg 24, 361-363.
- DERCKS U., PONCHIO F., SCOPIGNO R. 2012, CENOBIUM - A project for the multimedia representation of Romanesque cloister capitals in the Mediterranean region, in A. BIENERT, F. WECKEND, J. HEMSLEY (eds.), Konferenzband EVA (Elektronische Medien & Kunst, Kultur, Historie) Berlin 2012, 78-83.
- DOMAINE R., VALLET V.M. 2011, In hoc claustro - Studi sui capitelli del chiostro di Sant'Orso in Aosta; la multimedialità a supporto della valorizzazione, in R. BORDON (ed.), Georges de Challant priore illuminato. Atti delle giornate di celebrazione del V centenario della morte, 1509-2009, Aosta, Regione Autonoma Valle d'Aosta, 291-296.
- EDWARDS E., HART J. (eds.) 2004, Photographs Objects Histories, on the Materiality of Images, London, Routledge.
- EDWARDS E. 2014, Photographic uncertainties: Between evidence and reassurance, «History and Anthropology», 25, 171-188.
- FRANKEN T., DELLEPIANE M., GANOVELLI F., CIGNONI P., MONTANI C., SCOPIGNO R. 2005, Minimizing user intervention in registering 2D images to 3D models, «The Visual Computer» 21, 8-10, Sept., 619-628.
- GRONEMEYER N. 2015, Optische Magie - zur Geschichte der visuellen Medien in der Frühen Neuzeit, Bielefeld, transcript.
- HICK U. 1999, Geschichte der optischen Medien, München, Fink.
- HOMMERS J. 2010, Kaleidoskop der Bilder. Zur Mehransichtigkeit historisierter Kapitelle am Beispiel von Saint-Andoche in Saulieu, in D. GANZ, F. THÜRLEMANN (eds.), Das Bild im Plural. Mehrteilige Bildformen zwischen Mittelalter und Gegenwart, Berlin, Reimer, 161-179.
- KAUFMAN C.L. 2011, The Augustinian Canons of St. Ursus: Reform, Identity, and the Practice of Place in Medieval Aosta, Dissertation, Austin, Texas.
- KAZHDAN M., HOPPE H. 2013, Screened Poisson surface reconstruction, «ACM Transactions on Graphics (TOG)», 32, 3, 29.

- KEMP W., AMELUNXEN H. 1980-2000, *Theorie der Fotografie*, München, Schirmer/Mosel.
- KLÜVER H. 2009, *Mit digitalen Schatten die Welt vermessen*, «Süddeutsche Zeitung», 22<sup>nd</sup> July, 11.
- LÓPEZ-MENCHERO BENDICHO V.M. 2013, CENOBIUM: *Un museo virtual para los capiteles románicos*, «Clío: Revista de historia», 142, 86-87.
- MANODORI (ed.) 2016, *Il Grand Tour e le origini del 3D, viaggio nella fotografia dell'Ottocento*, Roma, Palombi editori.
- MEYER H. 1989, *Über das Betrachten der Statuen bei der Fackel (On viewing statues by torchlight)*, in R. HEITNER, T.P. SAINÉ (eds.), *J.W.v. Goethe, Italian Journey*, New York, Suhrkamp.
- PONCHIO F., DELLEPIANE M. 2016, *Multiresolution and fast decompression for optimal web-based rendering*, «Graphical Models», 88, Nov., 1-11.
- POTENZIANI M., CALLIERI M., DELLEPIANE M., CORSINI M., PONCHIO F., SCOPIGNO R. 2015, *3DHOP: 3D Heritage Online Presenter*, «Computer & Graphics», 52, Nov., 129-141.
- QUEYREL L.-E. 2014, *Les chapiteaux du cloître de Monreale, la légitimation de la dynastie normande en Sicile (1166-1185)*, «BUCEMA» 18, 1, 2-11.
- SALONIA P., SCOLASTICO H., MARCOLONGO A., LETI MESSINA T. 2009, *Survey and 3D reconstruction of the St. Orso capitals, Aosta, through three-focal photogrammetry*, in R. SABLATNIG, M. KAMPEL, M. LETTNER (eds.), *VŠMM '09. Proceedings of the 15<sup>th</sup> International Conference on Virtual Systems and Multimedia (Vienna 2009)*, Los Alamitos-Washington-Tokio, 35-40.
- SIEGEL S. (ed.) 2014, *Neues Licht. Daguerre, Talbot und die Veröffentlichung der Fotografie im Jahr 1839*, Paderborn, Fink.
- STIEGLER B. 2006, *Theoriegeschichte der Photographie*, München, Fink.

## ABSTRACT

The Authors present CENOBIUM, a web-based system designed to support the work of art historians. It provides access to multimedia content and related descriptive text on a specific topic: capitals in Romanesque cloisters. This paper discusses the motivation behind the decision to develop this web resource, taken more than ten years ago. It describes the initial design of the often system and how it evolved to keep pace with technological developments. In a context where the results of ICT & CH projects (digital tools, websites) have life span barely exceeding the timeframe of the actual project, CENOBIUM can be considered a success. It has been operating and steadily been updated with new content and latest technologies throughout its decade-long life.



## MAPPING GOTHIC

### 1. INTRODUCTION

Mapping Gothic (<http://www.mappinggothic.com/>) first began in summer 2008 as Mapping Gothic France. Funded by the Andrew Mellon Foundation we conducted five expeditions to gather high-resolution images and other data from great Gothic churches, which, in our ambitious website project, were located both in space and time. As work progressed we widened our geographical scope to include England and, we hope, Spain and Germany. Work on the written content of the site is still underway.

### 2. PROJECT GOALS

The Mapping Gothic project has had a two-part agenda. First, we wanted to create a spatial database with thousands of high-resolution zoom- and displace-able photographs, panoramas, graphic images and laser scans of hundreds of Gothic churches throughout France and, eventually, in contiguous areas (Fig. 1). We structured the images in our database to allow users to move through the space of each building: our “slide shows” allow you to first see the church from a distance, to approach from the west, moving around the exterior from west to east, and then to enter and walk down the length of the nave, crossing and choir. We provide plans and sections as well as accurate measurements taken with a hand-held laser device. This has proved to be the most immediately valuable part of our project – we made a great effort to produce the best possible images and we receive a constant flow of requests for permission to reproduce them in scholarly publications.

In addition to mapping the space of individual buildings, our project allows you to see and comprehend the space between those buildings, locating the churches on a Google map and providing tools to facilitate comparative study. Thus, the parametric measured sections can be arranged according to construction date and dimension. By holding down the Shift key and clicking on multiple buildings you can make a collection and study the shared characteristics and differences between buildings (Fig. 2).

However, our objectives went well beyond the creation of a spatial database or digital *Statistique monumentale*: we aimed at nothing less than the documentation of the role of architecture (church building) in the process by which France became France. Our inspiration here was provided both by Henri Lefebvre’s notion of the “production” of space, but more particularly by Eugène E. Viollet-le-Duc’s transition in the 1860s from

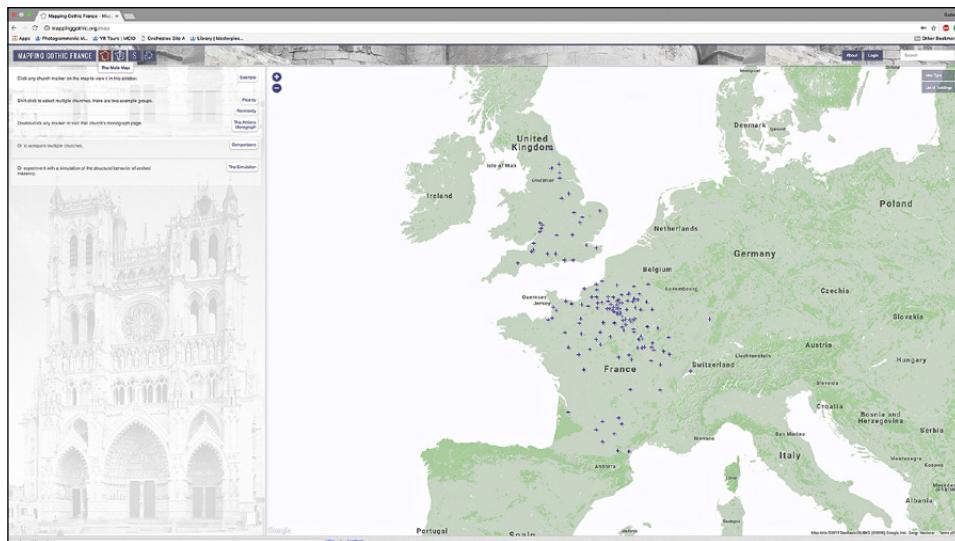


Fig. 1 – Mapping Gothic, front page.

encyclopedic cataloguing (databasing) in his *Dictionnaire raisonné* to the story-telling mode of the *Entretiens* (LEFEBVRE 1974; MIDDLETON 1976). Far from silent witnesses to the passage of time, works of architecture provide critical tools in the “production” of cultural and national identity. Whereas “Romanesque” can be understood as a kind of architectural historicism and internationalism, the roots of “Gothic” are forever associated with the area around Paris at the time when France was emerging as a national and cultural unity. Particularly exciting is the way that Notre-Dame of Paris established an early paradigm of Gothic (great height and slenderness, long-reach flying buttresses) at a time when Paris was not yet clearly the capital of France and when the outcome of the struggles between Capetians and Plantagenets and the geographical boundaries of France were far from certain (MURRAY 1998).

