

# Palmyra: An Assessment of Virtual and Physical Reconstruction Techniques and their Ethical Implications



Ancient History and Classical Archaeology MA (Hons)

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Abbreviations:

ASOR – American Schools of Oriental Research

DGAM – Directorate General of Antiquities & Museums

EAMENA – Endangered Archaeology in the Middle East & North Africa

GIS – Geographic Information System

ICE - International Committee of Experts

ICOMOS – International Council on Monuments and Sites

IDA – The Institute of Digital Archaeology

INSIGHT – Institute for Study and Integration of Graphical Heritage Techniques

ISIS – Islamic State of the Levant and Iraq

NGOs – Non-governmental organisations

OUV – Outstanding Universal Value

PCU – Project Coordination Unit

UCLA - University of California, Los Angeles

UNESCO – United Nations Educational, Scientific and Cultural Organisation

WHC – World Heritage Committee

WHEAP - World Heritage Earthen Architecture Programme

WHS – World Heritage Site

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## Introduction

In the 1<sup>st</sup>-3<sup>rd</sup> centuries AD, Palmyra was a beacon of multicultural syncretism that demonstrated the benefits of community, integration and tolerance, shown in its elaborate monumental architecture.<sup>1</sup> Native tradition freely entertained Graeco-Roman influence from the West, creating a symbiotic relationship built on trade, religion and politics.<sup>2</sup> For the rest of the 20th century its cultural history would continue to develop become integral to the city's heritage, but this changed drastically in 2015 when it was defaced and partially destroyed by ISIS. The Syrian Civil War (2011-) has stripped its inhabitants of homes, safety, and lives, and the destruction of Palmyra also marked a significant blow to Syria's own history. Its destruction however, not only shocked the people of Syria, but also resonated with the international community at large; with classicists and archeologists stressing the importance of preservation of memory more than ever before.

The vitriolic response from the international community is unanimous in its denouncement of the destruction that has taken place, and UNESCO has already set plans in motion to facilitate physical restoration and reconstruction of Palmyra.<sup>3</sup> The calls to action are inspiring and the international collaboration that has been achieved is also of great ideological importance against destruction and fear. A lot has been achieved so far in an effort to preserve Syrian cultural heritage in both virtual and physical reconstruction, as well as raising awareness of the importance of the preservation of memory. The destruction of Palmyra represents more than solely an architectural structure being destroyed. As a society today, we attach the strength of our communal identity and spirit

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<sup>1</sup> Stoneman (1992), 21.

<sup>2</sup> Danti et al. (2015), 2.

<sup>3</sup> World Heritage Committee (2016), 34.

to the seemingly permanent surroundings around us.<sup>4</sup> Destruction of one's environment disturbs the immortality of one's history.<sup>5</sup> This has resonated in many around the world, demonstrating the pressing need for the preservation of cultural heritage sites to sustain their longevity.

Physical reconstruction is a highly problematic area that has only recently started to be looked upon favourably in the discourse. Legislation in recent years has moved towards accepting the intangible as part of defined cultural heritage, making physical reconstruction a more viable option for damaged cultural heritage sites.<sup>6</sup> The evolution of these conservation principles has enabled a greater emphasis to be placed on the importance of these sites to the communities themselves, such as with the reconstruction of the mausolea in Timbuktu.<sup>7</sup> The societal need to heal is instinctively human and plays an important role in the motivation behind reconstruction, especially as it should be inclusive of the local community in which it takes place.<sup>8</sup>

In the same way that destruction effectively removes history, reconstruction places back its layers selectively. The danger of this is crucial to the nature of the issue of reconstruction at Palmyra. Acts of destruction have added another era of history, and removal would deny the importance of the devastation to the people of Syria. Current discourse in the international community displays wariness of intervening in such an extensive undertaking whilst conflict is unresolved. There is political danger in rushing into a reconstruction whilst hostilities are still current.<sup>9</sup> The instability of the region raises

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<sup>4</sup> Harrowell (2016), 82.

<sup>5</sup> Harrowell (2016), 82.

<sup>6</sup> Khalaf (2016), 263.

<sup>7</sup> World Heritage Committee (2014), 34.

<sup>8</sup> Kealy (2016), 1.

<sup>9</sup> Perring and van der Linde (2009), 200.

doubts as to the longevity of a proposed reconstruction, in the foreseeable future and long-term, as well as the possible politicisation of it, which has been seen in region before.<sup>10</sup>

However, to deny the restoration of heritage so brutally destroyed is disconcerting. There have been many archaeological sites where virtual and physical reconstructions have been successful; using data obtained from archaeological surveys to create a three-dimensional virtual reconstruction of a site, which can then become a physical reality. Virtual reconstruction is a highly developed process that does have exponential potential for the preservation of Syrian cultural heritage and promoting awareness of the importance of this issue; however it may be, in some aspects, flawed. There is a balance that needs to be met, between striving for an accurate physical reconstruction also, whilst incorporating advanced building techniques that ensure sustained longevity. Whilst technology has developed significantly, the ways in which it should be implemented need to be considered in regards to the motives behind reconstruction, if not there is a danger of destroying the culture they are attempting to preserve.

In an aim to assess the possibility of virtual and physical reconstruction at Palmyra, the first chapter will provide a background to the history of Palmyra at its peak in the Roman period. It will then discuss the many organisations that are currently working on the preservation of the remains of this heritage, both virtually and physically, before providing evidence of the different areas of the site that have been the focus of these attempts. Chapter 2 will evaluate the methods of virtual and physical reconstruction that would be integrated at Palmyra. Due to the recent nature of this research there is a shortage of published material surrounding reconstruction of the Roman period of the site.

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<sup>10</sup> De Cesari ((2015), 22) also recalls Saddam Hussein's use of Mesopotamian heritage as part of his propaganda.

Instead the focus lies on assessing the damages present at the site; therefore I have used examples from more long-standing virtual reconstruction studies. I will also use case studies in order to analyse the technical ways physical reconstruction has been accomplished, since my knowledge of construction is not at the level of a technician. The third chapter will consider whether physical reconstruction should take place at all due to the ethical nature of this research.

Different virtual and physical methods of reconstruction can be applied at Palmyra, however it is of paramount importance that one remembers not only whom the project is for, but also its newfound history: the events that took place from 2015 – 2017.<sup>11</sup> Reconstruction of Palmyra is possible in both the virtual and physical sphere to differing extents. This dissertation will examine both these methods of reconstruction, before assessing to what degree it should be implemented.

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<sup>11</sup> DGAM (2018), 12.

## 1: The Bride of the Desert

In order to examine whether it is best to undertake a physical or a virtual reconstruction of the site of Palmyra, it is important to acknowledge and review the remains and artefacts upon which there have already been attempts at restoration. Occupations by ISIS occurred from the 21<sup>st</sup> May 2015 until 27<sup>th</sup> March 2016 and again from the 11<sup>th</sup> December 2017 until the group was finally expelled on the 2<sup>nd</sup> March 2017.<sup>12</sup> Access to the site has since been impeded due to security concerns and lack of stability in the region.<sup>13</sup> However, this has not adjourned any other undertakings of restoration by different organisations and bodies, who have mainly worked in the sphere of virtual reconstruction, although there has been some physical restoration attempts. This chapter will first provide some background on Palmyra itself and its significant cultural heritage, before detailing the different organisations currently working on reconstruction and the preservation of cultural heritage in Palmyra. Additionally, it will examine particular areas of the site, including what has so far been achieved in both physical and virtual reconstructions.

### The History of Palmyra

Situated in an oasis in the Syrian Desert, nearly halfway between Damascus and Deir ez-Zor (*Fig. 1*), Palmyra rose to prominence in the 1<sup>st</sup> century AD to the 3<sup>rd</sup> century AD.<sup>14</sup> The relationship between Palmyra and Rome was a prosperous one, which is apparent from the early 1<sup>st</sup> century AD, where one can see grandiose civic architecture being introduced, such as the Temple of Bel; initiated around 17 or 19.<sup>15</sup> Cultural syncretism can be seen in the architecture of Palmyra, which at its height, perfectly exemplifies the

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<sup>12</sup> DGAM (2018), 12.

<sup>13</sup> ‘UNESCO Executive Board 199th Session’ website.

<sup>14</sup> Danti et al. (2015), 1, Stoneman (1992), 21.

<sup>15</sup> Stoneman (1992), 27.

mix of the ‘High Roman style’, the Greek East, and native traditions.<sup>16</sup> This is a solid indication of Palmyra’s formal induction into the Empire possibly occurring around this time.<sup>17</sup> Trade became a main feature of the city, with its inhabitants having profited from its advantageous location near the Euphrates and other trading posts.<sup>18</sup> The connections this brought to the city meant an influx of Graeco-Roman influence which mixed with the Persian and Parthian cultures already present; shown in fashions, religion, and politics.<sup>19</sup> This can also be seen in the multitude of languages seen on extant inscriptions: Greek, Palmyrene, and Latin, and the amalgamation of religions, such as cults dedicated to multi-faith deities, Christianity, and Judaism.<sup>20</sup> Their relationship with Rome brought relative peace to the region and Palmyrenes enjoyed their enriched economic and cultural wealth relatively freely.<sup>21</sup>

Such relations between political allies rarely remain amicable however, and the city fell out of favour with the Roman Empire during the late AD 260’s. Odenathus, the leader of a powerful tribal family, looked to assert power over the whole region after having acclaimed control in Palmyra, subsequently causing the disintegration of Roman-Palmyrene relations.<sup>22</sup> He was killed in AD 267, and succeeded by his wife Zenobia who

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<sup>16</sup> Stoneman (1992), 21.

<sup>17</sup> Although there is no unanimous agreement on this, see Stoneman (1992), 27.

<sup>18</sup> Danti et al. (2015), 2; Arkawi (2017), 41.

<sup>19</sup> Danti et al. (2015), 2. Evidence for this can be seen in the male funerary bust in Fig. 3: the toga, highlights Greco-Roman involvement and influence throughout the Roman East in the Classical Period (Colledge (1976), 69.). This pair of busts will be discussed further in the ‘Evidence’ section of this chapter.

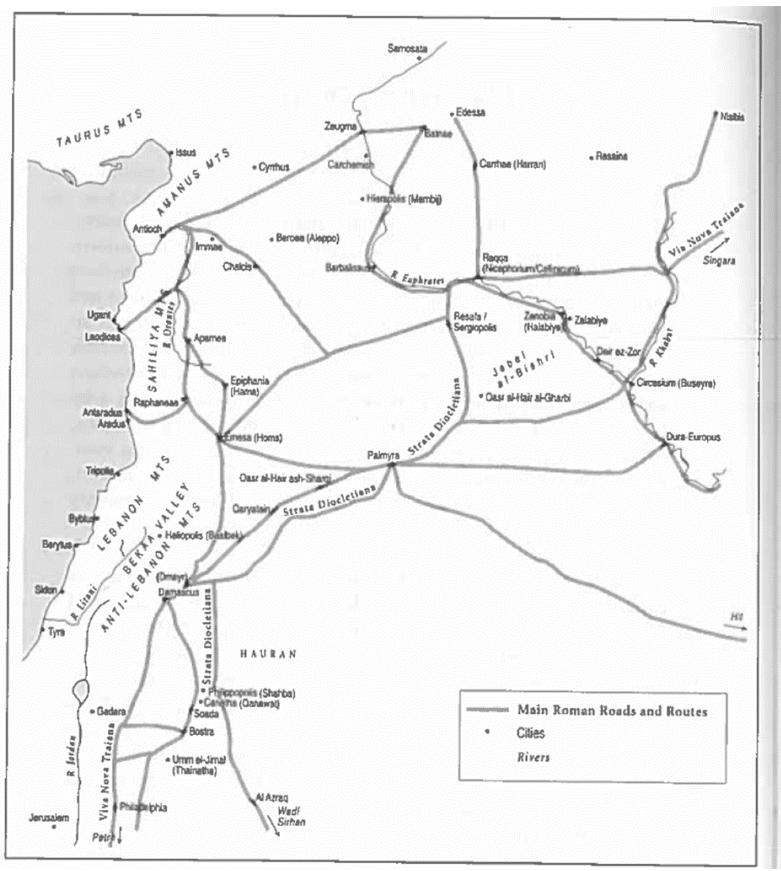
<sup>20</sup> (Danti et al.) 2015), 2. Al’lāt was a deity considered to demonstrate religious syncretism in the city, often depicted as Athena - the Greek goddess known for fertility and having an affinity for the protection of animals; this connection is represented not only in the Lion of Al’lāt (discussed further in the ‘Evidence’ section of this chapter), but also elsewhere in her imagery – seen through the presence of lions protecting weaker animals in her temple, discussed in Colledge (1976), 44.

