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## Heritage Visualisation and Potential Speculative Reconstructions in Digital Space: The Medieval Church of St. Anne in Famagusta, Cyprus

This article is concerned with the 14<sup>th</sup> century church of St. Anne's in the historic walled city of Famagusta, Cyprus, as a site for transdisciplinary investigation embedded in, interrogated by, and disseminated via, digital space. The principal tool to create the foundational model and database of this historic structure was HBIM (Historic Building Information Modelling), beyond which further experiments were conducted in Padua and Singapore into the scholarly and pedagogical potential of VR, AR, and curated 4D interactive historic spaces. Such non-invasive systems of analysis are most welcome in a city where the legalities of conducting work 'in the field' are complicated by political and economic considerations.

Key words:  
Famagusta; HBIM; digital modelling; cultural heritage; conservation.

## MEDIEVAL FAMAGUSTA AND THE CHURCH OF ST. ANNE

In its medieval heyday Famagusta was the coronation place of the crusader kings of Jerusalem and one of the wealthiest entrepôts in the known world. It was during this 14<sup>th</sup> century period of Lusignan prosperity and influence that the city's magnificent Gothic churches, St. Anne among them, were built. There were those who speculated that this golden age could not last for long however – but while Dante warned of 'Famagusta's lot' [1] in *Inferno* and Saint Birgitta of Sweden prophesied doom on account of corruption and ungodliness, the message fell on deaf ears. Shortly thereafter fortunes began to change, firstly with a damaging Genoese occupation, then with the subsequent transfer of the city to Venice, and finally with the protracted and bloody Ottoman siege of 1570-1571 after which Famagusta became an Ottoman possession. Famagusta's abandoned hulk embarked now on a three-century long path to ruin through abandonment, depopulation, plague, and earthquake. Little wonder it became the stage-set for a martyrdom on the scale of Shakespeare's *Othello*. On the eve of the British takeover of the island in 1878, French scholar Louis de Mas Latrie recorded "*Dans l'intérieur, tout est bouleversé. Églises, palais, maisons, chaussées, remparts, rien n'est intact. Depuis trois cents ans, la solitude et le silence pèsent sur ces ruines*" [In the interior, all is changed. Churches, a palace, houses, roads, ramparts, nothing is intact. For three hundred years, solitude and silent has presided over these ruins]. [2] Famagusta was revitalised as an urban space and port by the British administration post-1878 though funding for its monuments was notoriously hard to find and often pragmatic decisions involving dredging the medieval harbour or piercing the Venetian curtain walls were taken, to the horror of those who cherished the scattered and forlorn remnants of long forgotten halcyon years. With the empire came two world wars in which it was bombed, and after which it became an internment site for tens of thousands of Jews in the final days of the Palestine Mandate. In 1974, fourteen years after independence, with the Turkish invasion of / intervention in Cyprus and the subsequent

partition of the island, Famagusta found itself located in the unrecognised Turkish Republic of Northern Cyprus where it remains to this day. The tangible remains of the city's art and architecture while complex and diverse are endangered by the fragility caused by this political limbo. They are therefore the perfect subject for non-invasive interdisciplinary investigations using new digital platforms in virtual space. An earlier visualisation project undertaken in one of Famagusta's churches in 2014 concluded by saying 'These digital technologies through their

capacity to bridge borders, create networks and recreate experiences, may yet produce a wider, better informed, more engaged audience for previously hidden or neglected arenas of cultural heritage.' [3] Five years later, this article demonstrates what next steps have been taken in this direction to protect, investigate, understand and appreciate Famagusta's unique historical and aesthetic legacy from distant laboratories in Italy and Singapore.