The spatial dimensions of this intersection between cultural history and architectural production are difficult to capture in the pages of a book. Indeed, we were struck by the fact that attempts to tell the “Big Story” of Gothic had faltered in the last decades of the twentieth century. To provide an interactive means of exploring this phenomenon we set up three dimensions in our website: Space, Time and Storytelling. “Space” implies not just the space of individual buildings but also the space between buildings understood as a complex set of relationships leading to the critical choices that produce same-ness and difference (TIMBERT 2007). The “Time” dimension in our website

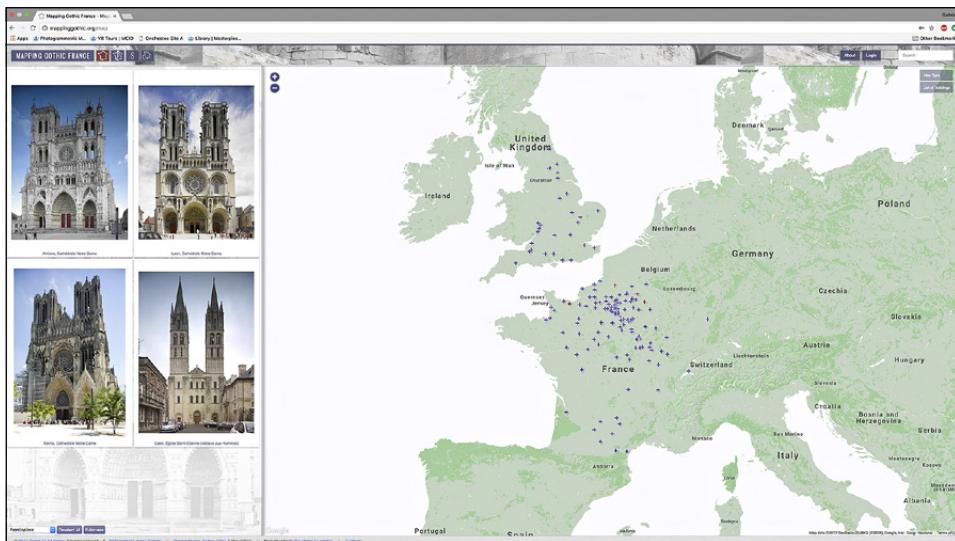


Fig. 2 – Comparing buildings.

facilitates three main operations. First, at the bottom of the screen we provide a timeline which you can activate to locate the churches on the map that belong approximately to the time period specified (the reign of King Louis VII, for example). Second, we took historical maps of twelfth- and thirteenth-century France from a number of sources (LONGNON 1885-1889; WESTERMANN 1963; SINCLAIR 1985), and superimposed them upon our Google map allowing the user to see whether a particular church was located within lands controlled directly by the Capetian kings, or whether the church fell into the domain of the Count of Champagne, the Duke of Normandy or one of the other great seigneurs. And third, inspired by the ideas of Yves Renouard on the unexpected way in which France became France as the result of a series of events in the decades around 1200, we constructed an animated map allowing the student to visualize this phenomenon (RENOUARD 1968). Given the well-founded skepticism on the part of some historians about the validity of such historical maps (medieval boundaries are often permeable; territory is not necessarily held by a single seigneur) we had expected some level of hostile response to our animation – it never came.

The third dimension of our project involved the recognition that nations become nations and Gothic becomes “Gothic” partly through storytelling or narration (BHABA 1990; FRANKL 1960). In our website, storytelling has three dimensions. We attempted to provide a short narrative for each church –, though not all the narratives are yet in place. Second, we suggested a series

of headings for the multiple and disparate ways the story of Gothic might be told. Third, our “Modern Goths” features historians of Gothic (like Henri Focillon, Paul Frankl, Jean Bony, Robert Branner, Otto von Simson and Hans Sedlmayr) with short summaries of their plots.

### 3. HISTORY OF THE PROJECT

The desire to collect and classify is as old as humanity – think of Noah’s assembly of the beasts of the earth... The compulsion to classify reached a crescendo in the nineteenth century and the way “Gothic” was defined in relation to its component elements owes much to parallel studies in the natural sciences (BERGDOLL 1990). But buildings present special problems: they are rooted in the ground and each brings a peculiar set of circumstances and objectives that is difficult to grasp under the simple word “context”. We have already alluded to older attempts to collect and organize buildings in the context of a book: one thinks of the *Statistique monumentale*, the *Victoria County History* or Nikolaus Pevsner’s *Buildings of England*. The immediate background for Mapping Gothic came with a series of six summer field schools on Medieval Architecture based in the Château de Bostz in Besson, France (thanks to our gracious host, Prince Charles-Henri de Lobkowicz). With a team of around a dozen students we began to move through the Bourbonnais landscape collecting churches. Andrew Tallon, Rory O’Neill and Stefaan van Liefferinge, then graduate students in the Columbia PhD program, began to apply digital means in order to allow our buildings to appear on a map where they could be viewed and analyzed in various ways. Joining our enterprise came Peter Allen of the Columbia School of Engineering who had pioneered the use of laser scanning to capture the spatial forms of buildings. Together we had completed in 2001-2002 the first complete scan of a Gothic monument – what better building than Beauvais Cathedral? In 2003-2006 we deployed the laser scanner in a number of our churches and incorporated the resultant three-dimensional models in the website. The Andrew Mellon Foundation took an interest in our Bourbon project and funded the production of an interactive database/website.

In the Bourbonnais we were interested in much more than a spatial database: our intention was to map the way that church construction expressed and projected social and spatial agendas (ROSENWEIN 1982). The *sires de Bourbon* were vassals of William, Duke of Aquitaine, and emulated him in their patronage of the Cluniac monastery of Souvigny. This church, originally with a great open wooden-roofed nave, was remodeled in emulation of the third abbey church at Cluny. We then tracked the campaigns in which lesser seigneurs of the region also set out to remodel local churches in the same way, introducing in the late eleventh and twelfth centuries arcades and

masonry vaults into nave spaces that had originally been entirely open and wooden roofed. This was the second great wave of church building in the region, belonging to the late eleventh and twelfth centuries: the first wave of wooden-roofed churches (the often-cited “white mantle” to which the Benedictine monk and chronicler Raoul Glaber referred) may have begun already in the tenth century. Churches, like castles, were facts on the ground in the attempt of the sires de Bourbon to progressively expand their control, moving from a base close to the river Allier westward toward the river Cher. It was in the context of this work that Murray became preoccupied with the notion of “plotting” (MURRAY 2014). The simple box-like structures embodied in the naves of the early Bourbon church were plotted on the ground using stretched ropes: we were able to discern some repeated shapes including triple squares and golden sections. However, the plot was also a social phenomenon (as in the 1605 Gunpowder Plot) involving architectural means of reifying social linkages through facts on the ground. And, of course, our attempt to retell the “Big Story” of Romanesque Architecture in the Bourbonnais involves the third kind of plot – a storyline or dramatic narrative (BROOKS 1984).

These were the issues and experiments that lay behind the Mapping Gothic Enterprise in which we set out to address buildings of much greater scale and significance than the relatively tiny Bourbonnais churches.

#### 4. TECHNOLOGIES AND SOFTWARE USED

One of the most important objectives of the project was to establish the highest possible standard of digital photography. After much research we selected a medium format digital camera (Cambo/Phase One) for the general views (operated by Andrew Tallon) and a Nikon D3 with a perspective correction lens (operated by Stephen Murray). Dimensional data collected in the field was used to generate parametric sections and interactive structural simulation within Unity 3D (Rory O'Neill).

Our content management application was custom-built using a LAMP platform. In the MySQL database, we created records for buildings, people, historical events, bibliographic records, panoramic nodes and images. Each record allowed for metadata to facilitate the needs of mapping in both time and space. Although an interactive Flash client was developed during the Bourbonnais phase of the project we eventually settled on a custom-built MTML/5jQuery client to meet the needs of the project using web standards.

#### 5. NUMBER AND ACADEMIC STATUS OF COLLABORATORS

There were three principals behind the Mapping Gothic project: Stephen Murray, Andrew Tallon and Rory O'Neill. In 1993 Stephen Murray,

Professor of Art History and Archaeology at Columbia University since 1986, had founded the Media Center for Art History with the support of NEH (National Endowment for the Humanities), Mellon and other foundations. Murray directed the Media Center between 1993 and 2003, establishing the practice of developing pedagogical/research projects using digital technology applied during field schools or expeditions. His publications have reflected his interests in the spatial intersection of cultural and architectural history, see *Notre-Dame of Paris and the Anticipation of Gothic* and *Plotting Gothic*. Andrew Tallon completed his BA at Princeton and an MA at the Sorbonne, joining the Columbia PhD program in 2000 and graduating with a PhD in 2007, when he joined the faculty at Vassar College. His principal publications include (with Dany Sandron) *Notre-Dame de Paris* and *An Architecture of Perfection* (SANDRON, TALLON 2013; TALLON 2013). Rory O'Neill completed his BS in Engineering at North Carolina State University and in March at Columbia and in the 1990s became a leading figure in the new world of three-dimensional digital imaging, multimedia applications and online communities. He co-authored *Guide to Creating 3D Worlds* (O'NEILL, MUIR 1998), and as adjunct Professor at Columbia University he was co-founder of the Digital Design Lab in the Columbia School of Architecture and of CyberSites, a company that developed educational games set in archaeological reconstructions of ancient sites. He joined the PhD program in Art History and Archaeology in 2006 and graduated in 2015; since then he has held a post-doctoral fellowship at the University of Pennsylvania and has taught at U-Penn and in the Columbia School of Architecture.

The other key members of the Mapping Gothic team over four summer programs in France, and continuing work in the Columbia University Media Center for Art History, were staff members of the Media Center: directors James Conlon and Caleb Smith; image processors Pilar Albuin Peters, Cassie Juhl and Gabriel Rodriguez; undergraduate students from Vassar College, Lindsay Cook, Sofia Gans, Ani Kodzhabasheva, Jessica Lentner, Katherine Minty and Alexandra Thom and graduate students in the Columbia Art History PhD program including Jordan Love, Zachary Stewart and Nicole Griggs. We should mention an extraordinary undergraduate Columbia student, Robert Stenson, now a principal of Goodhertz, who wrote the underlying code that makes the magic of mappinggothic.org happen. Most recently Stefaan van Liefferinge, appointed Director of the Media Center in 2014, has worked to migrate images and content to a more secure database, coordinating the project with other mapping operations. Dr. van Liefferinge has his BA from the Université Libre de Bruxelles and PhD (2006) from Columbia University and has taught at the University of Georgia in Athens (VAN LIEFFERINGE 2010 and forthcoming).



Fig. 3 – Parametric sections.

## 6. CASE STUDIES TO TEST UNDERLYING ASSUMPTIONS ABOUT GOTHIC ARCHITECTURE

Mapping Gothic provides a heuristic playground allowing students to test their assumptions and expand their ideas about Gothic architecture. Traditionally, Gothic architecture may be presented as a linear development with edifices that get progressively taller through mastery over the structural components (pointed arches, rib vaults and flying buttresses). The student may turn to our analysis of dimensions and cross section, arranging the buildings in chronological order and discover that the mega-cathedrals (Notre-Dame of Paris, Chartres, Reims, Amiens and Beauvais) that conform to this expectation are the exceptions: set them aside, modest-sized churches continued to be built (Fig. 3).