<sup>21</sup> Browning (1979), 34.

<sup>22</sup> Browning (1979), 45.

fought for independence once more from Rome (*Zosimus, New History* 1.22).<sup>23</sup> By the turn of the decade, she had expanded her empire into Egypt and Asia Minor, much to the displeasure of Rome and its emperor at the time, Aurelian.<sup>24</sup> The struggle for Palmyra's independence was quashed by Aurelian in AD 272, ultimately signalling the demise in its popularity across the Empire and the end of its prime.<sup>25</sup>

There was continued inhabitation of the city up until the medieval period where the whole town moved inside the courtyard of the Temple of Bel. Later in the 20<sup>th</sup> century, the modern-day Tadmor was founded nearby and the ancient city became in many considerations an archaeological site of great importance (*Fig. 2*).

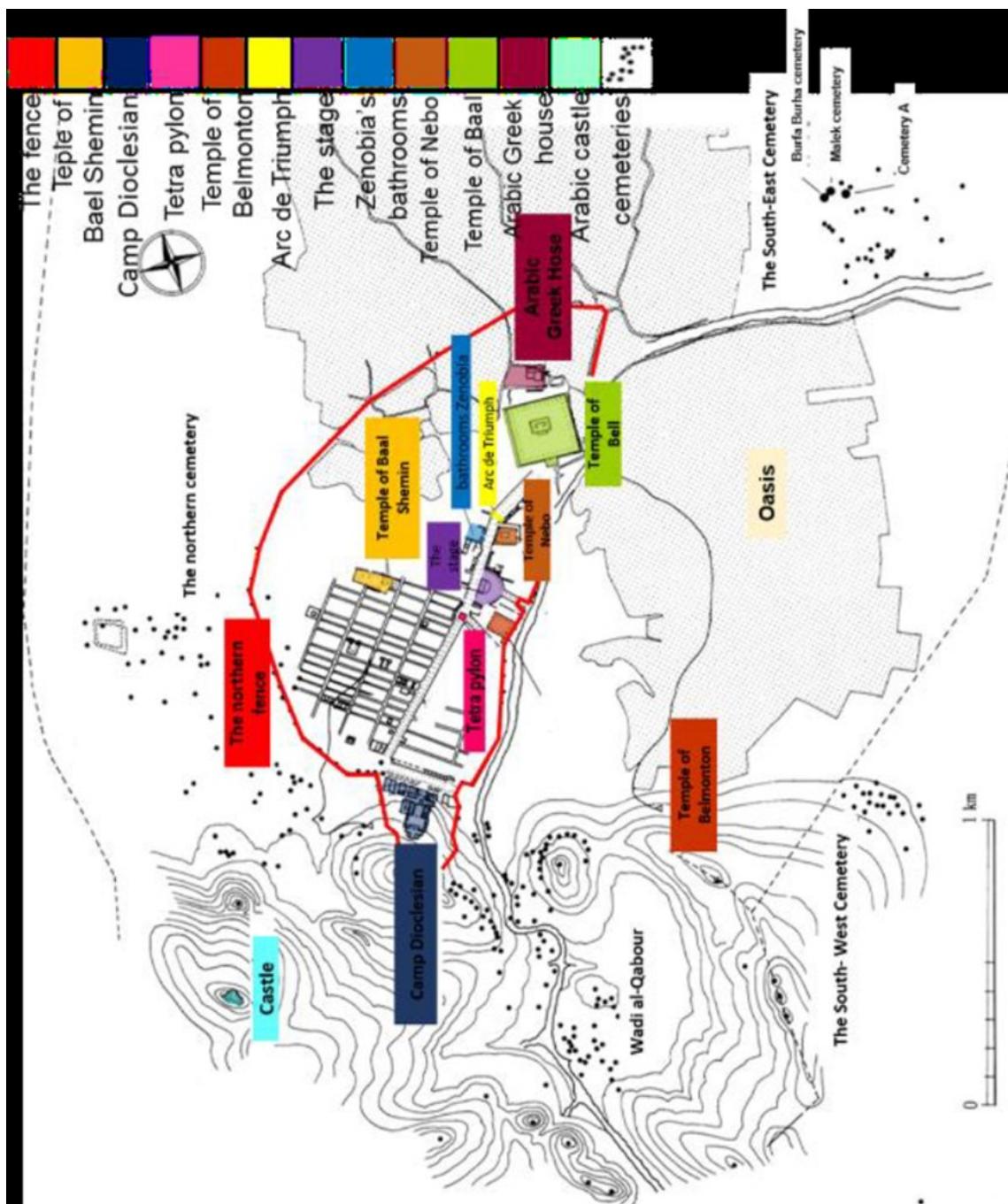


*Fig. 1: Map of Roman Syria.*

<sup>23</sup> Arkawi (2017), 41; Browning ((1979), 45.) stipulates she claimed the role of regent for her young son, Wahballat.

<sup>24</sup> Browning (1979), 46.

<sup>25</sup> Danti et al. (2015), 2; Guidetti and Perini (2015), 8.



*Fig. 2: Monuments at Palmyra.*

### Organisations

The response from the international community surrounding the conflict in Syria has involved calls for protection of Syrian cultural heritage. Since placing Palmyra on the List of World Heritage Sites in Danger in 2013, UNESCO has worked since 2014 to bring awareness to the cultural crisis unfolding in Syria, specifically Palmyra.<sup>26</sup> In March 2014 they implemented the ‘Emergency Safeguarding of the Syrian Cultural Heritage’ Project, funded by the European Union to provide an ‘operational response to halt the on-going loss of cultural heritage and prepare post-conflict policy actions in Syria.’<sup>27</sup> When access to the site became possible in 2016, UNESCO sent a Rapid Assessment Mission to identify the monuments and buildings requiring urgent conservation and restoration.<sup>28</sup> This mission recommended restoration and anastylosis - a process through which archaeologists can rebuild destroyed and damaged monuments and artefacts using existing remains.<sup>29</sup> This recommendation was then ratified at the 40<sup>th</sup> Session of the Committee of the World Heritage Centre in July 2016, as well as the 41<sup>st</sup> session in July 2017, to undertake detailed studies and extensive fieldwork before attempts at restoration.<sup>30</sup>

The British Council has also funded a project aimed at preserving Syrian heritage under the Cultural Protection Fund; awarding £109,445 to provide Syrians with the digital skills needed to record their endangered cultural heritage, such as Palmyra.<sup>31</sup> This will aid the creation of three-dimensional models which enables a new up-to-date digital record to be kept. In addition, the organisation EAMENA is supported by this fund, created in January

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<sup>26</sup> Guidetti and Perini (2015), 3.

<sup>27</sup> ‘Emergency Safeguarding of the Syrian Cultural Heritage project’ website.

<sup>28</sup> ‘UNESCO Executive Board 199th Session’ website.

<sup>29</sup> World Heritage Centre (2016), 2.

<sup>30</sup> World Heritage Committee (2016), 34; World Heritage Committee (2017), 64-65.

<sup>31</sup> ‘British Council: Preserving Syrian Heritage’ website.

2015 in response to the danger affecting archaeological and cultural heritage.<sup>32</sup> Their database holds crucial information on Palmyra, for example the ‘level of risk’ at each place, which aids in relieving some of the threats for Palmyra as well as improving the practice of heritage management in other conflict areas.<sup>33</sup>

The DGAM, founded in 1946 is the Syrian governmental organisation in charge of protecting its cultural heritage.<sup>34</sup> Since the conflict in Syria began their role has been to campaign for awareness of the country's at-risk archaeological sites.<sup>35</sup> Before Palmyra was retaken by ISIS for a second time, the DGAM took measures to document the damage at the museum of Palmyra as well as elsewhere on site with the assistance of Iconem (a French company specialising in three-dimensional reconstructions of buildings and artwork), and has been working to digitalise Palmyrene archaeological sites for the Syrian Heritage Project.<sup>36</sup> This project was run as part of a study alongside the DGAM, called #AssemblingPalmyra; its mission being ‘to realise a digital memory of Syrian archaeological heritage.’<sup>37</sup> Since its foundation demand for their work has been so great that they have uploaded one of their three-dimensional models on to their website for public use, specifically a funerary statue from Palmyra scanned in April 2016.

NGOs have also lent their expertise to the DGAM and UNESCO’s call for the security of Palmyrene cultural heritage. Together with the DGAM, Shirīn is a new project involving another online collated database of all the monuments and sites in Syria.<sup>38</sup> ASOR is doing the same, having been established in 1900 and consisting of over seventy collaborative

<sup>32</sup> ‘EAMENA: Endangered Archaeology in the Middle East and North Africa’ website.

<sup>33</sup> ‘EAMENA: Endangered Archaeology in the Middle East and North Africa’ website.

<sup>34</sup> Guidetti and Perini (2015), 6.

<sup>35</sup> Guidetti and Perini (2015), 6.

<sup>36</sup> DGAM (2017), 17-18; ‘Revival: Technological Support for Syrian Heritage’ website.

<sup>37</sup> ‘Sketchfab (c)’ website.

<sup>38</sup> ‘Shirīn International: Protecting Syria Heritage’ website.

institutions.<sup>39</sup> Their weekly reports have included updates on the remaining cultural heritage in at risk areas in Syria.

Another NGO, the Arc/k Project launched their Perpetuity Palmyra project on 17<sup>th</sup> September 2016, storing digital archives and reconstructions of the site.<sup>40</sup> They work on the same premise as #NEWPALMYA, whose online community work by ‘collecting data from international partners, analysing it and creating a reconstruction of Palmyra in virtual space, then share the models in the public domain.’<sup>41</sup> Through this, the site aims ‘advance open data policies in museums and institutions through advocacy, education, and consultation.’<sup>42</sup> However, they are slightly different in the way they view the digital archaeology projects they undertake; rather than preservation they work on the premise of reimagining Palmyra as modern, and are free for the public to interact with.<sup>43</sup> The ‘Orient Department of the German Archaeological Institute’ and the ‘Museum of Islamic Art in Berlin’ set up the Syrian Heritage Archive Project to build another database for Syria’s cultural heritage.<sup>44</sup> IDA has used their Million Image Database Project in order to help create three-dimensional images of the site of Palmyra, which will again be freely accessible to the public at large.<sup>45</sup> Through their surveys and high-resolution photography, their computer model of the Triumphal Arch was printed to a 1/3 scale, making international headlines.<sup>46</sup>

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<sup>39</sup> ‘American Schools of Oriental Research: About Asor’ website.

<sup>40</sup> ‘The Arc/k Project: Perpetuity Palmyra’ website.