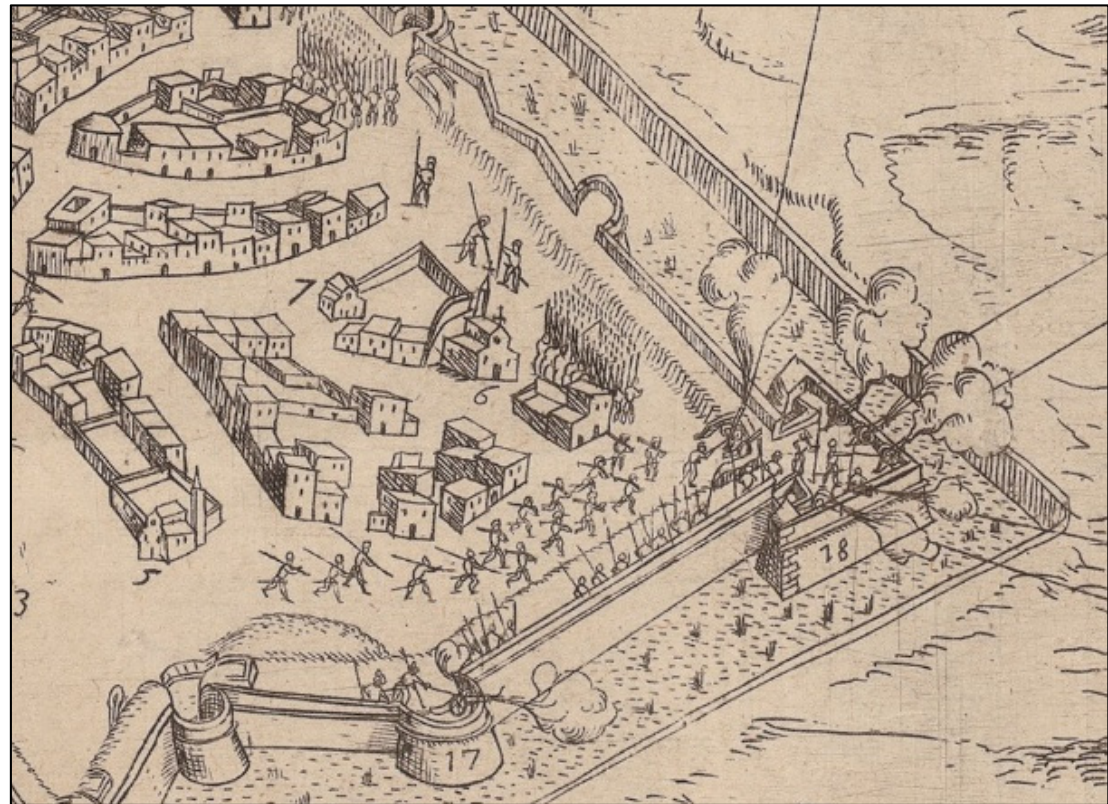


Fig. 1 - Stephano Gibellino, *Gravure représentant le siège de Famagouste* (Brescia, 1571). With permission of the Département de la Reproduction, Bibliothèque Nationale de France Bibliothèque Nationale de France.

## A BRIEF CONSERVATION HISTORY OF ST. ANNE'S

The 14<sup>th</sup> century church of St. Anne's remains remarkably intact structurally. It is located in the northwest corner (or 'Syrian Quarter') of Famagusta where Maronites, Jacobites, and Nestorians lived and worshipped. Although originally a Latin, Catholic church (probably Benedictine) it was given over to the Maronites at some point in the 14th century. Plagnieux and Soulard in their study of 'L'Église Sainte-Anne (Bénédictines de Sainte-Anne de Jérusalem)' cite a testament dated 1363, made by the Venetian Jean del Chastel, who appears to have left a legacy to the Abbey of Saint Anne of Famagusta. [4] It could well be the earliest record we have. Later the building appears on the Gibellino siege map made in Brescia shortly after the fall of Famagusta in 1571 and while the depiction is clearly schematic, the location and attribution seem unquestionable. (Fig.1) We lose sight of it then until Camille Enlart sketched and described it (church No. 7) in detail in his 1899 publication *Gothic Art and the Renaissance in Cyprus*. [5] St. Anne's, he stated with conviction, was 'a model of graceful simplicity and fine workmanship. The style is Southern French Gothic' [6] [It is one of the significant and unique values of studying the architecture of Famagusta that alterations are few as during the three centuries of neglect little was done to modify or erase the original construction. There was no Enlightenment, no Baroque nor Neo-Classicism, in Famagusta and so what remains is a direct glimpse of the 14<sup>th</sup> century - with minor conservation interventions dating to the 20<sup>th</sup> century]. The British 'Law on Famagusta Stones' in 1891 offered respite for the churches by attempting to prevent looting of cut stone for other building projects in Cyprus and further abroad. [7] We learn however that in 1906 George Jeffery (Curator of Ancient Monuments in Cyprus) was searching for meagre funds (about £20 'for the purpose of reclaiming the perfect church of St. Anne') [8] with which to clean it out and lock it to prevent any further usage as a donkey stable. [9] His locks were broken off and the practice resumed. [10] The following year he had it declared an Ancient