Art historians (particularly Jean Bony) have struggled to find systems to classify buildings by plan type or the number of stories in the elevation (BONY 1984). Mapping Gothic allows you to identify churches constructed in a given time period, select them (shift/click on the map) and to explore how churches with a similar plan type may have completely different elevations. It is a useful tool for the student who wishes to pursue the challenge to the notion of stylistic “development”. In 1983 Dieter Kimpel and Robert Suckale countered the notion of *Stilentwicklung*, emphasizing instead the political significance of the presence of hundreds of look-alike buildings on the ground

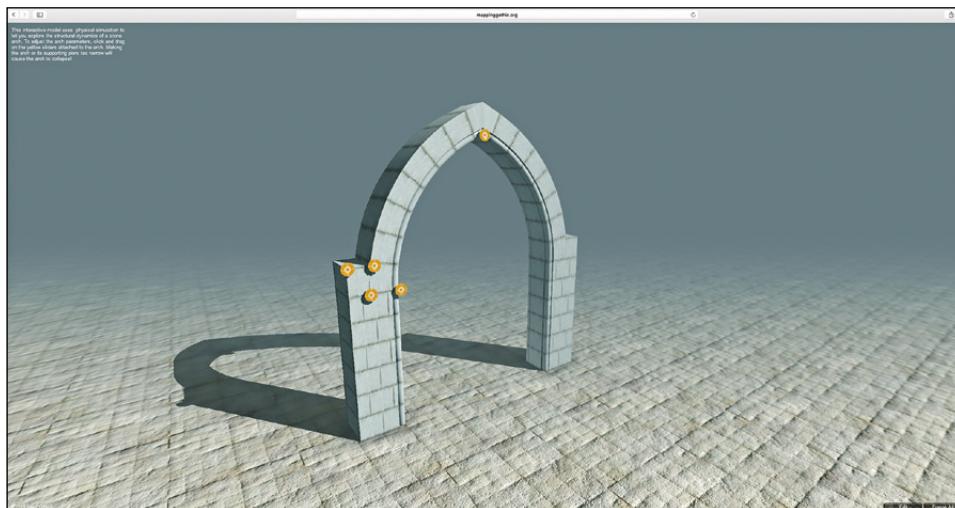


Fig. 4 – Arch simulation.

(KIMPEL, SUCKALE 1985). Focusing upon the role of the King of France as instigator they compared the phenomenon to the campaigns of church and castle building that followed the 1066 Norman Conquest of England. We would want students to temper this understanding with the realization that in some ways the architectural revolution and “spread of Gothic” preceded and anticipated the reality of territorial hegemony.

One of the surprises offered by mappinggothic.org is the ability to play with the structural behavior of arched masonry using a Unity 3D arch simulation developed by Rory O'Neill (Fig. 4). You can discover for yourself how the rounded arch will fail if placed atop supports that are too widely spaced or of inadequate cross section; you can also discover how to fix the problem with the introduction of a pointed arch. The user might be surprised to discover that the rounded arch is actually stronger when thicker: with the pointed arch it is the other way around. Despite the best efforts of Jacques Heyman and Robert Mark, the discussion of the role of the pointed arch in the architectural revolution we call “Gothic” had almost disappeared in art historical discourse and the “theoretical turn” of the later twentieth century: our arch simulation device allows the teacher to revive the issue and to spark the keen interest of students who love to play with collapsing structures (HEYMAN 1966; MARK 1982; TALLON in press). The discovery will lead to the formulation of exciting questions: was the pointed arch a new invention? If not, where did it *come from* (DRAPER 2005)? Was it first adopted because of its “otherness”, breaking the tyranny of the circle? How and when did builders including patrons fully realize its structural efficacy?

## 7. FUTURE DEVELOPMENT

After five years of intense and rapid progress (2008-2012) under the tenure of a grant from the Andrew Mellon Foundation, Mapping Gothic has been obliged to pause. There are a number of reasons for this. Our summer expeditions were expensive: the team of eight or ten people had to be housed and fed and transportation included not only transatlantic flights but also the lease of two vehicles for a period of three weeks to a month. And then on return we had to find hourly salaries for image processing. In addition to lack of funds we have also struggled with the problem of retaining members of the team: our programmer, for example, was so good that upon graduating he was immediately hired by Twitter and left us.

Paradoxically, the project also suffered from its own success. In 2008 Mapping Gothic was the only project hosted by the Media Center for Art History at Columbia University: upon seeing our product other faculty members wanted something similar and now multiple projects compete for limited resources: the Istanbul Documentation Project, Mapping Mesopotamian Monuments, Mapping India Temples and more. In this broader sense, the Mapping Enterprise continues full speed.

Beyond the period of the Mellon grant one more summer's work was completed by a team of one person: in 2012 Murray added some of the great Gothic churches of England to the project and plans are now being developed for a summer on German Gothic.

We are currently assessing the advisability of adding more material to a site where the underlying code may not be sustainable over the long term. A simpler, more robust code was developed first by Rory O'Neill (ArchMap) and then by Tim Trombley in the Media Center (Art Atlas) and images and content are being migrated to this new platform where Mapping Gothic finds its role within a global map. Some features and tools specific to Mapping Gothic will only be available on the original site but Art Atlas will host that project's large database of zoomable high resolution images and 360 degree panoramic views. The new platform ensures access to the visual materials of Mapping Gothic for the coming years since Art Atlas is developed with Drupal, which provides a more durable and manageable technology than the older site. The Art Atlas version of Mapping Gothic will offer registered users the possibility to create portfolios of monuments and to create maps that highlight certain selected sites facilitating presentations that show a map of the sites, or slideshows of visual materials. Because all Mapping Gothic materials will be fully integrated into the Art Atlas platform it will be possible to compare them with visuals from any of the different Media Center collections, such as architecture in Rome or Istanbul. Finally, Art Atlas facilitates a virtual reality experience – using smartphones with cardboard VR viewers, users will be

able to tour a large number of Mapping Gothic's landmark monuments. We anticipate that in coming years Mapping Gothic will continue to benefit from such new technologies in our flexible and expandable Art Atlas site.

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## REFERENCES

- BERGDOLL B. 1990, *Introduction*, in *The Foundations of Architecture: Selections from the Dictionnaire raisonné*, transl. Kenneth D. Whitehead, New York, Brasiller, 1-30.
- BHABA H. (ed.) 1990, *Nation and Narration*, New York and London, Routledge.
- BONY J. 1984, *French Gothic Architecture of the Twelfth and Thirteenth Centuries*, Berkeley, University of California Press.
- BROOKS P. 1984, *Reading for the Plot: Design and Intention in Narrative*, New York, Vintage Books.
- DRAPER P. 2005, *Islam and the West: The early use of pointed arches revisited*, «Architectural History», 48, 1-20.
- FRANKL P. 1960, *The Gothic: Literary Sources and Interpretations through Eight Centuries*, Princeton, Princeton University Press.
- HEYMAN J. 1966, *The Stone Skeleton; Structural Engineering of Masonry Architecture*, Cambridge and New York, Cambridge University Press.
- KIMPEL D., SUKALE R. 1985, *Die gotische Architektur in Frankreich, 1130-1270*, München, Hirmer.
- LEFEBVRE H. 1974, *La production de l'espace*, Paris, Editions Anthropos.
- LONGNON A. 1885-1889, *Atlas historique de la France depuis César à nos jours*, Paris, Hachette.
- MARK R. 1982, *Experiments in Gothic Structure*, Cambridge MA and London, MIT Press.
- MIDDLETON R. 1976, *Viollet-le-Duc's academic ventures and the Entretiens sur l'Architecture*, in E. BÖRSCH-SUPAN (ed.), *Gottfried Semper und die Mitte des 19. Jahrhunderts*, Basel, Birkhäuser, 239-254.
- MURRAY S. 1998, *Notre-Dame of Paris and the anticipation of Gothic*, «Art Bulletin», 80, 229-253.
- MURRAY S. 2014, *Plotting Gothic*, Chicago and London, University of Chicago Press.
- O'NEILL R., MUIR E.G. 1998, *Guide to Creating 3D Worlds*, Hoboken (New Jersey), John Wiley & Sons.
- RENOUARD Y. (ed.) 1968, *Comment les traits durables de l'Europe occidentale moderne se sont défini au début du XIII<sup>e</sup> siècle, 1212-1216*, in Y. RENOUARD (ed.), *Etudes d'histoire médiévale*, Paris, SEVPAN, 77-91.

- ROSENWEIN B.H. 1982, *Rhinoceros Bound: Cluny in the Tenth Century*, Philadelphia, University of Philadelphia Press.
- SANDRON, TALLON D. 2013, *Notre-Dame de Paris: neuf siècles d'histoire*, Paris, Parisgramme.
- SINCLAIR S. 1985, *Atlas de la géographie historique de la France et de la Gaule, de la conquête césarienne à nos jours*, Paris, Sedes.
- TALLON A. 2013, *An architecture of perfection*, «Journal of the Society of Architectural Historians», 72, 530-554.
- TALLON A. in press, *Gothic Structure*, in *The Cambridge World History of Religious Architecture*.
- TIMBERT A. 2007, *Existe-t-il une signification politique de l'architecture gothique au XII siècle? L'exemple des chevets de Saint-Denis et de Saint-Germain-des-Prés*, «Cahiers de l'histoire de l'art», 4, 13-25.
- VAN LIEFFERINGE S. 2010, *The hemicycle of Notre-Dame of Paris: Gothic design and geometric knowledge in the Twelfth century*, «Journal of the Society of Architectural Historians», 69, 490-507.
- VAN LIEFFERINGE S. forthcoming, *Gothic and the Medieval Quadrivium*, in *The Cambridge World History of Religious Architecture*.
- WESTERMANN G. 1963, *Atlas zur Weltgeschichte: Mittelalter*, Braunschweig, Georg Westermann Verlag.

## ABSTRACT

Mapping Gothic (<http://www.mappinggothic.com/>) first began in summer 2008 as Mapping Gothic France. Funded by the Andrew Mellon Foundation, the project was initiated at the Columbia University, Department of Art History and Archaeology. The team conducted five expeditions to gather high-resolution images and other data from great Gothic churches, which in this ambitious website project were located both in space and time. As work progressed the geographical scope was widened to include England and hopefully also Spain and Germany. Whereas pictures can be satisfactorily represented in two dimensions in a book or on a computer screen, space – especially Gothic space – demands a different approach, one which embraces not only the architectonic volume but also time and narrative. The intention has been not just to develop a more appropriate way of representing the spaciousness of individual monuments, but also to provide the user of the site with new ways to understand the relationship of hundreds of buildings conventionally described as “Gothic”.