<sup>41</sup> ‘Building a Future upon the Past’ website.

<sup>42</sup> ‘Building a Future upon the Past’ website.

<sup>43</sup> ‘CBC News: How a 3D-printed piece of Palmyra landed in Toronto’ website.

<sup>44</sup> ‘Syrian Heritage Archive Project: Arachne’ website.

<sup>45</sup> ‘The Million Image Database’ website.

<sup>46</sup> ‘Institute of Digital Archaeology: Building the Arch’ website.

Overall, these organisations and their work will enhance our ability to analyse records from Palmyra with greater coherency on a national and international scale. This will also provide the basis of research over deciding the best way to restore monuments and buildings in Palmyra, if at all, before being able to visit the site in person. The cooperation and communal efforts to commit to such a cause by many international partners also displays a commitment to combatting not only the senseless destruction of Palmyra, but also the ideology of hatred that caused it.

### The Evidence

#### **Funerary Busts**

Two funerary busts, one male and one female, have been salvaged from the museum at Palmyra by joint Russian and Syrian soldiers (*Fig. 3*).<sup>47</sup> They date from the 2<sup>nd</sup> – 3<sup>rd</sup> and centuries AD and these busts are typical of the artistic style of the period. This becomes clear through the jewellery and the position of the woman’s arms: her right hand held up to her shoulder, with her left across her.<sup>48</sup> These were defaced during the first occupation of the city in 2015, before ISIS returned to Palmyra once more.<sup>49</sup> In this case they have both undergone physical reconstruction rather than virtual, possibly due to their size, a subject which will be discussed in Chapter 2. The pair were reconstructed via three-dimensional printing, the results of which were subsequently hand-finished in order to produce a convincingly detailed copy.<sup>50</sup>

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<sup>47</sup> ‘The Telegraph (b)’ website.

<sup>48</sup> Colledge (1976), 70.

<sup>49</sup> ‘The Telegraph (b)’ website.

<sup>50</sup> ‘The New York Times (a)’ website.



*Fig.3: Male and female defaced funerary busts, dating 2<sup>nd</sup>-3<sup>rd</sup> c. AD.*

### The Lion of Al'lāt

Found in 1977 by a team of Polish archaeologists, this statue was once a main focal point of the Temple of Al'lāt.<sup>51</sup> Originally crafted out of limestone and dating from the 1<sup>st</sup> century AD, the Lion has a weight of fifteen tons and stands at a height of 3.5m.<sup>52</sup> These dimensions meant that it could not be transported quickly enough to a safe environment during the occupation, leaving it a target for militants. Iconem has used online records from the Damascus Museum, to create a three-dimensional model of the surviving state of the lion (*Figs. 4 and 5*).<sup>53</sup> By analysing the two different sets of data, of before and

<sup>51</sup> ‘UNESCO: Restoration completed on Lion of Al'lāt statue from ancient city of Palmyra’ website.

<sup>52</sup> ‘Sketchfab (b)’ website.

<sup>53</sup> ‘Iconem (a)’ website.

after the destruction, scientists were able to study the damage inflicted to allow for an accurate reconstruction to take place.<sup>54</sup>

In July 2016, the DGAM moved the sculpture to Damascus until it could be restored.<sup>55</sup> Since it had already undergone previous restoration in 2005 there was sufficient evidence and documentation to enable a quick reconstruction in a two-month period.<sup>56</sup> Unlike an explosion, which scatters most of the remains, the existing material was found where it was originally stood (*Fig. 6*). Due to this, over half of the Lion is made up of original material.<sup>57</sup> On the 5<sup>th</sup> October 2017, the restored statue was on display again (*Fig. 7*) by the work undertaken by the Damascus Museum and UNESCO, symbolising the importance of the ongoing efforts to protect Syria's cultural heritage.<sup>58</sup>

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<sup>54</sup> 'Iconem (a)' website.

<sup>55</sup> 'DGAM: Urgent Mission for Damage Assessment in Palmyra Museum' website.

<sup>56</sup> Restoration was previously undertaken by another Polish team that the current restorer, Markowski, was also a part of, see 'Ancient statue damaged by ISIS resurrected in Damascus' website.

<sup>57</sup> 'Ancient statue damaged by ISIS resurrected in Damascus' website.

<sup>58</sup> 'World Heritage Centre: Conservation completed on Lion of Al'lāt statue from ancient city of Palmyra, damaged by ISIL' website.

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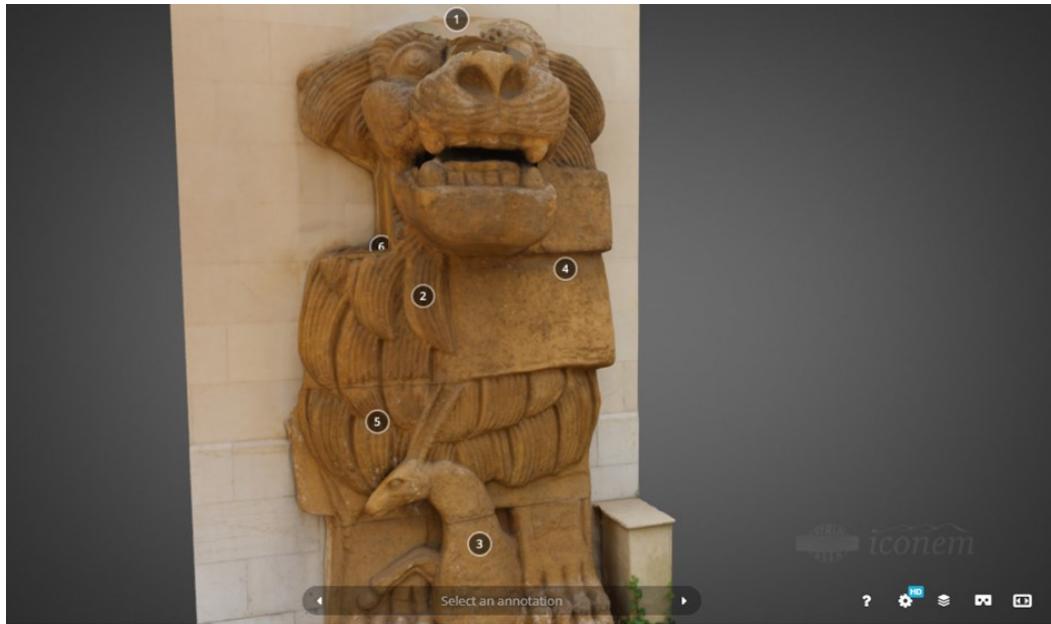


Fig. 4: Still of the virtual model of the Lion of Al'lāt

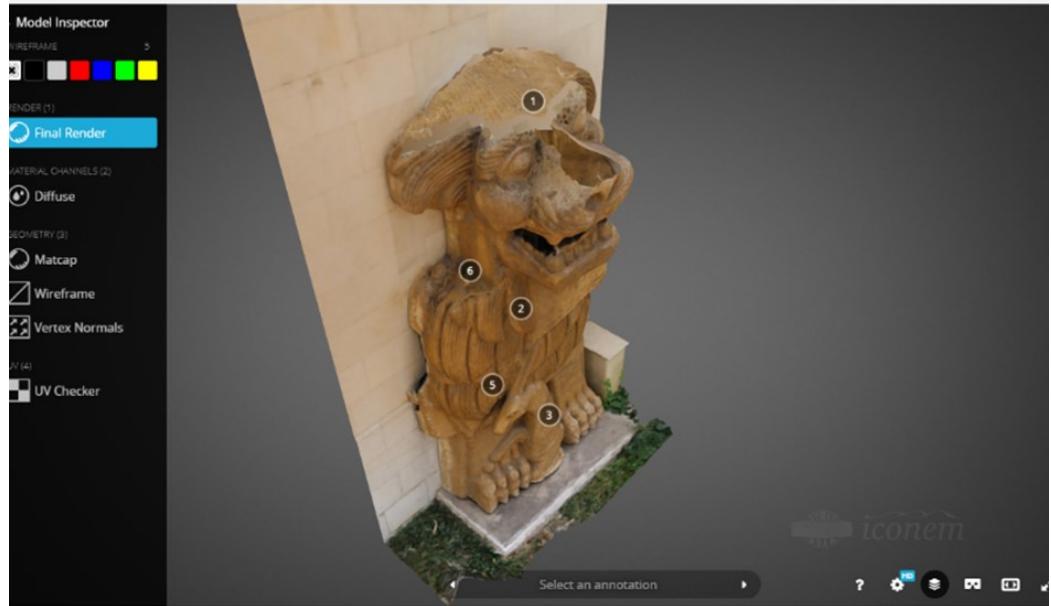


Fig.5: Still of the virtual model of the Lion of Al'lāt.



*Fig. 6: State of the Lion of Al'lāt after the destruction.*



*Fig. 7: Completed restoration of the Lion of Al'lāt.*

## Tetrapylon

The Tetrapylon was one of the most recognisable monuments of Palmyra, placed at an intersection in the Great Colonnade and two mains roads of the ancient city.<sup>59</sup> It was also destroyed in 2016 (*Fig. 8*).<sup>60</sup> Constructed during the reign of Diocletian (late 3<sup>rd</sup> century AD), it was comprised of a square platform, with each corner made up of four columns, made out of Egyptian pink granite.<sup>61</sup> Each column held a cornice weighing 150 tonnes, and a statue would have been placed in the middle.<sup>62</sup> In *Figure 9*, only one original column is extant, whereas the fifteen others were reconstructed in concrete by the DGAM in 1963.<sup>63</sup>

The virtual reconstruction, undertaken by #NEWPALMYRA, shows one set of four columns that is fascinating in detail and despite the lack of colour or finesse, it is possible to envisage the whole set of columns together (*Figure 10*). Its physical realisation was displayed at the Creative Commons Summit from the 28<sup>th</sup> to the 30<sup>th</sup> April 2017 in Canada; where it was printed over an 800 hour period, in 25 separate parts, using a three-dimensional printer.<sup>64</sup> Collectively it weighs 90 kilograms and is over 2m high (*Fig. 11*).<sup>65</sup> However, #NEWPALMYRA does admit that it is more about creating a vibrant, creative process than an ‘exercise in digital preservation or archaeological accuracy’, which raises a problem which could arise from such data being in the public domain because it may disrupt the accuracy of other online sources.<sup>66</sup> While the organisation has a more liberal

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<sup>59</sup> Southern (2008), 55.

<sup>60</sup> '#NEWPALMYRA (b)' website. Although Arkawi places damage inflicted on 20<sup>th</sup> February 2017, see Arkawi (2017), 45.

<sup>61</sup> '#NEWPALMYRA (b)' website.

<sup>62</sup> '#NEWPALMYRA (b)' website.

<sup>63</sup> '#NEWPALMYRA (b)' website.

<sup>64</sup> 'CBC News: How a 3D-printed piece of Palmyra landed in Toronto' website.

<sup>65</sup> 'CBC News: How a 3D-printed piece of Palmyra landed in Toronto' website.

<sup>66</sup> 'CBC News: How a 3D-printed piece of Palmyra landed in Toronto' website.

attitude to archaeology in an effort to contribute to saving cultural heritage, it still has ramifications for archaeologists attempting to undertake a full-scale possible physical reconstruction, as the models online have not all been vetted by professionals for accuracy.

Iconem has also produced a virtual reconstruction of the Tetrapylon in full, enabling the viewer to have a more rounded image of the structure (*Fig.12*).<sup>67</sup> It appears that this one has been completed in greater detail, possibly due to the conservation works undertaken fairly recently, in addition to other virtual reconstructions being attempted. However, it is hard to comment on whether there was a collaboration through data-sharing. If so, it could demonstrate the advantages of this for more detailed reconstructions in the future.