Monument under the Antiquities Law No. IV of 1905 but still by 1932 he could see the sky through cracks in the roof for which he requested a further £5. New windows were recommended too but the government had no such funds and private donations were sought through the Society for Protection of Ancient Buildings and, it was rumoured, the French government. [11] In 1935 the Department of Antiquities came into being with the Assistant Director of Antiquities for Famagusta being Theophilus Mogabgab, and soon after the paintings of Famagusta received their first rudimentary stabilization in centuries at the hands of a certain Monica Bardswell. [12] Coming up to Christmas 1940 we see photographs in the unpublished Mogabgab Archive which show the building being used as a 'garrison Church' by British servicemen, (Fig.2) then in the early years of Independence (ie post 1960) the churches of the Syrian Quarter were often used as homes for internally displaced Cypriots fleeing from

political turmoil outside the walls, and at other times, as storage sheds. Others were simply abandoned. After the invasion / intervention of 1974 the churches in the Syrian Quarter got fenced off within a military camp and remained there until late 2007. The author (with Professor Allan Langdale) inspected St. Anne's in that year and made an application to the World Monuments Fund to place the entire Walled City of Famagusta on the WMF Watch List of endangered heritage sites (this was repeated in 2010). [13] In 2012, following a long period of trust building measures (which had involved both the Greek Cypriot and Turkish Cypriot mayors of Famagusta delivering statements of support in Paris), emergency interventions in the Church of St. Anne began funded by the World Monuments Fund, Nanyang Technological University Singapore and the Famagusta Turkish Municipality.[14] It terminated in 2015 when the UNDP took over the project with European Union funding.

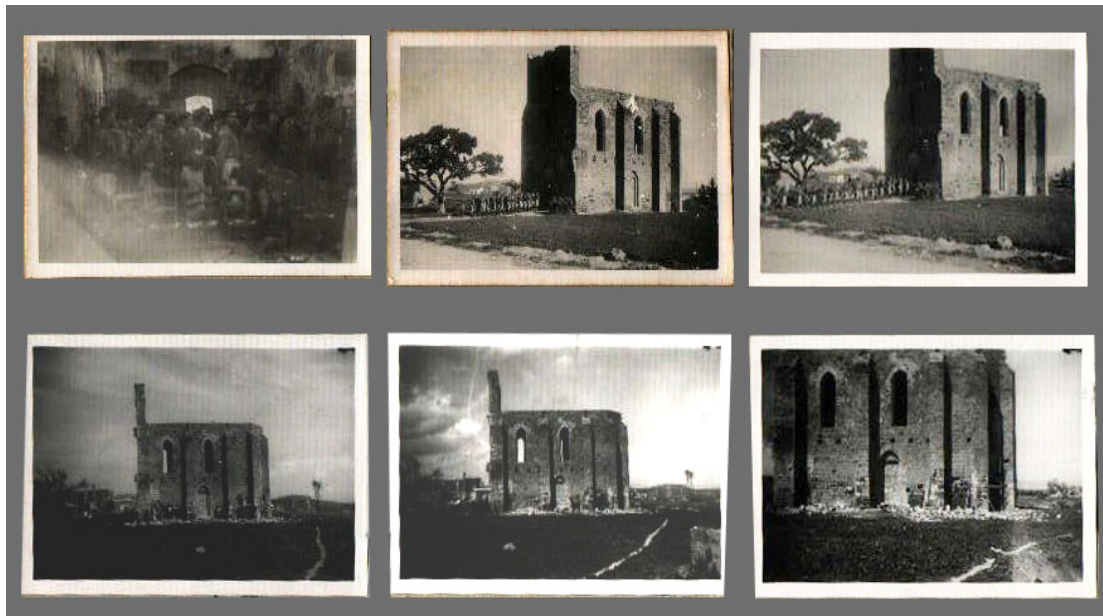


Fig. 2 - St. Anne's Church During the Second World War, Mogabgab Photographic Archive.

## BRIEF DESCRIPTION OF ST. ANNE'S AND ITS HBIM POTENTIAL

The team's initial objective was to make a full and complete record of the church of St. Anne as it is today. Secondly, we wished to undertake an academic reconstruction both architecturally and art historically by isolating, identifying and cross-referencing architectural and artistic elements throughout Famagusta and further afield. Thirdly, as diverse scholarship accumulated the need arose to create a system to catalogue and systemize models and data, establishing a standard for information management far and beyond footnotes and bibliographies in traditional publications [We felt that this was perhaps more forward looking and user friendly than our previous publication *The Armenian Church of Famagusta and the Complexity of Cypriot Heritage: Prayers Long Silent* (Palgrave MacMillan, 2017)]. The modelled clone should not be viewed as merely a geometrical representation then, but rather as a critical decision platform, replete with information derived from the multi-disciplinary project.

Technically St. Anne's as a physical space was easy to model as it consists of a simple single nave with two

bays (5.50 x 6 m) about 10 metres high, with two un-ribbed groined vaults and a rib vaulted choir. To create the initial scan a phase based Z+F Imager 5010C was used which created very high resolution/high density point clouds, then enhanced using an integrated HDR camera producing 80MPixel images. (Fig. 3, Fig.4) That completed, key areas for further investigation were selected based not on what is there today, but on that which has disappeared leaving only a historical lacuna behind.