**DE CLAUSTRA A PAISAJES ESPIRITUALES:  
PROYECTOS DE DIGITAL HUMANITIES  
SOBRE EL ESPACIO MONÁSTICO MEDIEVAL (SIGLOS XI-XV)\***

## 1. INTRODUCCIÓN

Este artículo pretende dar a conocer el desarrollo teórico y metodológico de dos proyectos de investigación pertenecientes al ámbito de las Humanidades Digitales (Digital Humanities) que tienen como objetivo el estudio de la espiritualidad femenina medieval. A lo largo de este trabajo nos referiremos a ellos como *Atlas CLAUSTRA*<sup>1</sup> y *PAISAJES ESPIRITUALES*<sup>2</sup>. En ambos proyectos se hace uso de las Tecnologías de la Información y la Comunicación (TIC), de los Sistemas de Bases de Datos (BBDD) y de los Sistemas de Información Geográfica (GIS) como herramientas de almacenaje, representación y análisis de la información contenida en las fuentes históricas. Uno de sus principales objetivos consiste en la creación de una potente plataforma digital sobre la espiritualidad femenina medieval, útil tanto para la investigación histórica como para la difusión y transferencia del conocimiento sobre la Edad Media. Ambos proyectos, liderados desde la Universidad de Barcelona, cuentan con la colaboración de múltiples equipos de trabajo e investigadores de carácter internacional, procedentes de un largo elenco de universidades y centros de investigación españoles, europeos y americanos, gracias a los cuales trabajamos desde una perspectiva colaborativa, interdisciplinar y en red.

## 2. ESPIRITUALIDAD FEMENINA Y DIGITAL HUMANITIES

A pesar de que en los últimos años se haya producido un incremento significativo del interés por conocer las diversas formas de la vida religiosa femenina en la Edad Media (GRUNDMANN 1961; FONSECA 1983-1984; VITOLO 1996; ANDENNA, VETERE 1997; BARONE 1997; ALBERZONI 1998; FONSECA

\* Si bien el presente artículo es el resultado de un trabajo conjunto, los apartados 2 y 3 han sido elaborados por Blanca Garí y Gemma Colesanti, los apartados 4 y 5 por María Soler-Sala, y el apartado 6 por Leopoldo Repola, mientras que la Introducción y las Conclusiones han sido redactadas conjuntamente.

<sup>1</sup> Su denominación completa es “*CLAUSTRA. Atlas de espiritualidad femenina en los reinos peninsulares*” (HAR2011-25127), dirigido por Blanca Garí (Universidad de Barcelona): <http://www.ub.edu/claustra/>.

<sup>2</sup> Su nombre completo es “*PAISAJES ESPIRITUALES. Una aproximación espacial a las transformaciones de la religiosidad femenina medieval en los Reinos Peninsulares en la Edad Media (siglos XII-XVI)*” (HAR2014-52198-P), dirigido por Blanca Gari y Núria Jornet (Universidad de Barcelona): <http://www.ub.edu/proyectorpaisajes/>.

2008), queda todavía mucho por investigar acerca del monacato masculino y femenino europeo de este período, tanto en relación al territorio como, sobre todo, a las redes monásticas propiamente dichas, con el objetivo de comprender la evolución de las órdenes con sus propias características y diferencias diacrónicas y geográficas. A partir de los estudios de Lester Little (LITTLE 1980), y de la importante obra de Grundmann (GRUNDMANN 1961), y muy especialmente para Italia, las investigaciones de Anna Benvenuti y Gabriella Zarri (BENVENUTI PAPI 1990; ZARRI 1997), «hoy sabemos que lo que más ha sorprendido a la investigación y lo que más ha contribuido a transformar nuestra visión de la Edad Media en esos siglos, y en parte incluso nuestra visión de la Historia, ha sido precisamente el descubrimiento del protagonismo excepcional de las mujeres» (GARÍ 2013b, 351).

Como ha evidenciado Luisa Muraro, ello ha sido así porque, como pocas veces en los análisis históricos, en este caso ha aflorado claramente la idea de que para los cambios de la espiritualidad medieval no existe una historia de las mujeres separada de la de los hombres y que, se use o no el masculino genérico para hablar de esos cambios, se es consciente de que fueron el fruto de movimientos y corrientes protagonizados por mujeres, y también por hombres (MURARO 2001, 13).

Cartografiar y catalogar los espacios de espiritualidad femenina en la Edad Media para visualizar y abrir interrogantes e hipótesis de estudio e impulsar las investigaciones ha sido el objetivo principal del Proyecto CLAUSTRA, coordinado por Blanca Garí, y que actualmente está desarrollando el *Atlas de espiritualidad femenina de los Reinos Peninsulares*. Este último, constituye una plataforma activa en línea (<http://www.ub.edu/claustra/>) en cuya elaboración participan más de treinta investigadoras e investigadores. Nuestro objetivo con el proyecto CLAUSTRA ha sido el de abordar primero este fenómeno junto con el estudio de las diferentes realidades monásticas en el marco concreto de los territorios de la Corona de Aragón, y después completarlo con el análisis del conjunto de la Península Ibérica, tomando como punto de referencia al menos dos grandes campos de estudio bien explorados por la historiografía de la Edad Media europea a lo largo de las últimas décadas. El primero, las transformaciones en la topografía sagrada marcada por un proceso de reurbanización de la espiritualidad y por la masiva presencia femenina; el segundo, las redes internacionales que se crean de cada orden en esta basta área geográfica (COLESANTI, GARÍ, JORNET-BENITO 2017). Partiendo de estos dos principales campos de análisis, gracias a las herramientas disponibles on line en la página web del proyecto, los equipos de investigación han trabajado de manera colaborativa, interdisciplinar y en red, planteando algunas nuevas líneas de trabajo desde el propio Atlas del proyecto.

Las transformaciones en las formas de espiritualidad de los últimos siglos de la Edad Media se hacen patentes a través de manifestaciones diversas en todo

el conjunto de la cristiandad latina y en todas las regiones de Occidente a partir del siglo XII. Un aspecto importante de esas transformaciones fue la tendencia a desplazar el eje de interés hacia las ciudades, pues frente a la adaptación del cristianismo al mundo desurbanizado en los siglos altomedievales, las transformaciones de la espiritualidad medieval a partir del siglo XII se dan en el seno de un verdadero proceso de reurbanización, creando respuestas religiosas e institucionales apropiadas al protagonismo indiscutible de la ciudad. Más allá de las diferencias, debidas a la conservación de fuentes o a las circunstancias específicas de cada espacio político y cultural, hay trazos comunes que pueden dibujarse con bastante precisión. Uno de ellos fue el peso cuantitativo y cualitativo de los espacios de religiosidad femenina que a partir del siglo XIII modificaron por completo el paisaje de la geografía sagrada de las ciudades y territorios de Occidente (BENVENUTI 1990; GRAÑA 2010). Monasterios, conventos y beaterios proliferaron, cambiaron de una realidad a otra, se ampliaron o trasladaron del campo a las ciudades, de extramuros a intramuros, de un espacio pequeño a uno mayor, pasaron a veces de una orden a otra, se dividieron, se multiplicaron, y a veces también se extinguieron. Todo ese ir y venir marcó a un ritmo creciente la topografía espiritual de la sociedad en los últimos siglos medievales y en su paso de la Edad Media a la Moderna. Las ciudades de la Corona de Aragón no fueron ajena a estos cambios. Baste una simple mirada sobre la evolución de la topografía sagrada en algunas de ellas para darse cuenta.

### 3. PROYECTO CLAUSTRA: ATLAS Y CATÁLOGO COMO HERRAMIENTAS DE INVESTIGACIÓN Y TRANSFERENCIA

El proyecto CLAUSTRA deriva de una investigación precedente coordinada por Blanca Garí desde la Universidad de Barcelona, conocida como TEF (*Topografía de la Espiritualidad Femenina*) sobre la topografía de la espiritualidad femenina en la Cataluña medieval. CLAUSTRA, sin embargo, comprende un territorio mucho más extenso y se construye sobre dos reflexiones muy concretas. La primera, se refiere a la necesidad de considerar la espiritualidad femenina como cualquier otro aspecto económico, político o social del desarrollo cultural de una sociedad y, por lo tanto, parte importante de una realidad histórica compleja. La presencia de espacios relacionados con la vida material y espiritual de las mujeres es una de las peculiaridades de un determinado paisaje, entendido como lugar de interacción entre todos los sistemas de relaciones que constituyen la realidad. La otra reflexión se refiere a la valoración del significativo papel de las mujeres en el importante y rápido proceso de transformación de la espiritualidad europea a partir del siglo XII (BENVENUTI 1990; GARÍ 2013a, 2013b; SOLÓRZANO, ARÍZAGA, AGUIAR 2013, 349-370; GARÍ 2014a, 2014b). Para comprender este cambio y entenderlo en sus diferentes dinámicas, se decidió desarrollar un proyecto mucho más

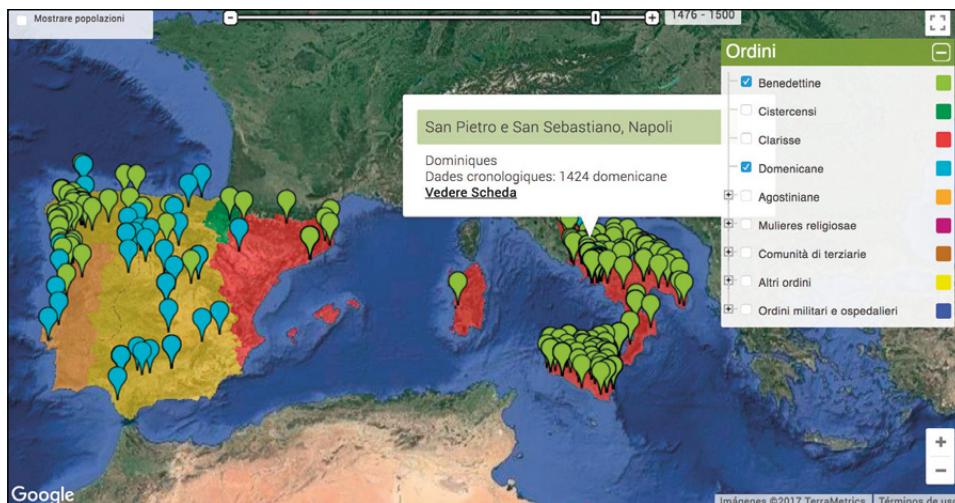


Fig. 1 – Imagen extraída del Atlas CLAUSTRA relativa a la ubicación de los monasterios de benedictinas y dominicas entre 1476 y 1500.

amplio, que no se limitara solamente a los reinos peninsulares de la Corona de Aragón. El *Atlas de los Reinos Peninsulares*, efectivamente, se ha ampliado y actualmente incluye casi todos los territorios pertenecientes a los reinos de la Península Ibérica entre los siglos XI y XVI, todo el sur de Italia, con las dos islas de Cerdeña y Sicilia, y una parte del sur de Francia. La estructura del proyecto se presenta como un atlas histórico digital, un instrumento especialmente útil para estudiar, en el complejo proceso de transformación de la sociedad y de la espiritualidad medieval, tanto las características comunes de las diversas realidades europeas, como las principales peculiaridades de cada territorio. Todo ello nos permite comprender de inmediato el peso cualitativo y cuantitativo de los espacios de religiosidad femenina entre los siglos XII y XVI, ya sean éstos monasterios o nuevos lugares de espiritualidad (beguinas, *mulieres religiosae*, etc.), que transformaron por completo el paisaje de la geografía sagrada de Occidente.