*Fig. 8: The destruction of the Tetrapylon during the 2<sup>nd</sup> occupation.*

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<sup>67</sup> ‘Sketchfab (d)’ website.



*Fig. 9: The Tetrapylon before the invasion of Palmyra.*



*Fig. 10: Virtual reconstruction of one corner of the Tetrapylon.*



*Fig. 11: Installation of the three-dimensional model in Toronto.*



*Fig. 12: Iconem's virtual reconstruction.*

## Triumphal Arch

The Triumphal Arch marked the start of the Great Colonnade that linked the main street to the Temple of Bel, built under the emperor Septimius Severus (r. AD 193-211) because of Palmyra's continued strategic importance for the Roman Empire.<sup>68</sup> It was used to bring together the central and southern parts of the Colonnade, marking a change in street axis.<sup>69</sup> When Palmyra was captured by ISIS, militants set explosives on the arch. On the 6<sup>th</sup> October its destruction was confirmed, what was later condemned as 'a war crime' by the UN.<sup>70</sup> The Arc/k project have been working on virtual reconstructions of the Arch amongst other monuments in Palmyra in order to combat the damage done by ISIS in the city (*Fig. 13*).<sup>71</sup>

In March 2016 Maamoun Abdulkarim, the director of the DGAM, stated that the Monumental Arch, Temples of Bel and Baalshamin would be rebuilt using anastylosis.<sup>72</sup> The IDA had created a three-dimensional model of the arch, using existing photographs and archaeological data, which was then printed at a 1/3 scale.<sup>73</sup> The end result was a 20-foot model of Egyptian marble, weighing eleven tonnes was installed for three days in London's Trafalgar Square, as well elsewhere around the world such as New York, restored in 'a message of peace' showing international collaboration in a time of increasing conflict in Syria (*Fig. 14*).<sup>74</sup> Here this reconstruction was also used as a political statement to show support against ISIS and the destruction left behind in their wake, as exemplified by the IDA Executive Director, Roger Michel:

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<sup>68</sup> Stoneman (1992), 202.

<sup>69</sup> 'Sketchfab (a)' website.

<sup>70</sup> 'CNN' website.

<sup>71</sup> 'The Arc/k Project: Perpetuity Palmyra' website.

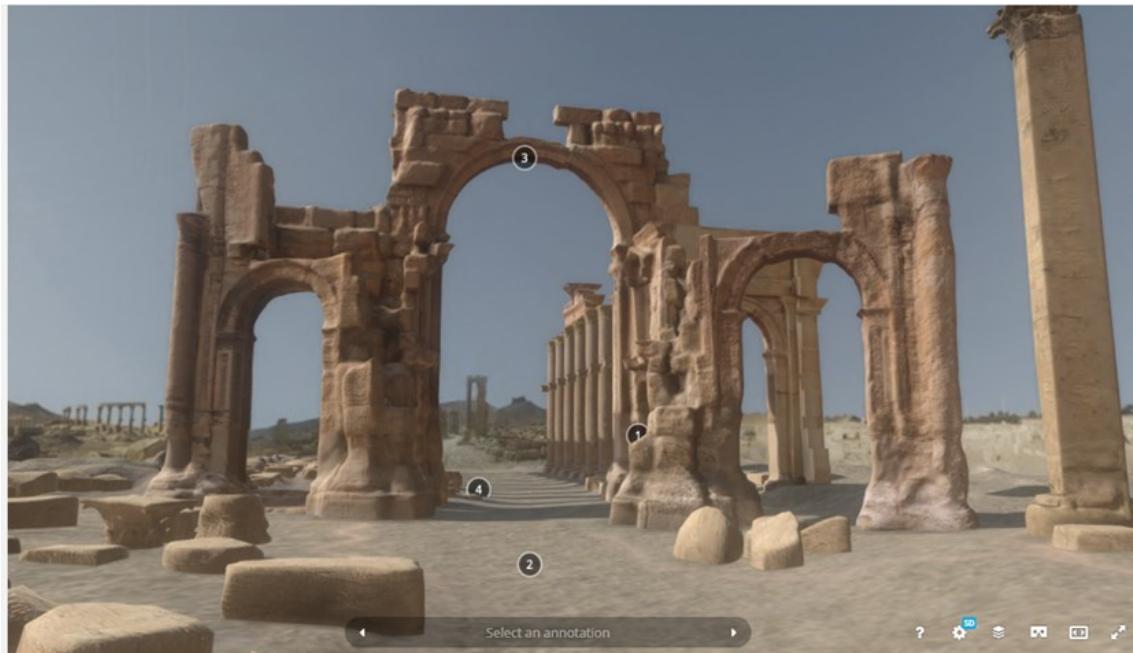
<sup>72</sup> For the statement see 'The Guardian (c)' website.

<sup>73</sup> 'Institute of Digital Archaeology: Building the Arch' website.

<sup>74</sup> 'The Guardian (b)' website.

“We also view this work as an important gesture of friendship and solidarity with people in the regions of conflict -- people with whom we share a common history that is represented by the very artefacts and monuments we seek to protect and preserve.”<sup>75</sup>

This exemplifies how this feat was not only an archaeological experiment to test how well possible future reconstructions might be successful using anastylosis, even down to the finest detail (*Fig. 15*), but also how monuments and statues can be utilised in order to show solidarity in a time of political and cultural turmoil.



*Fig. 13: Virtual model of the Triumphal Arch, Palmyra.*

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<sup>75</sup> ‘Institute of Digital Archaeology: Building the Arch’ website.



*Fig. 14: Unveiling of the three-dimensional model of the Triumphal Arch in London.*



*Fig. 15: Reconstruction of the Arch once fully assembled.*

## Theatre

The theatre of Palmyra (2<sup>nd</sup> century AD) is located along the Great Colonnade, adjacent to the Tetravylon.<sup>76</sup> It draws its influence from Roman theatres in the west of the empire, with an enclosed area including columns of the Corinthian order.<sup>77</sup> Its seating (*cavea*) had a diameter measuring 92 metres, allowing space for a large proportion of the city.<sup>78</sup> It has been used throughout history from imperial Rome to the contemporary, and has long been one of the city's more recognisable icons, also featuring heavily in ISIS' propaganda videos. This demonstrates the importance the theatre held in the context of Palmyra, as militants made use of it in their visual economy.

2016 to 2017 reports have speculated over the extent of the destruction of the theatre (*Fig. 16*). Photo evidence has proved that the front section of the *skene* (stage building) sustained the most damage (*Figs. 17 and 18*).<sup>79</sup> From the drones collecting visual documentation during the two campaigns by ISIS of 2016 and 2017, Iconem started creating a three-dimensional model to demonstrate the original state of the theatre and pinpointing exact areas of damage in order to achieve an accurate restoration (*Fig. 19*).<sup>80</sup>

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<sup>76</sup> Stoneman (1992), 65.

<sup>77</sup> Browning (1979), 43.

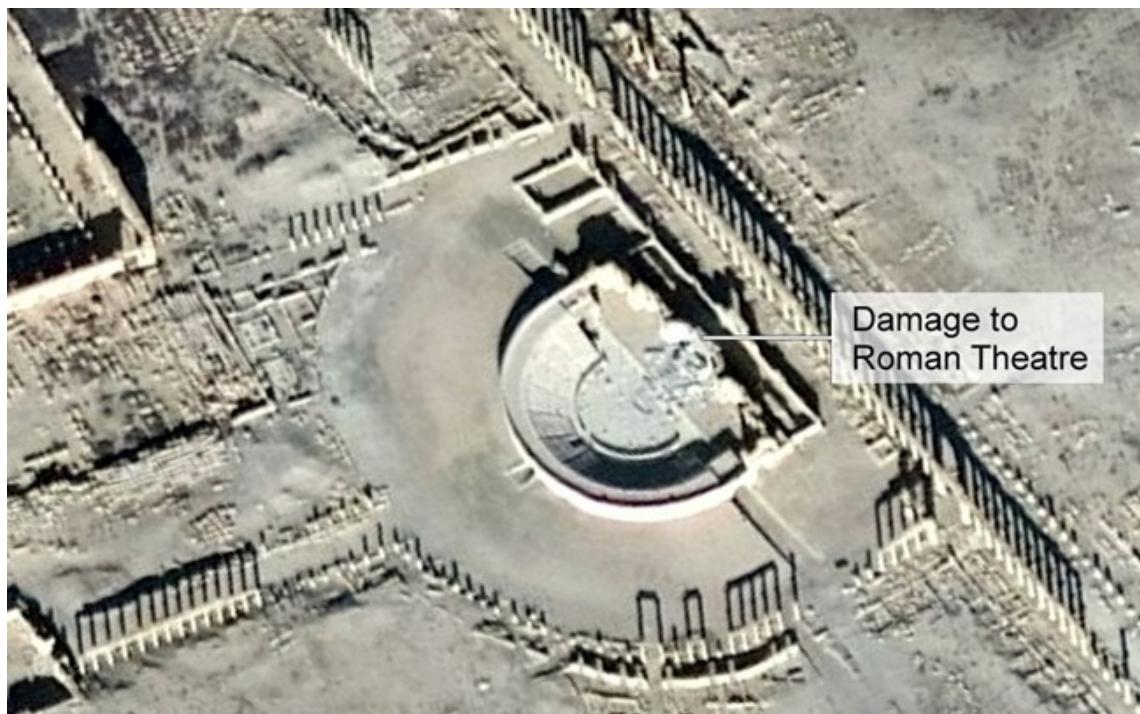
<sup>78</sup> Denker (2017), 27.

<sup>79</sup> 'BBC News (d)' website; DGAM (2018), 12; Arkawi (2017), 45.

<sup>80</sup> 'Sketchfab (c)' website.



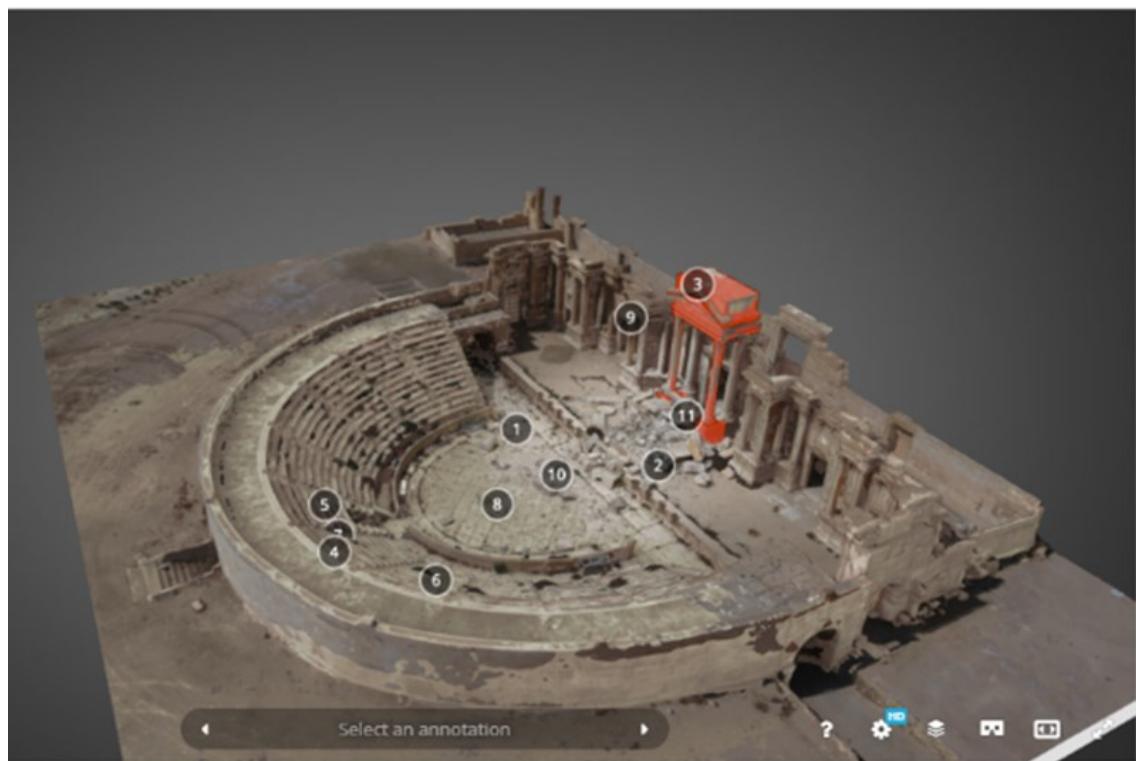
*Fig. 16: The Theatre before the Syrian conflict.*