During the reconstruction of historical buildings the missing components often yield as much information as those extant; from negative constructive elements it is possible to assume geometry and materials used, validated by comparison with other similar buildings. For example, Enlart invited comparisons with Guebwiller in Alsace, and a variety of other ecclesiastical monuments from Isômes (Haute-Marne) to Embrun Cathedral – references that can now be demonstrated visually. From the laser scan - point cloud it was possible to isolate, study and remake each architectural and structural element of the church and establish construction links not only with other buildings in Famagusta, and further afield in Cyprus, but across the short expanse of Mediterranean into what is today Israel and Syria.

Consider the following speculations: there were four entrance doorways the north-eastern most of which might have led into a sacristy. But the sacristy is now gone. Could we reconstruct it with the evidence we have? There are eight lancet windows but no trace at all of the glass that would have been contained within (it has survived nowhere in Famagusta). Is there any way at all, beyond careless speculation, to suggest what might have been there? There were two funerary niches (but no sign of the tombs), related inscriptions and some of the elaborate decorations that were recorded and admired by George Jeffery. Building on the scholarship of Michele Bacci could we re-make them? [15] Image recognition software can cross-reference objects and artefacts with a strong linear component often using crowd sourcing techniques as suggested by Dan Frodsham and Duncan Rowland. [16] For example, in St. Anne's there is a boss carved in a floral design which could easily be recorded and fed into an image recognition software that, in the fullness of time and with the benefit of projects like 'Arches' (<https://www.archesproject.org/>), would be able to instantaneously cross reference and match from a common database. The same might have been said of the heraldic devices that were observed above the interior of the west door and described by both Enlart and Jeffery: 'two shields of arms in the Renaissance style bearing azure, a rose gules surmounted by a Cross of Malta of the same with a bordure or.' [17] Even if the image is gone, the metadata provided through the description may well be able to detect other similar examples elsewhere with which historical comparison can be made. Outside, the roof was flat and linked perhaps to a monastery / convent by a wooden walkway, evidenced today by the existence of a flight of stairs which seem to lead nowhere.

George Jeffery had noted in his *Monuments of Cyprus* that 'the buildings of a convent (probably of unburnt brick) may be faintly traced in the rough ground on the north-west of the church. [18] Of this monastery we know nothing, though a GPR survey like that conducted by Minho University on the Armenian project would yield immediate results.



Fig. 3 - Orthophoto Section South. Laser Scan Survey. Solvotek.

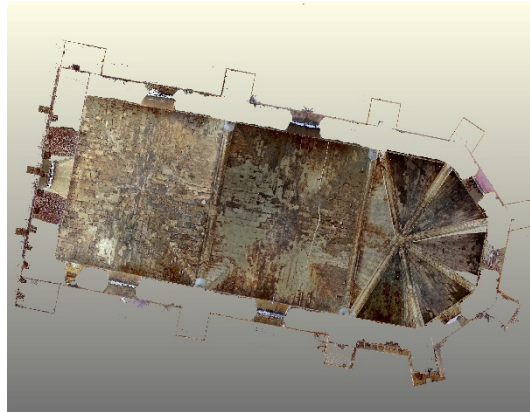


Fig. 4 - Orthophoto Plan. Laser Scan Survey. Solvotek.

There was 'a minute chapel or oratory', also described as a 'curious little sanctuary', [19] but it is no longer visible today. (Fig.5) Enlart had admired it, seeing embedded within its contours the influences of Saint-Maixent and La Puy Notre Dame in Poitou, and noting too how it had remained entirely resistant to earthquakes. [20] An entry from George Jeffery's diary dated 28/2/1923 reads 'Pulling down the little chapel apse outside St. Anne's and placing the remains within the church.' [21] Can we now rebuild it based on a single surviving photograph? On the south-west facade there was almost certainly a timber-roofed porch, a wooden balcony, and evidence of flagstaff holders. It would be fascinating to reconstruct the colourful and symbolic flags accurately and to digest what they tell us about noble families and power structures in Famagusta – but one does not know at present who to turn to for such research.



Fig. 5 - 'A curious little sanctuary', reproduced in Walsh, M. & A. Langdale, 'A Short Report on Three Newly Accessible Churches in the Syrian Quarter of Famagusta', *Journal of Cyprus Studies* (2007).