CLAUSTRA es una plataforma activa, diseñada y accesible para la comunidad científica a través de Internet, en la que se encuentran catalogados y ubicados todo tipo de espacios de espiritualidad femenina medieval en la Europa mediterránea. Desde el punto de vista metodológico, el proyecto estudia todo tipo fuentes – documentales, archivísticas, librarias, artísticas, arquitectónicas y arqueológicas – que son interpretadas a través de dos perspectivas:

- 1) Reinterpretación de las fuentes en la elaboración de las fichas descriptivas partiendo de la base teórica de la historia de las mujeres para demostrar

que no se puede hablar de la espiritualidad medieval sin tener en cuenta la importante contribución de las mujeres en este ámbito.

2) Prioridad de metodologías de trabajo multidisciplinar, que incorporen algunos enfoques innovadores sobre todo en los sectores de la historia y de la historia del arte provenientes de ámbitos de investigación comunes con la historia de las mentalidades y la antropología religiosa.

Así pues, la plataforma CLAUSTRA se desarrolla sobre dos bases principales: el Catálogo y el Atlas. El Atlas incluye mapas de los reinos medievales que cubren el período comprendido entre 1100 y 1545, con una periodicidad de 25 años. En los diferentes mapas se muestra el origen y evolución (cambio de lugar, variación de orden, etc.) de los diferentes espacios de religiosidad femenina en el medioevo: se visualizan tanto los núcleos de beguinas y los grupos de mujeres de vida terciaria y comunidad independiente, como los monasterios de las órdenes de época medieval o de principios de la época moderna, ya que, de hecho, el Atlas termina en el año de inicio del Concilio de Trento (1545). Cada uno de los espacios religiosos que aparecen en el mapa proporcionan acceso a los registros almacenados en el Catálogo. Dicho Catálogo contiene hoy un total de 1.400 fichas, las cuales ofrecen inmediatamente un estado de la cuestión sobre lo que sabemos acerca de cada comunidad/monasterio, con enlaces a los principales estudios, tesis, archivos, bibliotecas, datos arqueológicos, etc. El catálogo permite diferentes criterios de búsqueda y, a su vez, da acceso a los mapas del Atlas. Las fichas están siempre abiertas y la plataforma es a la vez un espacio de transferencia, diseño y desarrollo de futuras investigaciones. En este sentido, la plataforma también permite dar respuesta a la creciente necesidad de divulgación, difusión y transferencia de la cultura histórica a través de herramientas informáticas que faciliten el trabajo de los grupos de investigación de carácter internacional, y que sean capaces de crear redes de intercambio de conocimientos, de métodos y de experiencias de investigación. La posibilidad de que los datos proporcionados por la investigación e incluidos en el Catálogo puedan ser posicionados después sobre plataformas georeferenciadas permitirá realizar posteriormente estudios capaces de individualizar los espacios de influencia de los monasterios en un ámbito regional (Fig. 1).

#### 4. PROYECTO PAISAJES ESPIRITUALES: LA RELACIÓN CON EL ESPACIO INTERIOR, CERCANO Y MÁS LEJANO

Los procesos de catalogación, georeferenciación y cartografiado realizados durante el desarrollo del proyecto Atlas CLAUSTRA, nos permitieron reflexionar sobre la importancia del paisaje en el estudio de la espiritualidad femenina medieval. Fruto de tales reflexiones (GARÍ *et al.* 2014), surgió la necesidad de acercarnos a los monasterios medievales desde la perspectiva holística del paisaje histórico (BOLÒS 2010, 83-84). Desde este punto de vista,

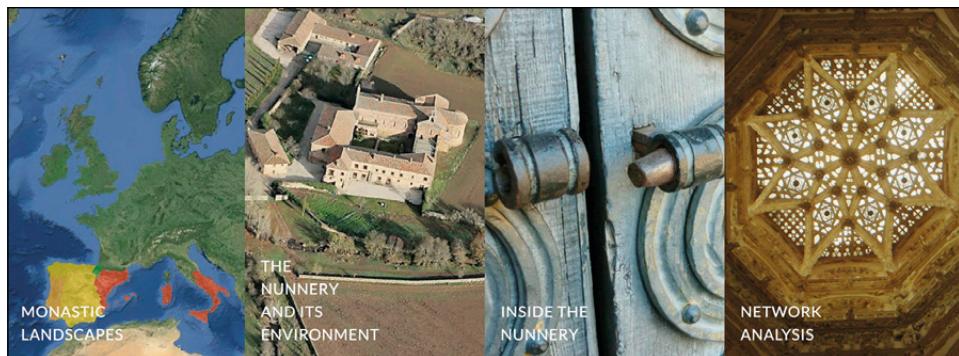


Fig. 2 – Imagen extraída de la web del proyecto PAISAJES ESPIRITUALES, en la que se visualizan los cuatro Ejes de investigación.

el paisaje es mucho más que un concepto ligado al territorio, constituyendo un espacio de interacción de la complejidad de factores económicos, sociales, culturales, religiosos o territoriales que convergen en los monasterios rurales y urbanos de época medieval. Nos adentramos así en el concepto holístico de paisaje monástico (CASSIDY-WELCH 2001; BOND 2004), conceptualizado como paisaje espiritual (*Spiritual Landscape*), el estudio del cual constituye el principal objeto de análisis del proyecto PAISAJES ESPIRITUALES.

Desde esta perspectiva, nuestra investigación pretende avanzar en el conocimiento sobre las formas de recepción, transformación y desarrollo de la espiritualidad femenina en los distintos ámbitos de la Península Ibérica y en sus áreas históricas de influencia, estableciendo líneas de comparación con los espacios de espiritualidad masculina. Además, quiere trabajar en una propuesta metodológica que explore las posibilidades de un análisis integral y complejo del paisaje espiritual, con aproximaciones a diferentes escalas espaciales al fenómeno religioso de la Europa medieval. Todo ello, a través de cuatro Ejes de investigación bien definidos (Fig. 2):

- *Eje 1: Paisajes Monásticos*, destinado a la elaboración y estudio de cartografías comparativas de los procesos de fundación, implantación y desarrollo de las órdenes monásticas femeninas y masculinas;
- *Eje 2: El Monasterio y su entorno*, que estudia las relaciones e impacto de los centros monásticos con su territorio circundante, sea éste rural o urbano;
- *Eje 3: El Monasterio interior*, centrado en la recreación de la topografía interior de los monasterios femeninos medievales;
- *Eje 4: Redes de Espiritualidad*, en el que se pretende mapear las relaciones, el movimiento y la circulación de ideas en contextos espirituales de reforma, disidencia y persecución.

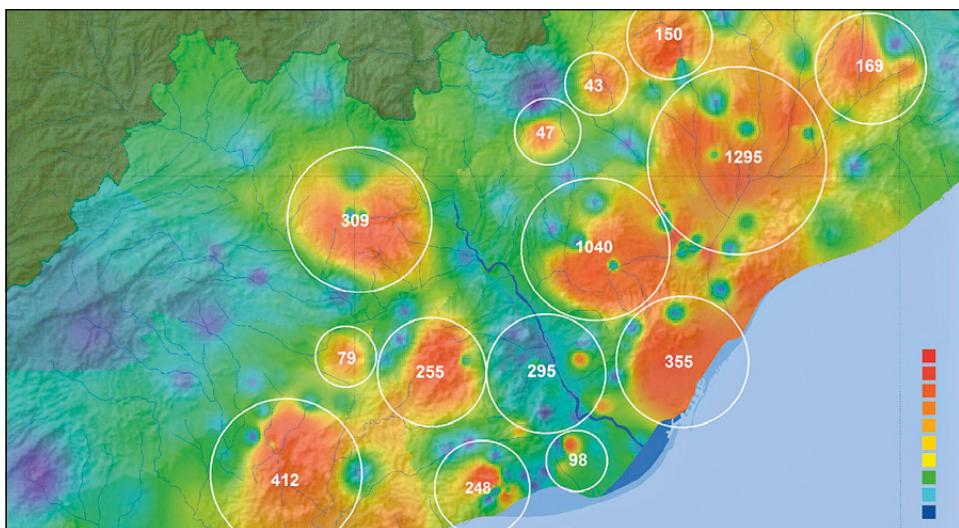


Fig. 3 – Ejemplo de interpolación, recuento y clusterización de datos en el análisis del patrimonio productivo del monasterio Sant Cugat del Vallès (siglos X-XI).

Tal aproximación al fenómeno espiritual requiere de una investigación multinivel e interdisciplinar, que tenga en cuenta todo tipo de fuentes a nuestra disposición: documentales, arqueológicas, artísticas o territoriales, con el objetivo de analizar el impacto de los centros monásticos medievales en el territorio rural o urbano sobre el que se fundaron. A partir de la información catalogada y georeferenciada en el Atlas CLAUSTRA, además de los espacios monásticos masculinos registrados a través de PAISAJES ESPIRITUALES, podremos conocer la ubicación concreta del conjunto de cenobios de un determinado territorio, acceder a sus datos descriptivos y ponerlos en relación espacial con las redes monásticas de su misma o distinta orden. Por otro lado, el estudio pormenorizado de la información conservada en los cartularios y otras colecciones documentales de los monasterios, nos permitirá georeferenciar las relaciones de cada uno de ellos con el territorio inmediato o más lejano que los circundaba. Estudiaremos así la ubicación y evolución cualitativa y cuantitativa de sus propiedades productivas, la relación con los espacios de poder, con la red viaria, con las villas mercado cercanas o con los espacios de abastecimiento económico y alimentario de la comunidad.