*Fig. 17: Aerial view of damage*



*Fig. 18: Damage to the façade of the theatre from 11<sup>th</sup> December 2016- 2<sup>nd</sup> March 2017.*



*Fig. 19: Virtual reconstruction of the Roman Theatre at Palmyra.*

## Temple of Baalshamin

The Temple of Baalshamin was dedicated to the Canaanite sky deity of the same name.<sup>81</sup>

The earliest phase of the temple was constructed during the 2<sup>nd</sup> century BC, then dedicated in AD 130-131 under Hadrian.<sup>82</sup> The temple was one of the best-preserved sites at Palmyra, located in the northern part of the city, with all four exterior walls intact, providing archaeologists, historians, and visitors alike with invaluable insight into ancient Palmyra (*Fig. 20*).<sup>83</sup>

An explosive was set in the *cella* in 2015, slightly limiting the blast as it was contained internally (*Fig. 21*).<sup>84</sup> Drones photographed the aftermath, and because of its specific type of destruction, scientists were able to identify the original location of every piece of stone, as the ‘radial displacement’ from the explosion shows the direction of movement the stone took. (*Figs. 22 and 23*).<sup>85</sup>

As it was so well-preserved, #NEWPALMYRA digitally reconstructed the temple using images taken before the destruction (*Fig. 24*), although it does lack detail, decoration and the interior of the *cella*.<sup>86</sup> This demonstrates some of the dangers surrounding digital archaeology and virtual reconstruction as erroneous information will be supplied to the wider public, distorting the perception of the site and its history.

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<sup>81</sup> Stoneman (1992), 65.

<sup>82</sup> Stoneman ((1992), 201) dates the altar’s construction to AD 115, earlier than its dedication.

<sup>83</sup> ‘BBC News (c)’ website.

<sup>84</sup> Lablaude and Russo (2017), 38.

<sup>85</sup> Lablaude and Russo (2017), 38.

<sup>86</sup> ‘Sketchfab (e)’ website.



*Fig. 20: Temple of Baalshamin before the occupation by ISIS.*



*Fig. 21: The explosion at the Temple of Baalshamin.*

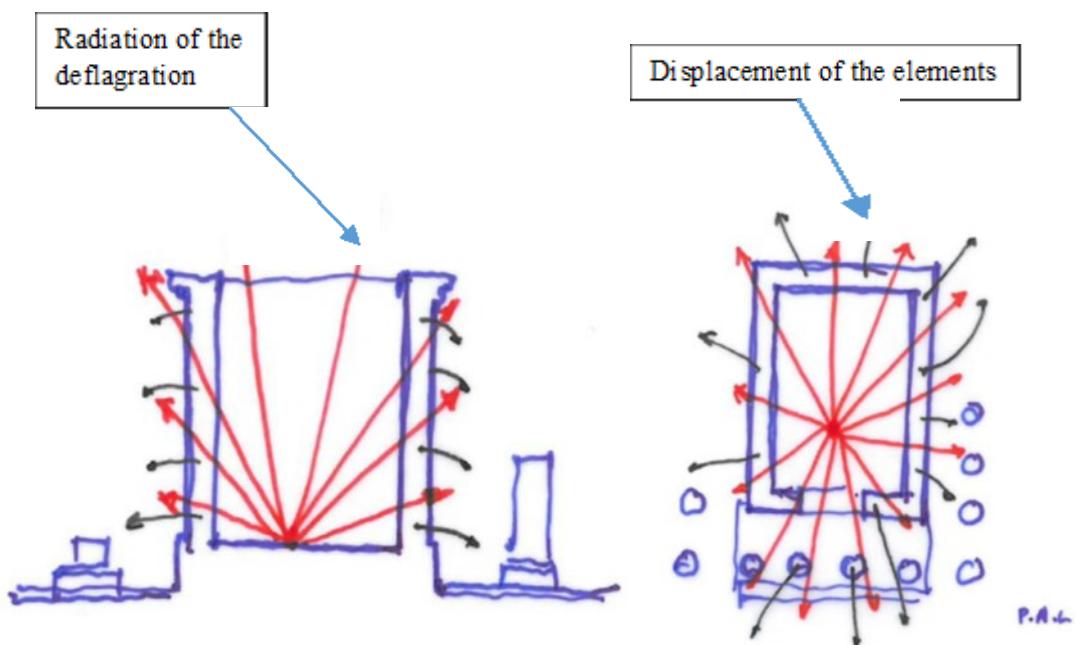
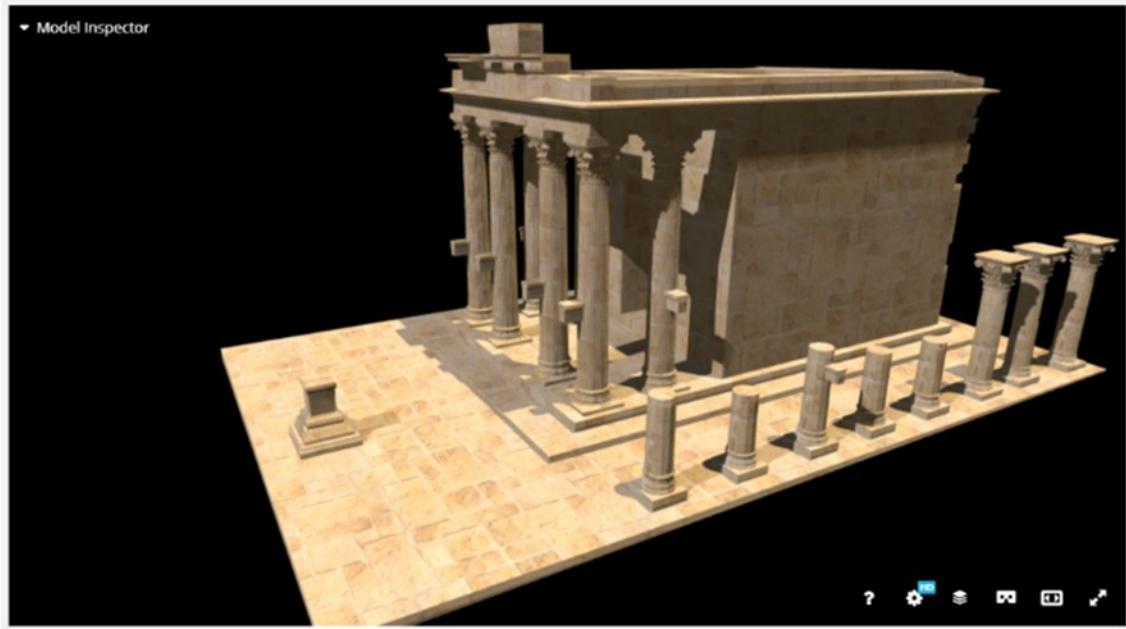


Fig. 22: Diagram showing the results of the explosion, labels added by the author.



Fig. 23: Aerial photograph of the destruction of the Temple of Baalshamin.



*Fig. 24: Still of a virtual reconstruction of the Temple of Baalshamin.*

### Temple of Bel

Destroyed in April 2015 the Temple of Bel was one of the most exquisite temples in Palmyra, surrounded by a colonnade, it appeared as a Greek pseudo-dipteral temple.<sup>87</sup> However, the roof had *merlons* attached along the edges (*Fig. 25*), and the entrance was on the long side not the short side, as one would expect in most Graeco-Roman temples.<sup>88</sup> Construction began between the years AD. 17-19, and dedicated in AD 32.<sup>89</sup> Located at one end of the Great Colonnade, its namesake deity, Bel, was one of the oldest celebrated in Palmyra, coming from Babylonian origin.<sup>90</sup> However, it also honoured many different religious deities throughout Palmyra's history, which attests to the symbiotic relationship of multiple religious ideologies in the city.<sup>91</sup> After the spread of Christianity in the 3<sup>rd</sup> and

<sup>87</sup> Denker (2017), 24; Arkawi (2017), 45; Browning (1979), 99.

<sup>88</sup> It actually shows greater connection to the Hellenistic East according to Colledge (1976), 214.

<sup>89</sup> Stoneman (1992), 27.

<sup>90</sup> Stoneman (1992), 64.

<sup>91</sup> Guidetti and Perini (2015), 8.

4<sup>th</sup> centuries AD, the temple became a Byzantine Church, then later a mosque.<sup>92</sup> In the 1900s the sanctuary of the Temple housed a small community, before the modern settlement Tadmor was inhabited.<sup>93</sup>

The aerial images taken by Iconem (*Figs. 26 and 27*), dated between August and September 2015, showed how little remained of the Temple after the first ISIS occupation. Through this data they were able to create an online model of the Temple seen in *Figures 28 and 29*.<sup>94</sup> The State Party Report from the DGAM shows a reconstruction (*Fig. 30*), created by overlapping pictures and previous surveys (in red) with the remaining part of the temple (in white).<sup>95</sup>

Along with the funerary busts mentioned previously, part of the ceiling from the Temple of Bel has been physically reconstructed through three-dimensional-printing and displayed in an exhibition at the Colosseum in Rome in October 2016 (*Fig. 31*).<sup>96</sup> This demonstrates how physical reconstructions have started off small-scale, such as funerary busts and artefacts of smaller surface areas, instead of large-scale restoration of temples, theatres, and arches. Whether this will continue with larger-scale projects remains to be seen, not only due to funding, but also due to the debate in the international community over the ethics of reconstruction in general.

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<sup>92</sup> Guidetti and Perini (2015), 8; Stoneman (1992), 184.

<sup>93</sup> 'BBC News (b)' website.

<sup>94</sup> 'The New York Times (b)' website.

<sup>95</sup> DGAM (2017), 21.

<sup>96</sup> 'NPR: Replicas of Artefacts Destroyed by ISIS 'Rising from Destruction' in Rome' website.