The belfry on the south-west façade is well preserved though has no bells. What would Famagusta have sounded like in the late 14<sup>th</sup> century? Can a 'sonic map' of medieval Famagusta be attempted to identify, locate, then blend all of the competing sounds emanating from the distinct sectors of the city. The 1457 will of Ugo Podocataro suggests strongly that the Jewish community resided in the South-West, Latins to the north and east, and Greeks in the south. Nicholas Coureas also suggested that the Catalans and Provençals had their own districts in Famagusta. [22] They would have looked different – so I imagine they would have sounded different too. [23] The team is currently at work identifying relevant music that would have been associated with the structure throughout the different stages of its history. In time these will be recorded and inserted into the model too.

Turning our attention now to the future we were able to visually anticipate certain interventions in advance of them happening in real life. For example, the removal of cement plaster could be done on the digital model, floors and windows replaced, conservation work on the stone surfaces undertaken, virtual cleaning of deposits, biological colonisation, and maybe even some re-pointing and grouting where necessary. We could also anticipate the structural interventions that will in time be needed such as the replacement of the deeply decayed stones of the vault, the reconstruction of the crumbling masonries, and even model what the structure's reaction to seismic activity might be. Visualising data therefore not only offers an attempted history of the church, or allows us to understand it's more recent conservation history, but actually offers an anticipated future. The rate of decay can be predicted, the materials used for conservation tested, and projected structural interventions 'modelled'. New strategies can be tried out too - for example, how floodlighting might be applied in the future. All in all, digital space can be edited, altered, reversed, augmented – and all at virtually no cost. No longer the restriction of the Venice Charter, Article 9, of which states that 'The process of restoration is a highly specialized operation. Its aim is to preserve and reveal the

aesthetic and historic value of the monument and is based on respect for original material and authentic documents. It must stop at the point where conjecture begins...' [24] Quite the contrary, we should not be fearful to speculate in this reversible environment. The success is of course entirely dependent on collaboration between experts of different disciplines, sharing information, working towards a common 'publication', away from the knowledge silos that have for too long characterised academia [Universities also need to support researchers and faculty in this transition finding new ways of assessing 'impact' beyond citation numbers from Tier 1 journals]. The case study which follows demonstrates this point by elucidating what trans-disciplinary potential suggests itself and emanating from a single architectural element.

#### CASE STUDY: RECONSTRUCTING THE WESTERN PORCH OF ST. ANNE'S USING HBIM

As previously noted there are many missing architectural elements due to the perishable materials used and the events the city has witnessed. The building is made of finely dressed local yellow sandstone ashlar masonry and as such is sensitive to weathering and aging in the form of granular disintegration, and therefore prone to water infiltration and subsequent decay. In the silent centuries the church was also used as a quarry for valuable cut stone which could be used for other building projects in Famagusta and further afield. Absences are especially prevalent around the location of the external porch, the crucial threshold between the urban space of mere mortals and the internal religious space in the house of God. As a starting point for a reconstruction at this location we used the bracket of an octagonal arch anchored to the wall and a capital alongside the bases of columns and two octagonal capitals found nearby. (Fig.7) Using Camille Enlart's descriptions, sketches and eventual architectural visual reconstruction of 1899, [25] and then through the comparative study of other churches (notably in Bellapaix, Pyrga, and the Carmelite church in Famagusta).