Con este trabajo de mapping, hemos analizado los ejemplos de los monasterios benedictinos de Sant Daniel de Girona y Sant Cugat del Vallès – femenino el primero y masculino el segundo – los cuales disponen de ricos fondos documentales sobre el proceso de articulación de su dominio

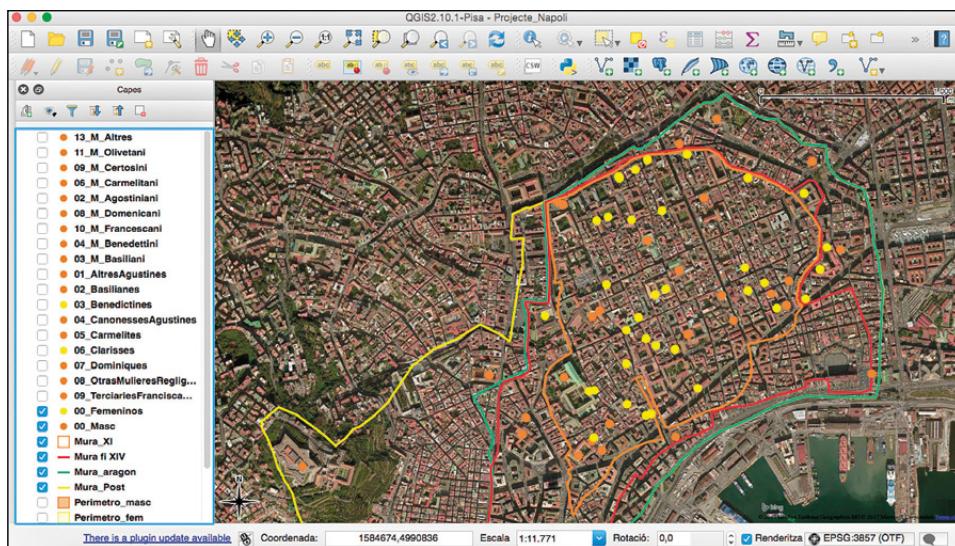


Fig. 4 – Ventana del programa QGIS en el estudio de los monasterios femeninos y masculinos localizados en la ciudad de Nápoles (siglos XII-XV).

patrimonial. Gracias al estudio pormenorizado de la información contenida en las fuentes escritas de ambas comunidades y a su georeferenciación sobre una base cartográfica digital hemos podido conocer la ubicación, tipología y sucesiva evolución de sus propiedades, así como su respectiva tipología. En el caso de Sant Cugat del Vallès (Fig. 3), la georeferenciación de tales elementos (MAURI 2006; SOLER 2006) nos ha permitido avanzar en el conocimiento sobre el origen y formas de adquisición de su dominio, la ubicación y tipología de sus bienes productivos y la vocación económica de su gestión patrimonial (SOLER 2017, 478-489).

De igual manera, pretendemos analizar el impacto de las fundaciones monásticas en el entorno urbano. Tal objetivo se desarrolla a través del análisis de la topografía urbana de las ciudades medievales, la cual constituye un magnífico palimpsesto sobre su evolución histórica (SOLER 2002; LILLEY 2005). Tomando como base metodológica el estudio realizado sobre el modelo de implantación de los monasterios de clarisas en las villas y ciudades catalanas (COSTA, SANCHO, SOLER-SALA 2017), queremos ahora analizar el comportamiento de las fundaciones monásticas medievales en otras ciudades mediterráneas. Tal es el caso de Nápoles, para cuyo estudio se han registrado, georeferenciado y perimetrado los más de sesenta monasterios femeninos y masculinos documentados entre los siglos XII y XV (Fig. 4), con la finalidad de analizar su impacto sobre la topografía urbana de la ciudad y detectar la existencia de modelos de implantación

para las distintas órdenes. Todo ello, con el objetivo final de poder establecer comparaciones con otras ciudades de la Corona de Aragón.

Finalmente, el interés por acercarnos al fenómeno monástico desde múltiples aproximaciones y perspectivas nos permite reducir la escala de observación al paisaje interior de la comunidad (JORNET 2014), con el fin de recrear un modelo de topografía interior de los monasterios de mujeres bajomedievales que haga especial hincapié en las arquitecturas, los documentos, los objetos y los usos performativos, buscando visualizar la especificidad espacial de los contextos de clausura. Se trata de recrear un paisaje particular, que queda limitado por el edificio monástico, acercándonos a sus personas, a sus objetos, a sus relaciones, al movimiento y a la ausencia del mismo (CORBELLINI 2014, 81-100).

Tal diversidad de aproximaciones solo es posible a partir de un uso intenso de las herramientas digitales y a través de una plataforma informática capaz de permitir tanto el almacenaje y georeferenciación de los espacios de espiritualidad, como el análisis territorial y de relaciones con su entorno inmediato o más lejano, así como la visualización del paisaje monástico en sus múltiples escalas de observación. Todas estas miradas constituyen la base de nuestro proyecto.

## 5. ESTUDIO ESPACIAL: LA OPORTUNIDAD DE LOS GIS

En lo que se refiere a los aspectos tecnológicos, PAISAJES ESPIRITUALES apuesta por la utilización de los GIS (Geographical Information Systems) como herramienta de representación y análisis del fenómeno monástico medieval. Más allá del creciente interés que suscita su uso en el ámbito de los estudios históricos (BODENHAMER *et al.* 2010), tal elección responde a un doble objetivo. Por un lado, la necesidad de representar la información contenida en el Atlas CLAUSTRA sobre una base cartográfica digital capaz de almacenarla, visualizarla y analizarla en cada una de las distintas aproximaciones explicadas en el apartado anterior. Por otro lado, la voluntad de estudiar la espiritualidad medieval des de la perspectiva holística del paisaje histórico, en sus múltiples relaciones y a través de todo tipo de fuentes. Tal objetivo nos obligaba a disponer de una plataforma de representación y análisis integrada, donde la georeferenciación de los datos constituya el elemento de homogeneización necesario para el trabajo conjunto con todos ellos. Esta es, sin duda, una de las grandes ventajas de los GIS en el estudio del paisaje medieval (MAURI 2006).

De acuerdo con ello, los GIS son mucho más que simples herramientas de representación cartográfica. Constituyen también plataformas de análisis espacial, interdisciplinar y multinivel de las informaciones almacenadas en nuestra base de datos. En este sentido, para el proyecto PAISAJES ESPIRITUALES, el objetivo no ha sido solo el de georeferenciar la ubicación concreta de cada monasterio (Fig. 4), sino también la de los diferentes elementos que forman parte de su espacio patrimonial de recursos y dominio, sus parámetros de relación e

impacto, así como sus entornos de influencia y relación en el espacio territorial donde se insertan. Todo ello, con el objetivo de comprender la complejidad de factores que intervienen en la construcción y desarrollo del paisaje espiritual medieval. Las cartografías históricas resultantes de este proceso constituyen no sólo en una fuente elaborada para conocer la distribución de los monasterios estudiados, sino también una herramienta de conocimiento de las relaciones existentes tanto entre ellos, como entre ellos y el territorio.

Todo ello, gracias a la aplicación de funcionalidades de análisis complejo, estadístico y algorítmico propios de los GIS, capaces de analizar desde un punto de vista cuantitativo el conjunto de los datos. Si bien este trabajo se encuentra hoy en proceso de implementación, hemos aplicado ya algunas funciones analíticas de interés. Por un lado, la elaboración de mapas temáticos a través de criterios de búsqueda concretos, en los que se representan sólo aquellos datos que cumplen con los parámetros requeridos. Por otro, la interpolación de datos, una útil función de representación cartográfica que permite crear modelos evolutivos a partir de la información almacenada en nuestra base de datos. En el ejemplo del monasterio de Sant Cugat del Vallès, donde se pretendía estudiar la distribución de las propiedades productivas localizadas en las fuentes (Fig. 3), el modelo interpolado otorga colores fríos (azules) a los ámbitos con menor densidad de propiedades, y coloraciones cálidas (rojas) a los espacios de mayor concentración. En este mismo ejemplo se observa el uso de otras técnicas de análisis territorial, como el recuento y la clusterización, a través de las cuales se facilita el visionado e interpretación de los datos cuando estos son muy abundantes.

Así pues, el uso de los GIS en los procesos de representación cartográfica y análisis del paisaje espiritual medieval nos permite visualizar realidades históricas y relaciones que hasta el momento no éramos capaces de conocer, convirtiéndose en una sugerente puerta de entrada a la complejidad del pasado (GUERMANDI 2011, 441-445).

## 6. TECNOLOGÍAS Y LENGUAJE DE LA HISTORIA

Retomando el análisis metodológico de los proyectos Atlas CLAUSTRA y PAISAJES ESPIRITUALES, se observa como cada estructura arquitectónica – cada convento – constituye una sedimentación compleja de factores externos: económicos, sociales, religiosos y territoriales, y aspectos internos que lo conectan con los acontecimientos locales. Las dos escalas de relación se entrecruzan solidariamente en la imagen que tenemos sobre su historia, hecha tanto de macro-eventos como de disputas locales, que las piedras, los documentos, registran en la vida de las cosas y de las personas. Los nuevos lenguajes y herramientas digitales nos ofrecen posibilidades de conexión “diferentes” (DELEUZE 1997) entre estas dos escalas. Efectivamente, si por un lado el diagnóstico a través de scanner 3D y georadar, que hemos utilizado para el estudio de las posibles

estructuras arquitectónicas enterradas de la basílica de Santa Clara en Nápoles, ha dado a conocer las señales más íntimas de los eventos sucedidos en el lugar (ya sean visibles u ocultos), por otro lado, las plataformas informáticas de gestión de datos nos han permitido un uso integrado de la información. El potencial que ofrecen las TIC interviene desde las primeras fases de la construcción del dato, para posteriormente pasar a redefinir los esquemas de registro y de gestión de la información, abriendo la narración histórica a nuevas formas de representación y aprendizaje, que van más allá de los resultados de la investigación científica.