*Fig. 25: Temple of Bel before the invasion.*



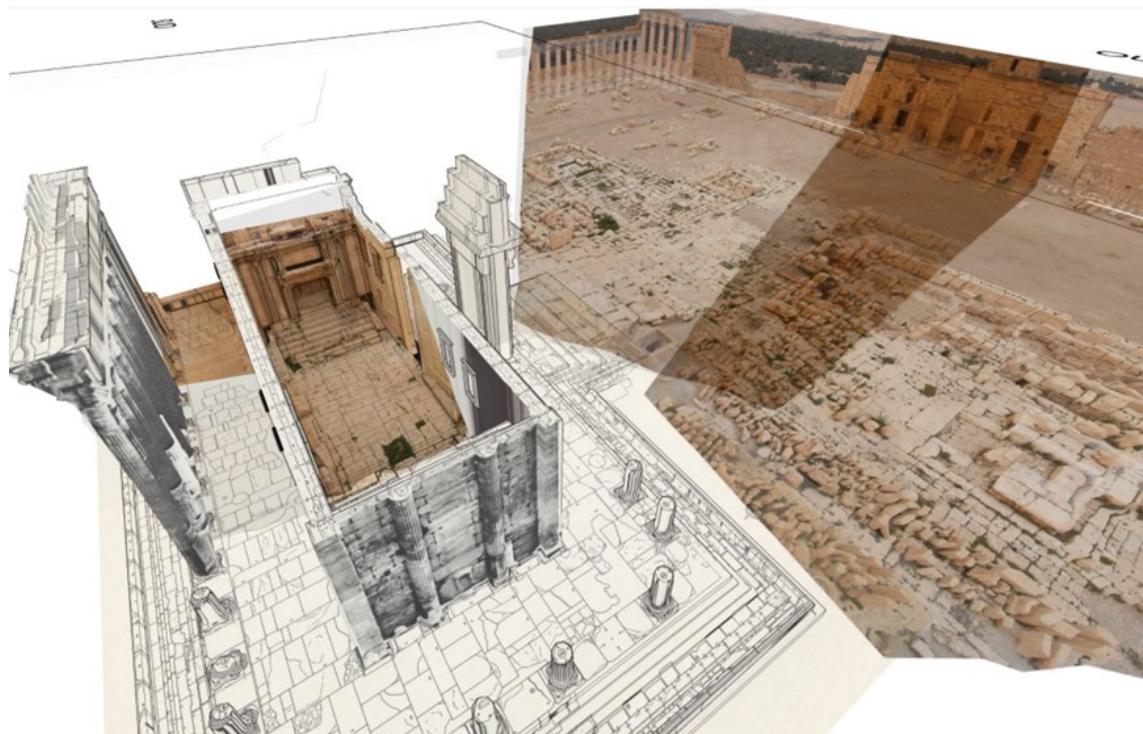
*Fig. 26: Aerial view of the Sanctuary of Bel, August 2015.*



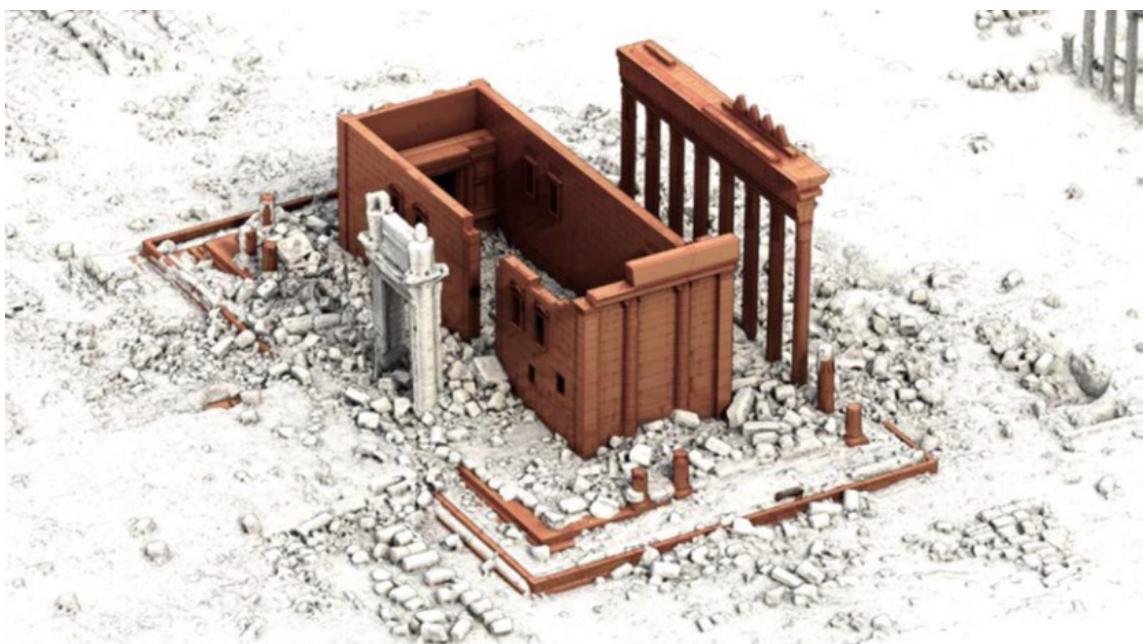
*Fig. 27: Aerial view of the Sanctuary in September 2015.*



*Fig. 28: Partial virtual reconstruction of the Temple of Bel, facing the entrance.*



*Fig. 29: Virtual reconstruction of the Temple of Bel, showing internal and external views.*



*Fig. 30: Virtual reconstruction of the Temple of Bel, including existing remains in white.*



*Fig. 31: Three-dimensional model of part of the ceiling of the Temple of Bel.*

## Conclusion

Overall, what has been done so far is promising in terms of the cultural response to the occupation of Palmyra. It appears that whilst the political situation and the security risks of returning to the site are still prominent, little physical reconstruction can or will be done. However, this has not stopped organisations from collaborating to digitally preserve as much of the remains as possible, through limited site visits and aerial analysis. The nature of the collaboration is one of public openness and free usage, which, although ideologically important in contrast to the dictatorial regime of ISIS, does raise issues concerning the accuracy of what is then released on the internet for all to see. It then begs the question of how to regulate correct reconstructions and which digital reconstruction is best used if proceeding to a physical one. Overall, the message from the evidence of reconstruction at Palmyra, in both physical and digital nature, is one of hope; to see Palmyra in its former beauty. From an ideological and cultural perspective this is an important and welcoming stance, although it remains to be seen in how much should be reconstructed and in what nature; as to keep the history of the site intact without removing selective periods of recent history from existence.

## 2: How far might virtual/physical reconstruction be achieved?

There has been a significant amount achieved in terms of attempts at conservation of cultural heritage in Palmyra already, although more in the sphere of virtual reconstruction. Due to the recent nature of the research topic and the lack of published research, there is not a wealth of information on the matter of reconstruction of the Roman period sites at Palmyra as yet, as studies are mainly assessing the damages up to now. Therefore, it will be necessary to use case studies from other archaeological sites destroyed through conflict as evidence for proposed methods of physical reconstruction. This chapter aims to look at how far both forms of reconstruction might be achieved, how it has been undertaken, how it might be used to promote Palmyra's mission for recognition of the importance of cultural heritage, and finally how viable this may be.

### Virtual Reconstruction

Recent technological advances have made it possible to conceive ancient sites in a more 'immersive format,' in ways not possible from two-dimensional reconstructions or photographs.<sup>97</sup> Virtual reconstruction has become crucial when looking to undertake a conservation or restoration project, when one is wanting to hypothesise different avenues of restoration.<sup>98</sup>

In order to gather the necessary data there exist different methods which carry different advantages and disadvantages depending on the site. A sensor laser survey uses three-dimensional laser scanners to plot out the angles and points of the site together.<sup>99</sup> By placing them in numerous locations around the site, adequate data can be acquired in

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<sup>97</sup> Lancaster (2005), 1.

<sup>98</sup> Gaiani and Micoli (2005), 103.

<sup>99</sup> Mulliez et al. (2013), 580.

which to create a model using specialised software, for example “Faro SCENE,” as used on the survey of Marmaria (*Fig. 32*).<sup>100</sup> The advantage of this method is that the high geometric resolution means the topology of the site is accurately recreated.<sup>101</sup> However, it is slightly flawed in that this post-processing is a laborious process, requiring different tools and software, and coming at great expense.<sup>102</sup>

In this case, photogrammetry would be the preferred option; producing a 360° panorama of the site (*Fig. 33*).<sup>103</sup> The camera moves around automatically from the optical centre to merge the photographs it takes using calibrating software.<sup>104</sup> Due to the close environment in which the photographs are taken, this technique provides one with a superior visuals and measurements helpful in three-dimensional reconstruction.<sup>105</sup> This technique is more cost-effective and gives a wider sphere of data, although it does require an on-the-ground presence to do so. This possibly would not be viable in Palmyra in the foreseeable future due to security reasons, leading to delays to using a combination of the two.

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<sup>100</sup> Mulliez et al. (2013), 580.

<sup>101</sup> Pietroni (2005), 246.

<sup>102</sup> Pietroni (2005), 246.

<sup>103</sup> Mulliez et al. (2013), 580.

<sup>104</sup> Mulliez et al. (2013), 580-1.

<sup>105</sup> Mulliez et al. (2013), 581.

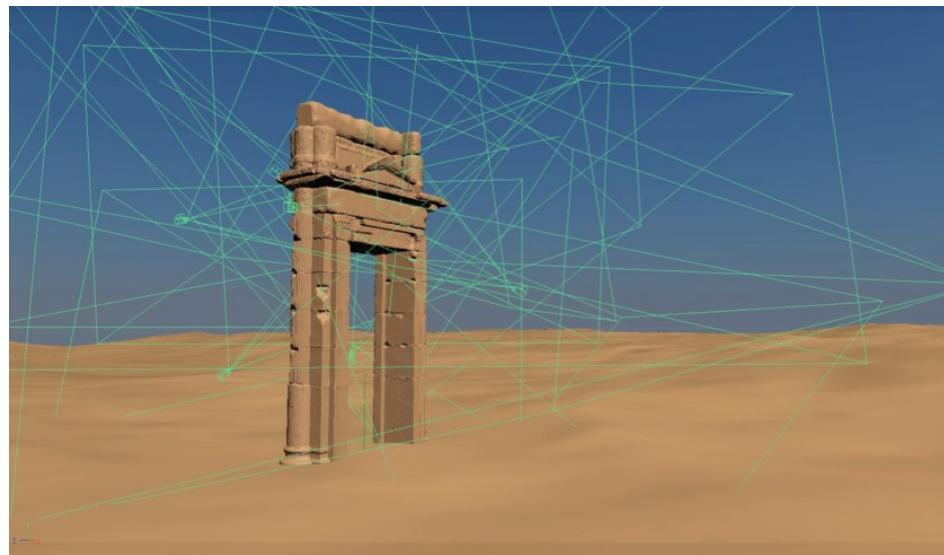


*Fig. 32: Lasergrammetric survey of Marmaria.*



*Fig. 33: Photogrammetric plan at the Massalian Treasury.*

In order to create the three-dimensional reconstruction, each element of the remaining aspects of the building/monument would need to be digitized using the aforementioned techniques, to allow for a realistic outcome of the digital anastylosis.<sup>106</sup> Some of this work has already been done at Palmyra: by the IDA in their work on the Million Image Database Project. Through their site surveys they are able to produce a computer-rendered model which lay the foundations for physical replicas to be printed.<sup>107</sup> Not only have they managed to create a model with the doorway of the Temple of Bel (*Fig. 34*), but also the aforementioned reproduction of the Triumphal Arch.



*Fig. 34: Three-dimensional rendering of the doorway of the Temple of Bel*

As evidenced previously, there is no shortage of virtual reconstructions involving Palmyra.<sup>108</sup> From these there is a great possibility for creating smaller scale models as has already been accomplished. The detail and accuracy of these will be improved when

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<sup>106</sup> Mulliez et al. (2013), 581.

<sup>107</sup> ‘The Million Image Database: Introducing 3D’ website.

<sup>108</sup> Denker (2016), 318-20.

archaeologists are able to survey the site in depth using close-range photogrammetric techniques, needed for an accurate and detailed reconstruction.