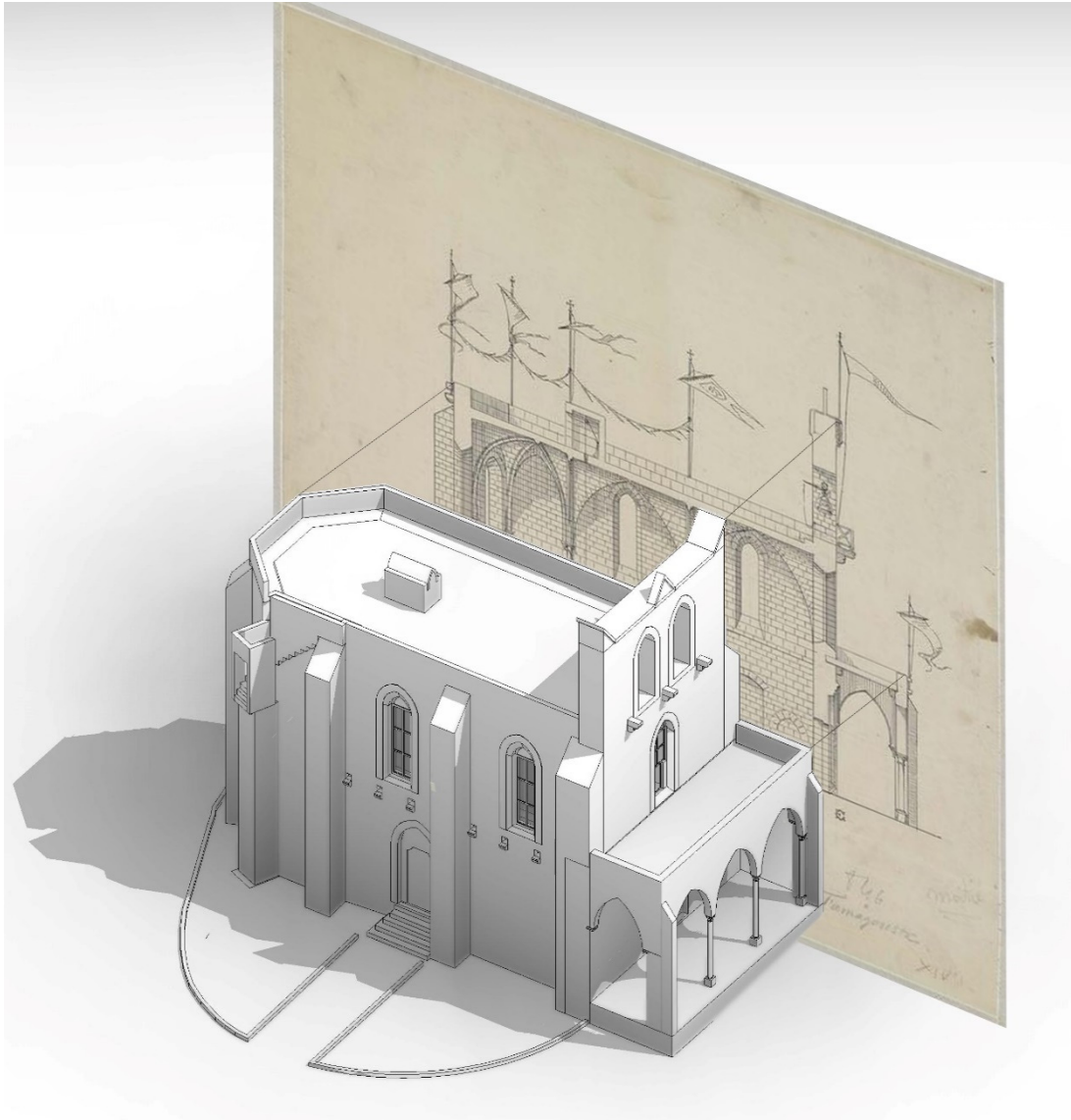


Fig. 6 - St. Anne. 3D model. Reconstruction of the west porch. Derived from drawing by C. Enlart (behind).



Fig. 7 - Bracket of an octagonal arch. Drone's view of St. Anne and a drawing published by Enlart.

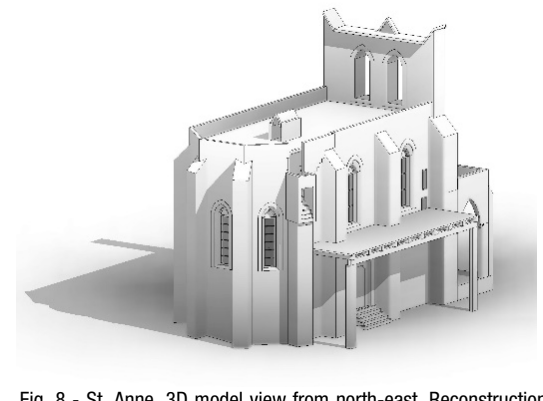


Fig. 8 - St. Anne, 3D model view from north-east. Reconstruction of the porch on the three sides.

it was possible to digitally reconstruct the lower part of the porch. In the church of St. Anne, the presence of square brackets with over-voids, along the north and south side, shows how there were beams, made up of a very light, probably timber structure. As the Church of Pyrga, St. Anne was also surrounded by a porch on three sides, consisting of a timber roof supported on a few stone pillars or columns. The presence of voids and stone supports on the outside west facade supposes the presence of a balcony along the entire west side above the porch. Similarly inside there must have been a gallery, as in the church of Ss. Peter & Paul, which would justify the presence of rectangular openings on the north-west corner. Fig 6 and Fig. 8 demonstrate this process of reconstruction and speculates visually how the western façade of St. Anne's may have looked six and a half centuries ago.



Fig. 9 - St. Anne, 3D model overlapping with the point cloud. Reconstruction of the west porch.