Los nuevos sistemas de digitalización 2 y 3D de textos, de artefactos históricos o de contextos, permiten un registro cualitativo de los datos mucho más avanzado, garantizando grados de conexión referibles a los diferentes tipos de información y no reducibles a las habituales relaciones lógico temporales. El mundo digital otorga al dato una condición metamórfica fuertemente relacionada con los contextos de pertenencia según modelos de conexión complejos, en algunos casos no consecuenciales, que nos acercan a las relaciones metaestructuradas. Estas relaciones, en particular, abren el uso de los datos a modelos de compartición de la información propios de los mecanismos de desarrollo de la inteligencia colectiva (LEVY 1994), los cuales, a la vez, requieren modelos de gestión próximos a la lógica de los espacios topológicos. De tal manera, el uso de las tecnologías en la construcción del dato histórico se conecta a los temas propios del intercambio y de la gestión de la información en el interior de su propio ciclo de vida, que en la era de lo digital coincide con la necesidad de transformar la aproximación interdisciplinar en un riguroso método científico.

De ahí el sentido de nuestra investigación, destinada a estudiar los posibles métodos de construcción de los datos históricos, de registro y restitución de los mismos en el interior de matrices de relaciones complejas, hasta transformar la propia información y las tecnologías que los representan en artefactos para el conocimiento.

1) La construcción del dato. La digitalización de los datos, ya sean textuales o espaciales, garantiza un registro de la calidad del signo documental, de los objetos, más allá de los límites de lo visible, pudiendo integrar técnicas de diagnóstico multiespectral, termográficas, radar, rayos X, etc., con informaciones obtenidas con instrumentos láser, a luz estructurada o *image-based*. La misma escala de visualización de los datos permite investigar los estados más íntimos de la materia, poniéndolos en relación con las formas percibidas y con las fuerzas, con los sucesos que los han determinado. En el caso del proyecto de investigación dedicado a la detección y al estudio del *tramezzo* de la basílica de Santa Clara, la investigación con georadar, por ejemplo, ha sido fundamental en el proceso de verificación de los estudios históricos tradicionales, geométrico-formales y cultuales (véase C. BRUZELIUS *et. al.* en el mismo volumen, pp. 81-103).

2) Registro y gestión de los datos. La búsqueda de nuevas técnicas, procesos y métodos capaces de restituir con mejor consistencia, coherencia y exactitud los

datos digitales adquiridos debe ser encuadrada en un contexto científico más amplio, en el que los mismos datos pueden asumir una diferente relevancia cuando se insertan en un entorno de análisis sofisticado y multidisciplinar. El potencial que ofrecen hoy los sistemas de catalogación y gestión de los datos, que pueden conectar la información a través de redes semánticas para apoyar mapas de representación del conocimiento, consiguen secuenciar tipos y sistemas de información diversificados, permitiendo análisis y deducciones inalcanzables con los sistemas de catalogación tradicional. Tales métodos de gestión de los datos garantizaran un uso de los mismos según lógicas multinivel referidas a los diversos ámbitos disciplinares para apoyar la comprensión de contextos complejos y extensos, tales como los paisajes históricos. Para llevar a cabo una metodología de investigación histórica como esta, es necesario diseñar una infraestructura tecnológica basada sobre el sistema del Big Data, capaz de manejar grandes cantidades de datos heterogéneos y no estructurados, útiles para la construcción de escenarios de investigación inéditos. Los avances tecnológicos en apoyo a los procesos de Data Mining y Machine Learning permiten, de hecho, la extracción compleja de información implícita, desconocida y potencialmente útil, mediante procesos automáticos/semitácticos. Con el uso de modelos analíticos será posible explorar y analizar grandes cantidades de datos, proporcionando a la investigación histórica nuevos modelos de recurrencia de las informaciones (pattern), los cuales, integrados en sistemas de aprendizaje automático, extenderán los escenarios de contextualización de los datos mucho más allá de los simples patrones de proximidad y correlación lineal. Del mismo modo, tal procedimiento de gestión de los datos del proyecto de la basílica de Santa Clara podría ser aplicado en el estudio de otros monasterios, produciendo de tal modo un segundo nivel de interacción macroestructural, una especie de suma y potenciación de los proyectos CLAUSTRA y PAISAJES ESPIRITUALES.

3) Representación y artefactos para el conocimiento. Lo digital y la representación como herramienta de generación informativa, determinan la existencia de una conexión entre lo real y sus propias formas de abstracción, que tienen lugar en el pensamiento y en la imaginación. La imagen del espacio donde suceden las posibles correlaciones entre las informaciones se ha enriquecido de manera notable, incluyendo las dimensiones de lo posible junto a las categorías de lo real, de lo actual junto a los contextos mismos de lo virtual. En apoyo a la gestión y a la representación de los patrones de relación entre los datos históricos, es necesario definir niveles correlacionados de mapas topológicos. Estos mapas, mediante un segundo nivel de relaciones, compondrán diagramas topológicos, en los cuales la proximidad entre las cualidades de los datos definirá nuevos ámbitos de conocimiento, más allá de los límites cuantitativos de las relaciones de medidas y las sucesiones temporales. Aquello que el uso de lo virtual deberá investigar y mapear en estructuras dinámicas de datos, es la posibilidad de incluir diferentes estados perceptivos en el instante sincrónico de

la representación y generación de “contextos variables”, a través de imágenes multidimensionales. El incremento de dimensiones, a su vez, permitirá, por un lado, la extensión de los estados perceptivos, y por el otro, la inclusión de las formas en dinámicas complejas que trazarán sus cualidades, produciendo una proliferación de lo actual entre los pliegues más íntimos de los objetos y de los contextos sobre los que se apoyan (REPOLA 2008).

Desde el interior de la virtualidad todo está comprometido, los individuos, las cosas y las imágenes que tenemos de ellos, y sobre esta alteración se fundan los ecos de una comprensión más profunda de los acontecimientos y de la intensidad de las formas: «L'attualizzazione è creazione, invenzione di una forma a partire da una configurazione dinamica di forze e di finalità. Vi accade altro dal conferimento di realtà a un possibile o dalla scelta all'interno di un insieme predeterminato: una produzione di qualità nuove, una trasformazione delle idee, un vero e proprio divenire che di rimando alimenta il virtuale stesso» (LEVY 1997, 7).

En realidad, se debe constatar que, como consecuencia de la variación de los conceptos de tiempo, de determinación del espacio y de registro del movimiento, está cambiando la idea misma de lo actual; de manera que se investiga siempre más la producción de modelos referidos a un real aumentado, en los cuales el pensamiento y los instrumentos interactúan críticamente (REPOLA 2017, 33-46). La variación cualitativa de las formas de los contextos y de los objetos en ellos incluidos ha hecho poco a poco complicados y parciales los procesos de percepción y representación sobre los que se basan los procesos cognitivos de las personas. Las tecnologías digitales han ampliado los límites de tal percepción y han permitido el uso de la información contextual más allá de los mecanismos primeros de determinación del pensamiento, generando diferentes niveles de interpretación crítica, válida para diferentes tipos de usuarios. De aquí el potencial de los software paramétricos en la modulación de los datos tridimensionales de la fábrica de Santa Clara, que a partir de los modelos numéricos reales permitirán una progresiva verificación de las hipótesis reconstructivas, a través de la variación de los parámetros derivados del recorrido histórico y del conjunto de las informaciones registradas. Tal infraestructura tecnológica podrá investigar sobre nuevos lenguajes de representación, dinámicos y también válidos para los diversos contextos de estudio referidos a los espacios claustrales.

## 7. CONCLUSIONES

A lo largo de estas páginas hemos pretendido dar a conocer dos proyectos de investigación en curso enmarcados en el ámbito de las Digital Humanities. Ambos se articulan en base al diseño, implementación y desarrollo de dos potentes plataformas digitales que son a la vez espacio de trabajo compartido, herramienta de estudio científico y ámbito de difusión de los conocimientos

alcanzados a través del proceso de investigación. Así lo hemos visto en el caso del Atlas y Catálogo de CLAUSTRA, donde la base de datos y el proceso de georeferenciación se entrecruzan en una misma plataforma de visualización y estudio; y así pretendemos que suceda también en el proyecto PAISAJES ESPIRITUALES, a través de la representación mediante GIS de los diferentes niveles de aproximación al espacio monástico medieval.

En ambos casos, y también en el ejemplo de estudio interdisciplinar y multinivel de la basílica de Santa Clara, la aplicación de herramientas de representación y análisis digital nos permite encontrar nuevas formas de aproximación al estudio de la espiritualidad femenina medieval, abriendo el campo de atención a novedosas perspectivas de investigación sobre el papel de las mujeres y de los hombres en el paisaje espiritual de la Edad Media.

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Por su lado, en el proyecto PAISAJES ESPIRITUALES, participan miembros de la Universidad de Barcelona, de la Universitat Internacional de Catalunya, de la Universidad Pablo de Olavide, de la Universidad Pontificia de Comillas, de la Universidad de Oviedo, de la Universidad de Lisboa, de la Universidad Abierta de Portugal, de la Universidade Nova de Lisboa, de la University of Nottingham, de la Universitat Leipzig, de la Duke University, de la University of Colorado-Boulder, de L'École des hautes études en sciences sociales, del Istituto di Studi sulle Società del Mediterraneo–CNR, del Istituto di Storia dell'Europa Mediterranea, del Reial Monestir de Pedralbes (ICUB) y del Servei d'Arxius de la Federació Catalana de Monges Benedictines.