Virtual reconstruction at Palmyra could therefore be constructed on a much larger, cohesive scale than has already been achieved come the time when better access to the site is possible. A virtual three-dimensional model of Palmyra would have an exponential reach in publicising the need for conservation of cultural heritage at this site, and in general, as it would enable wider audience access and greater public interaction.<sup>109</sup> Lancaster states that ‘if museums could show the viewer an immersive reconstruction of the “world” of the object, the experience would be far more involved than is currently the case.’<sup>110</sup> This is true, as a virtual, interactive experience would be more accessible to the wider public, not purely for academics. Especially, at a time when physical reconstruction may not be possible, connecting Palmyra virtually with the outside world can also help in the ideological battle against the destruction of cultural heritage.<sup>111</sup> This could be aided again by showing some recent events at the site, for example, its destruction.<sup>112</sup>

In 2003, a team from INSIGHT, was invited to take part in a reconstruction attempt on the tomb belonging to Ramesses II.<sup>113</sup> After creating a three-dimensional reconstruction of the tomb, they projected reconstructed inscriptions over the damaged ones on the wall.<sup>114</sup> They created a virtual reality using non-destructive archaeology, enabling the conservation of cultural heritage with an imaginative, and experimental purpose. This could be potentially used at Palmyra, perhaps projecting a virtual reality of the site inside

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<sup>109</sup> Haas (2013), 100.

<sup>110</sup> Lancaster (2005), 1.

<sup>111</sup> Denker (2016), 318.

<sup>112</sup> Lancaster (2005), 1.

<sup>113</sup> Cain and Martinez (2005), 251.

<sup>114</sup> Cain and Martinez (2005), 251.

a space with a blank wall, as the Temple of Bel and the Temple of Baalshamin have been structurally diminished since the invasion.

An advantage of virtual reconstruction is that it allows for different options of anastylosis to be tested on screen, and compared with others.<sup>115</sup> This was the route taken by researchers at the UCLA CVRLab, while attempting to digitally reconstruct the Curia Julia in Rome in AD 400.<sup>116</sup> Their finished design lacked in some detail due to conflicting source material on its appearance. The different alternatives meant they embarked on two separate approaches, and consequently reconstructed the building with alternative elements, such as different stairs and porches.<sup>117</sup> This incredibly useful method can alleviate fears over perception and accuracy in terms of different reconstructions, whereby perhaps on one main site they are collected and reasons given for each hypothesis. The team's work on the Roman Forum project gives invaluable support to the possibility of a cohesive large-scale reconstruction of the whole site of Palmyra in the Roman period. It consisted of an integration of all the individual structures as well as integrating GIS data also, meaning that each element of the reconstruction can be geographically located and given an actual real-life location - allowing it to be checked to ensure it fits the context in which it was built, something that could be another layer when the data is collated on Palmyra.<sup>118</sup>

Organisations mentioned in the first chapter, such as Iconem, are at the forefront of the push for a wider global interaction with the protection of Palmyra. Unfortunately, this inclusion for a wider network of the international community does bring some

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<sup>115</sup> Mulliez et al. (2013), 582.

<sup>116</sup> Abernathy and Johanson (2005), 222.

<sup>117</sup> Abernathy and Johanson (2005), 223.

<sup>118</sup> Abernathy and Johanson (2005), 224.

disadvantages regarding historical accuracy and coherence. This coincides with the argument that the interaction with virtual reality is more likely to distort historical fact rather than be a source of reliable information for users.<sup>119</sup> The idea that anyone can download and upload their own versions of digital reconstructions, when accessing shared data, will mean there is a lack of scholarly-reviewed reconstructions online, providing correct information. Such virtual reality, although accurate in the Tomb of Ramesses II, could be less likely to be argued against when it looks so fascinating.<sup>120</sup> This is why for some academics such ‘interpretive’ virtual reality is seen as ‘fiction’ and consequently a highly-critiqued endeavour for archaeologists to attempt.<sup>121</sup>

Ensuring a high quality three-dimensional reconstruction of Palmyra would not only be beneficial for the continued efforts to protect cultural heritage but also build a strong foundation for the possibility of developing it into a physical reconstruction. Not only is this entirely possible, but the range of hypotheses that can be tested enable greater academic collaboration over accuracy, creating a multi-disciplinary dialogue that will only benefit the international community.

### Physical Reconstruction

So far only small-scale physical reconstruction has been attempted at Palmyra, due to cost and lack of consensus. Hence in order to examine how one might undertake physical anastylosis at Palmyra it will be necessary to look at other case studies of reconstructions of sites that have also been destroyed by conflict, such as the Frauenkirche, mausolea in

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<sup>119</sup> Lancaster (2005), 1.

<sup>120</sup> Lancaster (2005), 1; Cain and Martinez (2005), 251.

<sup>121</sup> Lancaster (2005), 1.

Mali, and the Old Bridge area in Mostar. In this way, it can be best determined, not only how to reconstruct, but also the purpose of the reconstruction itself.

### The Frauenkirche

The Frauenkirche in Dresden, Germany is an interesting example of a successful physical reconstruction. The original church was designed by the architect George Bähr in the 18<sup>th</sup> century in the Baroque style, and was one of the main landmarks defining the Dresden cityscape throughout the centuries.<sup>122</sup> The church was built square in plan covered by a large stone dome.<sup>123</sup> On the interior, the church was circular, constructed around eight columns, allowing support for the dome and skylight (*Fig. 35*).<sup>124</sup> Destroyed in the Second World War, there were calls to reconstruct the building straight after its collapse, however it took 45 years for this to become a viable option – it was lobbied for by the citizens themselves, as early as 1989, and in 1992, the city itself provided part of the funding for this to become an actuality – the total cost was around €182 million.<sup>125</sup>

There was a heavy emphasis on rebuilding the church as closely as possible, achieved through the use of modern technology.<sup>126</sup> The reconstruction team created a three-dimensional model using previous construction plans and existing measurements from surviving data that were held in archives (*Fig. 36*).<sup>127</sup> Before the ground was cleared (*Fig. 37*), the team employed the use of photogrammetry to document the shape of the collapsed dome and how the internal supports fit into the physical space.<sup>128</sup>

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<sup>122</sup> Haas (2013), 99.

<sup>123</sup> Jäger (2003), 641.

<sup>124</sup> Jäger (2003), 641.

<sup>125</sup> ‘The Reconstruction of the Frauenkirche: the Return of Dresden’s landmark’ website; Moshenska (2015), 83.

<sup>126</sup> Jäger et al. (2003), 686.

<sup>127</sup> Collins et al. (1993), 19.

<sup>128</sup> ‘The Reconstruction of the Frauenkirche: the Return of Dresden’s landmark’ website.



*Fig. 35: Cross-section of the original Frauenkirche*



*Fig. 36: After the collapse*



*Fig. 37: After reconstruction*

Importantly, the team involved in the reconstruction of the Frauenkirche were looking to reconstruct not only for historical purposes, but also for modern usage, requiring functional necessities for the visitors of today. They aimed to correct flaws that were present during the first construction of the church: they incorporated a tension ring constructed of steel, located at the springing of the dome to help support the structure, as well as swapping out wooden beams in exchange for steel girders, in an effort to ensure structural solidity.<sup>129</sup> The only difference here with what could be achieved at Palmyra is that the inclusion of modern technology would take away the authenticity from how the original structure was built, as well as not being in possession of the construction plans

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<sup>129</sup> ‘The Reconstruction of the Frauenkirche: the Return of Dresden’s landmark’ website.

from any of the sites. A possible way this could be rectified is by looking at excavation reports from past archaeological teams in order to ascertain more structural information and measurements of the buildings and monuments, from before the destruction.<sup>130</sup>

In the event of a possible physical reconstruction in Palmyra, archaeologists could benefit from three-dimensional permanent surveying, similar to what was used during the building of the Frauenkirche. In order to create an accurate building plan, they implemented a fixed point network, allowing them to pinpoint where the exact specification of the main axes of the building were.<sup>131</sup> By the use of custom software, throughout the building process they could spatially map the position of every building element and ensure accuracy.<sup>132</sup> This could be useful when collaborating with different archaeological teams on site in Palmyra, as exact measurements can be referred to, to ensure a cohesive process.<sup>133</sup>

### The Mausolea, Timbuktu

In more recent history, Malian cultural heritage has also been under attack from terrorist groups, not unlike what has happened in Palmyra. On 10<sup>th</sup> July 2012, armed rebel groups had destroyed 14 out of the 16 mausolea that were inscribed on the World Heritage List by UNESCO.<sup>134</sup> The WHC, having met in Phnom Penh, Cambodia from the 16<sup>th</sup> to the 27<sup>th</sup> June in 2013, outlined the damage caused in the ten months of occupation by the armed groups and made a decision to work with a ‘view to reconstruction’ of the sites.<sup>135</sup>

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<sup>130</sup> Plans of the Temple of Bel (Seyrig et al. (1975)) could be used here. However, the data collected from a three-dimensional scan would be far superior in terms of reconstruction.

<sup>131</sup> ‘The Reconstruction of the Frauenkirche: the Return of Dresden’s landmark’ website.

<sup>132</sup> ‘The Reconstruction of the Frauenkirche: the Return of Dresden’s landmark’ website.

<sup>133</sup> A recent study of the topography (Schnädelbach (2010), 29-35) with georeferenced structures could be useful here.

<sup>134</sup> ‘UNESCO and European Union undertake to reconstruct the cultural heritage of Timbuktu’ website.

<sup>135</sup> World Heritage Committee (2013), 50.

By 14<sup>th</sup> March 2014, restoration work on all of the mausolea had begun and this was recognised by the WHC in Doha at their 38<sup>th</sup> Session (*Fig. 38*).<sup>136</sup>



*Fig. 38: Reconstruction of one of the mausolea in Mali*

The region of Timbuktu, similar to Palmyra during its economic peak in the Roman period, is located in a convenient area in relation to the Sahara, to take advantage of trading routes and caravan traffic between Mediterranean Africa and the Sudan.<sup>137</sup> The sixteen mausolea were built to saints that were considered to safeguard the area, and are central to the religious belief system in the region, with some dating back to the 13<sup>th</sup> century.<sup>138</sup> They are located all over the central area of the city to act as a spiritual barrier to misfortune,

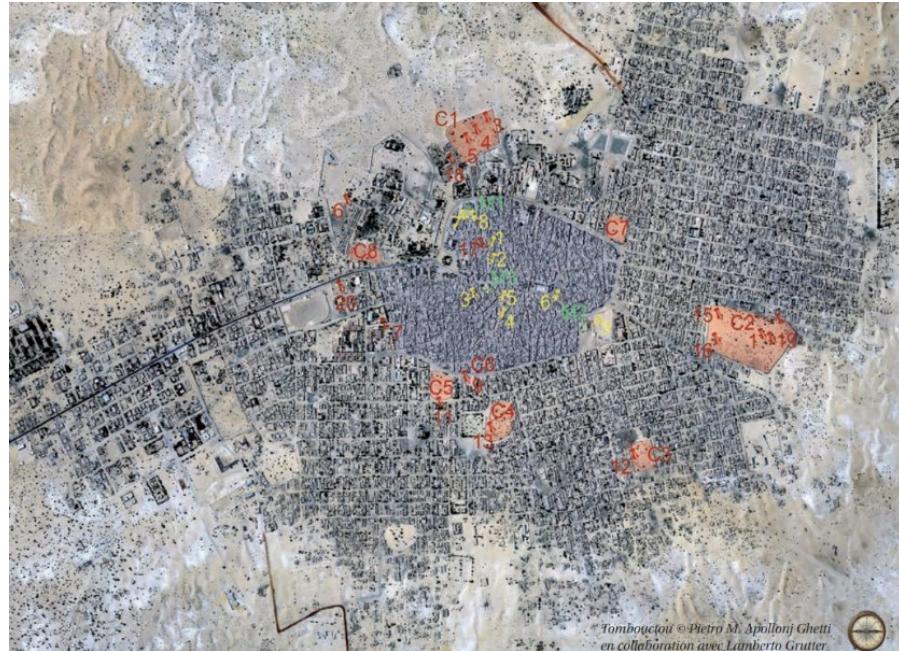
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<sup>136</sup> World Heritage Committee (2014), 34.