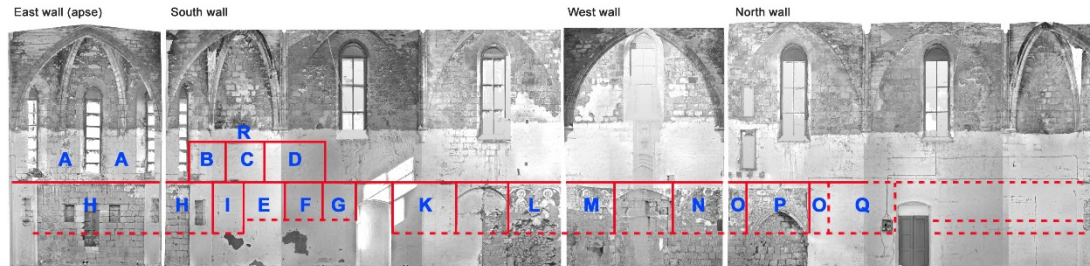
## INVESTIGATING THE SURVIVING WALL ART OF ST. ANNE

Though the paintings of St. Anne's were in a critical condition when our project began, and though the majority of them remain covered in whitewash, plaster and cement to this day, Philippe Plagnieux and Thierry Soulard, expressed a sentiment shared by our team when they wrote '*On peut espérer retrouver un jour les fresques d'origine sous la peinture, mais des moyens techniques importants seraient nécessaires pour cette opération.*' [26]

Indeed, our project was significantly more ambitious than mere recovery. Firstly we a) conducted emergency stabilization of St. Anne's Medieval murals; and then set out to b) understand the material constitution and the degree of interaction of the subsequent covering layers; before attempting to c) understand the painting techniques and materials used in the original compositions, and so d) re-interpret artistic and cultural interaction in the

Mediterranean in the 15<sup>th</sup> century. [27]

Returning to the digital model we got to work reconstructing and rehabilitating the lost images. (Fig.10) Through on site investigations and interventions led by Nanyang Technological University and World Monuments Fund from 2013-2014 (including an uncovering trial made on the white-washed upper register of the christological cycle on the south wall) we retrieved original colour which could now be applied speculatively throughout Bardswell's black and white image from the 1930s which we had already re-attached to the model's walls.(Fig.11) For the 'remote' participant observing all of this within the digital model accompanying explanatory texts embedded in infographics and hot spots were added as was a magnifying glass feature to make a minutely close examination of the painted surface possible. In addition to that, and using advanced geometric modelling (inspired by the University of Padua project MONADII at the Scolletta del Carmine), [28] the virtual viewer could now



- A = Crucifixion (no archival photograph available; ref.: Michele Bacci)
- B = Deposition (documented by archival photograph)
- C = Lamentation of Christ – *Threnos* (documented by archival photograph)
- D = Dormition of the Virgin (documented by archival photograph)
- E = Presentation to the temple (documented by archival photograph)
- F = Baptism (documented by archival photograph)
- G = Pentecost (documented by archival photograph)
- H = Figures of apostles (no archival photograph available; ref.: Michele Bacci)
- I = Holy bishop, probably great Cypriot saint Epiphanius of Salamis (documented by archival photograph)
- K = Three female saints; from left probably: St. Helena, St. Anne, St. Margaret (documented by archival photograph)
- L = Two female saints (holy princesses): St. Catherine (left) and St. Ursula (still visible)
- M = Two female saints (holy princesses): the one on the left probably St. Lucy (still visible)
- N = Two unidentified apostles (still visible)
- O = Two flanking figures in monastic garments (still visible)
- P = Ascension (still visible)
- Q = Three saints; from left: St. Margaret, St. Stephen, St. Anthony the Great (documented by archival photograph)
- R = Ornamental band with Corrado Tarigo's inscription and coats of arms

Fig. 10 - Church of St. Anne. Iconographic Programme. Werner Schmid.

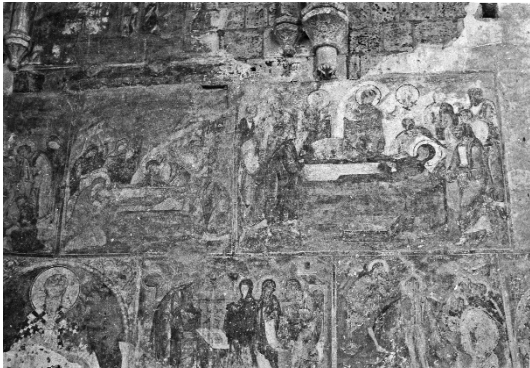


Fig. 11 - St. Anne Church, Frescoes of the South Wall. Monica Bardswell, Conway Library, Courtauld Institute.

‘enter’ the painting, breaking into the inherent 2D limitation associated with studying art, to move among the protagonists.