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## BIBLIOGRAFÍA

- ALBERZONI M.P. 1998, *Papato e nuovi ordini religiosi femminili. Atti del XXV Convegno internazionale della Società internazionale di studi francescani (Assisi 1998)*, Atti dei Convegni della Società internazionale di studi francescani e del Centro interuniversitario di studi francescani, 25, Spoleto, 205-261.
- ANDENNA C. 2012, *Da moniales novarum penitentium a sorores ordinis Sancte Marie de Valle Viridi. Una forma di vita religiosa femminile tra Oriente ed Occidente (secoli XIII-XV)*, in F. PANARELLI (ed.), *Da Accon a Matera: Santa Maria la Nova, un monastero femminile tra dimensione mediterranea e identità urbana (XIII-XVI secolo)*, Vita regularis. Abhandlungen, 50, Berlin, 59-130.
- ANDENNA G., VETERE B. 1997, *Chiara e il secondo ordine. Il fenomeno francescano femminile nel Salento*, Galatina, Congedo Editore.
- BARONE G. 1997, *Come studiare il monachesimo femminile*, in ZARRI 1997, 1-15.
- BENVENUTI PAPI A. 1990, “*In Castro Poenitentiae*” Santità e Società Femminile nell’Italia Medievale, Italia sacra, 45, Roma, Herder.
- BODENHAMER D.J., CORRIGAN J., HARRIS T.M. (eds.) 2010, *The Spatial Humanities: GIS and the Future of Humanities Scholarship*, Indiana, University Press.
- BOLÒS J. 2010, *Un paisatge complex d'un país molt vell. Els estudis d'història del paisatge per comprendre i valorar el territori*, in J. BOLÒS (ed.), *La caracterització del paisatge històric*, Lleida, Universitat de Lleida, 83-147.
- BOND J. 2004, *Monastic Landscapes*, Stroud, Tempus.
- CASSIDY-WELCH M. 2001, *Monastic Spaces and their Meaning. Thirteenth-Century English Cistercian Monasteries*, Belgium, Brepols Publishers.
- COLESANTI G.T., GARÍ B., JORNET-BENITO N. (eds.) 2017, *Clarisas y dominicas. Modelos de implantación, filiación, promoción y devoción en la Península Ibérica, Cerdeña, Nápoles y Sicilia*, Firenze, Firenze University Press.
- CORBELLINI S. 2014, *Mapping spiritual life: A spatial approach to late medieval spirituality*, «Anuario de Estudios Medievales», 44/1, 81-100.
- COSTA X., SANCHO M., SOLER-SALA M. 2017, *Monacato femenino y paisaje. Los monasterios de clarisas dentro del espacio urbano en la Catalunya medieval*, in G.T. COLESANTI, B. GARÍ, N. JORNET-BENITO (eds.), *Clarisas y dominicas. Modelos de implantación, filiación, promoción y devoción en la Península Ibérica, Cerdeña, Nápoles y Sicilia*, Firenze, Firenze University Press, 449-486.
- DELEUZE G. 1997, *Differenza e ripetizione*, Milano, Raffaello Cortina Editore.
- DE LUCA L. et al. 2011, *A semantic-based platform for the digital analysis of architectural heritage*, «Computer and Graphics», 35, 227-241.
- DIODATO R. 2005, *Estetica del virtuale*, Milano, Bruno Mondadori.
- FAI S., FILIPPI M., PALIAGA S. 2013, *Parametric Modelling (BIM) for the documentation of vernacular construction methods: A BIM model for the Commissariat Building*, Ottawa, Canada, «ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences», II-5/W1, 115-120.
- FONSECA C.D. (ed.) 1983-1984, *L'esperienza monastica benedettina nelle antiche province della Puglia: bilancio storiografico e prospettive di ricerca. Atti del Convegno di Studio organizzato in occasione del XV centenario della nascita di San Benedetto (Bari-Noci-Lecce-Picciiano 1980)*, Galatina, Congedo Editore.
- FONSECA C.D. (ed.) 2008, *Il Monachesimo femminile tra Puglia e Basilicata. Atti del Convegno di Studi promosso dall'Abbazia benedettina barese di Santa Scolastica (Bari 2005)*, Bari, Edipuglia.
- GARAGNANI S. 2012, *Semantic Building Information Modeling and high definition surveys for Cultural Heritage sites*, «DISEGNARECON», 5, 11, 297-302.

- GARÍ B. (ed.) 2013a, *Redes femeninas de promoción espiritual en los Reinos Peninsulares (s. XIII-XVI)/Women's Networks of Spiritual Promotion in the Peninsular Kingdoms (13<sup>th</sup>-16<sup>th</sup> Centuries)*, Roma, Viella.
- GARÍ B. 2013b, *La ciudad de las mujeres: redes de espiritualidad femenina y mundo urbano*, in J.Á. SOLÓRZANO, B. ARÍZAGA, A. AGUIAR (eds.), *Ser mujer en la ciudad medieval*, Logroño, Instituto de Estudios Riojanos, 349-370.
- GARÍ B. (ed.) 2014a, *Espacios de espiritualidad femenina en la Europa medieval. Una mirada interdisciplinar*, «Anuario de Estudios Medievales», 44/1.
- GARÍ B. 2014b, *The sacred space of meditation: Nunneries and devotional performance in the territories of the Crown of Aragon (Fourteenth-Fifteenth Centuries)*, «The Journal of Medieval Monastic Studies», 3, 71-95.
- GARÍ B., SOLER M., SANCHO M., NIETO D.-I., ROSILLO A. 2014, CLAUSTRA. *Propuesta metodológica para el estudio del monacato femenino*, «Anuario de Estudios Medievales», 44/1, 21-50.
- GIORDANO A. 2016, *La comunicazione della conoscenza per la conservazione e l'innovazione dei luoghi storici: digital visualization delle trasformazioni del centro storico di Carpi*, in G. CENNAMO (ed.), *Processi di analisi per strategie di valorizzazione dei paesaggi urbani*, Vol. 1, Roma, ERMES Servizi editoriali integrati srl, 869-876.
- GRAÑA M.M. 2010, *Religiosas y ciudades. La espiritualidad femenina en la construcción sociopolítica urbana bajomedieval* (Córdoba, siglos XIII-XVI), Córdoba, AHEF.
- GRUNDMANN H. 1961, *Religiöse Bewegungen im Mittelalter. Untersuchungen über die geschichtlichen Zusammenhänge zwischen der Ketzerei, den Bettelorden und der religiösen Frauenbewegung im 12. und 13. Jh. und über die geschichtlichen Grundlagen der deutschen Mystik* (Ebering, Berlin 1935), Darmstadt, Wissenschaftliche Buchgesellschaft.
- GUERMANDI M.P. 2011, *La sfida della complessità*, «Archeologia e Calcolatori», 22, 441-445.
- JORNET N. 2014, *Un monestir a la cruïlla, els inventaris de sagristia del monestir de Sant Antoni i Santa Clara de Barcelona (1389-1461)*, «Anuario de Estudios Medievales», 44/1, 277-308.
- LEVY P. 1994, *Il virtuale*, Milano, Raffaello Cortina Editore.
- LEVY P. 1997, *L'intelligence collective. Pour une anthropologie du cyberspace*, Paris, Éditions La Découverte.
- LILLEY K.D. 2005, *Mapping and analyzing medieval built form using GPS and GIS*, «Urban Morphology», 9/1, 5-15.
- LITTLE, L.K. 1980, *Pobreza voluntaria y economía de beneficio en la Europa medieval*, Madrid, Taurus.
- MALDONADO T. 1993, *Reale e virtuale*, Milano, Feltrinelli.
- MAURI A. 2006, *La configuració del paisatge medieval: el comtat de Barcelona fins el segle XI*, Tesis doctoral inédita, Universidad de Barcelona.
- MURARO L. 2001, *Le amiche di Dio. Scritti di mistica femminile* (ed. C. JOURDAN), Napoli, M. D'Auria.
- PANARELLI F. 2012, *Da Accon a Matera: Santa Maria la Nova, un monastero femminile tra dimensione mediterranea e identità urbana (XIII-XVI secolo)*, Berlin, LIT Verlag Münster.
- PIERRE L. 1994, *L'intelligence collective. Pour une anthropologie du cyberspace*, Paris, Éditions La Découverte.
- REPOLA L. 2017, *Spazi immersivi e figurazioni virtuali*, in *Le stanze del tempo. La collezione d'arte di Rocco Pagliara tra passato e futuro*, Napoli, Università Suor Orsola Benincasa, 33-46.
- REPOLA L. 2008, *Architettura e variazione attraverso Gilles Deleuze*, Napoli, Istituto Italiano per gli Studi Filosofici.

- SOLER M. 2002, *Medieval topographical urban models: Development and morphological evolution of the villages in Barcelona's county between the 10<sup>th</sup> and 13<sup>th</sup> centuries*, in G. HELMIG, B. SCHOLKMANN, M. UNTERRMANN (eds.), *Centre, Region, Periphery. III International Conference of Medieval and Later Archeology*, II, Basilea, Folio Verlag, 573-579.
- SOLER M. 2006, *Els espais d'intercanvi. El mercat en el procés de gènesi i consolidació del feudalisme al comtat de Barcelona (segles IX-XIII)*, Tesis doctoral inédita, Universidad de Barcelona.
- SOLER M. 2017, *Propiedad monástica y sustento alimentario: el patrimonio productivo del monasterio de Sant Cugat del Vallès (siglos X y XI)*, «Hortus Artium Medievalium», 23/1, 478-489.
- SOLÓRZANO J.Á., ARÍZAGA B., AGUIAR A. (eds.) 2013, *Ser mujer en la ciudad medieval*, Logroño, Instituto de Estudios Riojanos.
- STEWART C. 2011, *Monastic space and time*, in H. DEY, E. FENTRESS (eds.), *Western Monasticism ante litteram. The Spaces of Monastic Observance in Late Antiquity and the Early Middle Ages*, Turnhout, Brepols, 43-51.
- VITOLO G. 1996, “Vecchio” e “nuovo” monachesimo nel regno svevo di Sicilia, in A. ESCH, N. KAMP (eds.), *Friedrich II. Tagung des Deutschen Historischen Instituts in Rom im Gedenkjahr 1994*, Tübingen, Max Niemeyer Verlag, 182-200.
- ZARRI G. 1997, *Il monachesimo femminile tra passato e presente*, in G. ZARRI (ed.), *Il monachesimo femminile in Italia dall'alto medioevo al secolo XVII. A confronto con l'oggi. Atti del VI Convegno del Centro di Studi Farfensi (Santa Vittoria in Matenano 1995)*, Negarine (Verona), Gabrielli Editori, X-XX.
- ZELLNER P. 1999, *Hybrid Space. New Forms in Digital Architecture*, London, Thames & Hudson.

## ABSTRACT

This paper aims to present two projects carried out within the Digital Humanities field and related to the study of medieval feminine spirituality: the Atlas CLAUSTRA and the SPIRITUAL LANDSCAPES project. Both headed by the University of Barcelona, in collaboration with researchers at a large number of internationally renowned universities and research centres, they aim to study the medieval spiritual landscapes. The first does so through the creation of an Atlas and Catalogue of female spirituality spaces in Mediterranean Europe between the 11<sup>th</sup> and 16<sup>th</sup> centuries, and the second, through the study of the territorial impact of the foundation of monasteries on rural and urban landscapes during the Middle Ages. All this is based on the design, implementation and development of two powerful digital platforms that constitute a shared work space, scientific study tool, and instrument for the dissemination of the knowledge gained through the research.