Beyond aesthetics and still in the real world of future emergency interventions we could use the model to simulate speculative strategies for the stabilization of plasters, the removal of the lime-wash and cement (using air-powered tools with diamond-coated grinding and cutting accessories, and also laser-cleaning experimentation), and even reverse subsequent inappropriate interventions such as lime mortar fills applied during the 1930s. The conservation specialist can demonstrate appropriate interventions and their outcomes, can demonstrate what an inappropriate intervention would look like and visualize the impact of no intervention at all. A timeline that projects forwards is as useful as one that goes back into history.

## DIGITAL FUTURES

Let us now move away from HBIM. Of course with the continual development of technologies and softwares, and with ever-decreasing prices, it seems that Virtual Reality, 360 degree environments and interactive experiences are going to become commonplace tools. Smart-phone-based Samsung

Gear VR and Google Cardboard can run 360-degree videos and low-polygon animated content, while Oculus Rift and HTC Vive can support high resolution or high mesh density content. As a consequence the experiential learning potential for students of all ages is enormous as demonstrated by the Hiverlab Laboratory in Singapore. [29] Our project wanted to explore the implications for this in terms of meaningful pedagogical experience and enhanced story-telling potential.

Firstly, the student must experience the context of medieval Famagusta and so to do this the virtual walking tour begins outside the church of St. Anne. The student is navigated into the building by passing a series of archival photographs and works of art – each created from the same exterior angle and each clearly labelled – before arriving at the threshold. Once inside they have the ability to walk around the interior space and indeed to ‘fly’ through it when it comes to examining paintings high on the walls. As they approach these carefully ‘re-attached’ murals they can interact with them through infographics, pop up signboards, and even receive a virtual tour offered by a ‘guide’ created through human movement scanning by depth cameras and triggered by the location of the viewer in the virtual space. The infographics don’t merely tell the student what to think and what to believe, they guide them to the sources: the reading materials, film clips, paintings, photographs, pilgrims accounts, sound files and so on. The infographic is therefore only the entrance to a complex network of aggregated original sources (bypassing the numerous assumptions made by scholars), accessing state archives (though this would involve dropping the proprietorial mind-set that characterises such collections), newspaper archives, museum and gallery inventory records, and crowd sourced and curated image data bases such as Arches [Collective efforts which outsource the virtual reconstruction to the general public have started to emerge, such as Project Mosul [30] and Curious Travellers [31], although the quality of the 3D models is highly inconsistent due to the lack of standards and monitoring. The scholar should always be at the helm].

In addition, we developed a 4D component using hand-held controls whereby the ‘visitor’ can select the era that he / she might like to visit and be escorted back in time. Using an extensive photographic archive the visitor can choose to witness St. Anne’s as a ruin at the end of the 19<sup>th</sup> century, observe the various stages of reconstruction in the 1930s – 50s under the direction of Theophilus Mogabgab, follow the ‘story’ of the cycle of painted medieval images, or even follow the inch-by-inch progress of the conservator in recent years. In VR or AR we have also developed a multi-use presentation experience where visitors can occupy the same virtual space (inside St. Anne’s) simultaneously and in real time from anywhere in the world. The ‘session master’ directs the tour in real time and students interact to create and enable enhanced multi-user curated storytelling experiences. In 2014 we wrote of the pedagogical potential that existed in these digital systems, especially in relation to Famagusta, saying ‘...students acquire an understanding of the multifaceted and interdisciplinary nature of human knowledge, learning and interpretation.’ [32] More than ever as they situate themselves at the dynamic intersection of time, place and narrative. For scholars and students alike - no longer the frozen moment in time and space offered by a book. In any case, each of these models are anchored by as many footnotes as a book equivalent, while having the luxury of being a work-in-progress and in perpetuity.

## CONCLUSIONS

W.H. Mallock who, upon exploring the silent gothic ruins of Famagusta in the late 19<sup>th</sup> century and upon contemplating the fragmented yet exquisite art and architecture, wrote about how they ‘...affected me like a burst of devotional music, vibrating far off from the lost ages of faith, distinct, and yet so faint that it made me hold my breath to hear it. It surrounded me with a new atmosphere, in which new thoughts were whispering...’ [33]. We now have the opportunity to digitally re-engage with the ‘lost ages of faith’ and to move closer to experiencing for ourselves Famagusta’s ‘atmosphere in which new thoughts were whispering.’ [34]



## NOTES

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- [28] This project is called M.O.N.A.D.I.I. [Methodologies and Best Practice for Non-Destructive Approaches to Interoperable Design and Management of Cultural Heritage] and is led by Università degli Studi di Padova and Università IUAV di Venezia (Rachele A. Bernardello, Mirka Dalla Longa, Emanuela Faresin, Giulia Piccinin).
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