<sup>137</sup> Apollonj (2014), 8.

<sup>138</sup> Lostal (2017), 130; Mechtild (2016), 33-4.

usually within select groups as disciples strived to be buried near their saint (*Fig. 39*).<sup>139</sup> They are not exceptionally large buildings, although they are all different. On average, they have both a height and width of around 3 metres and are commonly in a rectangular shape, lacking architectural adornment or design (*Figs. 40-42*).<sup>140</sup>



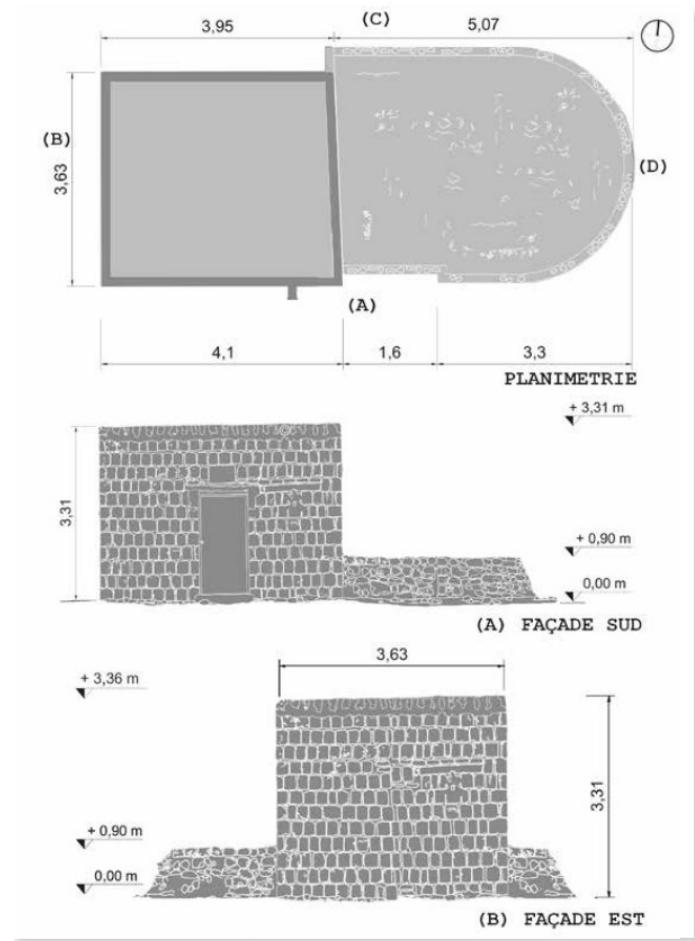
*Fig. 39: Locations of the mausolea shown in red, Timbuktu.*



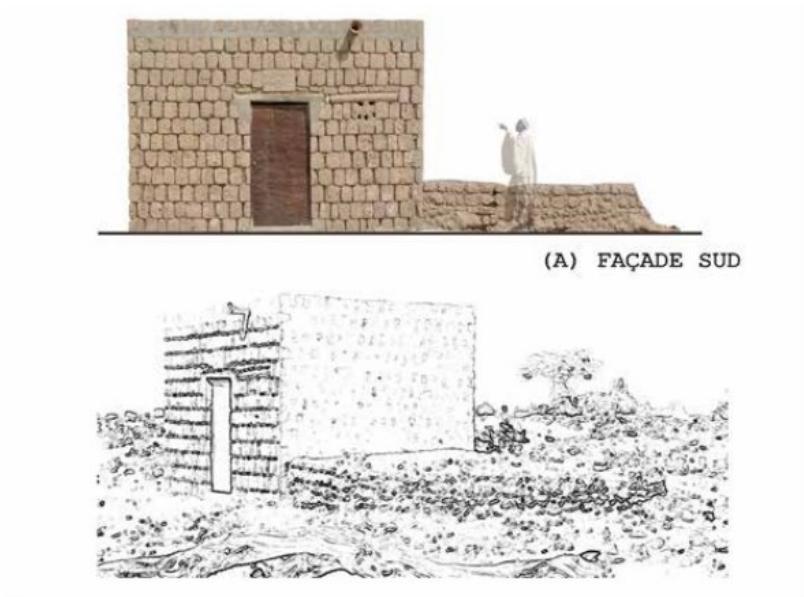
*Fig. 40: Aerial view*

<sup>139</sup> Apollonj (2014), 19.

<sup>140</sup> Apollonj (2014)



*Fig. 41: Floor plan and elevation of the mausoleum*



*Fig. 42: Sketch and virtual reconstruction of the mausoleum*

The importance of these buildings are internationally recognised and they were first protected under the ‘Convention Concerning the Protection of Cultural and Natural World Heritage’ in April 1977.<sup>141</sup> Not only internationally, but also on a national scale the Law 85-40 / AN-RN, ratified on the 26<sup>th</sup> July 1985, showing a concerted legal effort to protect cultural heritage, and specifically included this region also, demonstrating its standing.<sup>142</sup> The project was financed by UNESCO through the ‘Special Account for Mali,’ created in 2012, made up of donations from multiple counties.<sup>143</sup> Consequently, it was included in the WHEAP in 2012, with regards to the nature of the threat of irreversible change to its structure.<sup>144</sup> Although, architecturally this case study is not similar to Palmyra, the way in which it saw intentional destruction to a cultural heritage site is a mirror image. The mausolea were a huge focus on the region’s religion and their beliefs, so when insurgents actively stopped the ongoing maintenance of the mausolea, it was considered sacrilege.<sup>145</sup>

After the removal of the insurgents, Mali’s Ministry of Culture in partnership with UNESCO, started a collaboration with the local community to employ and train masons and builders who would undertake this reconstruction – which could be used at Palmyra also. In their efforts to reconstruct as closely as possible to the original, they used the same type of materials that made up the original mausolea: earth and limestone.<sup>146</sup> A detailed report by UNESCO, written on the mausolea, demonstrates the methods used for reconstruction.<sup>147</sup> Here, they seemingly relied on pictures and sketches of the previous structures, and then created architectural plans based on the remains of the mausolea and

<sup>141</sup> Apollonj (2014), 13.

<sup>142</sup> Decree 92245 (in Apollonj (2014), 13) states that the city of Timbuktu was to be included in this law.

<sup>143</sup> ‘The first stage in the rehabilitation of cultural heritage of Timbuktu (Mali) is complete’ website.

<sup>144</sup> Gandrau and Delboy (2012), 39.

<sup>145</sup> ‘Director-General praises the people of Timbuktu for the reconstruction of the city’s mausolea’ website.

<sup>146</sup> ‘The first stage in the rehabilitation of cultural heritage of Timbuktu (Mali) is complete’ website.

<sup>147</sup> Apollonj (2014).

previous measurements (*Figs. 41 and 42*). One example of a mausoleum that underwent this process is one dedicated to Cheikh Aboul Kassim Attawaty, which has undergone restoration, the process of which can be seen in the figures above outlining sketches, measurements and a digital reconstruction.<sup>148</sup>

This can also be described as a healing for the community and a step towards reconciliation, an interesting idea that can be applied to Palmyra also. The destruction of cultural heritage sites, that remember the location in a period of prosperity and cultural vibrancy, is a serious blow to any community, and shows that the case of Palmyra is unfortunately not unique.<sup>149</sup> On the other hand, it does provide evidence for a successful reconstruction that has been welcomed by the community of the region as a whole. It is interesting to see how successful it was, not only architecturally and technically, but also how it has helped preserve and protect the cultural heritage of the region.<sup>150</sup> In this case, it is also important for the sanctity of religious beliefs and displays the validity of one of the arguments of physical reconstruction: violence will not win.

### The Old Bridge at Mostar

The Stari Most was built in the town of Mostar in Bosnia and Herzegovina in 1566 under the Ottomans, and designed by Mimar Hajruddin, who studied under the renowned Ottoman architect, Sinan.<sup>151</sup> The original bridge, straddling the Neretva River, has been described as having ‘a humpbacked arch’ which had a width and length of four and thirty metres, respectively (*Fig. 43*).<sup>152</sup> The bridge, whose arch was made of *tenalia* stone,

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<sup>148</sup> Apollonj (2014), 34-5.

<sup>149</sup> Ali (2013), 365.

<sup>150</sup> Al Quntar et al. (2015), 154.

<sup>151</sup> ‘Bosnia and Herzegovina – Stari Most’ website.

<sup>152</sup> ‘Bosnia and Herzegovina – Stari Most’ website.

sprung from two towers, named the Halebiya and the Tara.<sup>153</sup> It was destroyed in the Bosnian War on the 8<sup>th</sup>-9<sup>th</sup> November 1993, in the conflict of the city, Mostar, involving Serbia and Croatia.<sup>154</sup> The destruction of the bridge was of significance because it not only divided the city logistically, but was also the ruin of a cultural icon in the city, that affected morale and community identity.<sup>155</sup> This was recognised by the local government and after the war had ended plans were put in place for reconstruction, which was finally completed in 2005, after one of the largest collaboration projects involving many NGOs and international experts.<sup>156</sup> UNESCO set up an ICE in 1998, who would be in charge of the architectural plans and the overall project; this was matched by the city of Mostar itself, who created a PCU, to collaborate on the reconstruction efforts.<sup>157</sup> Through these committees, multiple international companies were employed to undertake different aspects of the surveys, designs, and construction.<sup>158</sup> After the reconstruction project was finished, ‘The Old Bridge Area of the Old City of Mostar’ was added to the World Heritage List, recognising its importance in history.<sup>159</sup>

Unfortunately there were no archives remaining which could provide information as to how the structure was initially built, however photos and surveys from past conservation and repairs provided adequate information to ensure a successful reconstruction.<sup>160</sup> The first step was to remove the extant remains of the arch whilst documenting the measurements of every piece of material removed.<sup>161</sup> The thorough analyses of surveys

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<sup>153</sup> Armaly et al. (2004), 8; Popovac (2006), 51.

<sup>154</sup> Forde (2016), 472.

<sup>155</sup> Forde (2016), 473.

<sup>156</sup> Bosnia and Herzegovina – Stari Most’ website.

<sup>157</sup> Armaly et al. (2004), 10-11; Popovac (2006), 53.

<sup>158</sup> Armaly et al. (2004), 12.

<sup>159</sup> World Heritage Committee (2008), 5.

<sup>160</sup> Popovac (2006), 50; Armaly et al. (2004), 14.

<sup>161</sup> Popovac (2006), 53-4.

taken, much in keeping with ones undertaken at the Frauenkirche, as well as discoveries made of the original materials used meant there was a high standard of architectural authenticity in both the virtual and physical reconstructions (*Fig. 44*).<sup>162</sup>



*Fig. 43: The Stari-Most in the 1980s*

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<sup>162</sup> ‘Bosnia and Herzegovina – Stari Most’ website.



*Fig. 44: 3D image showing a proposed reconstruction*

In order to produce an accurate reconstruction, the materials used included the same *tenalia* stone, a different combination of mortars with different strengths and combinations, as well as paving slabs made of krecnjak stone.<sup>163</sup> The team were challenged in that due to the individually-hewn stone used in the construction, no two blocks were the same, which would affect how accurate the reconstruction would be.<sup>164</sup> This is a problem affecting most sites involving physical reconstruction, especially from centuries ago, including Palmyra.

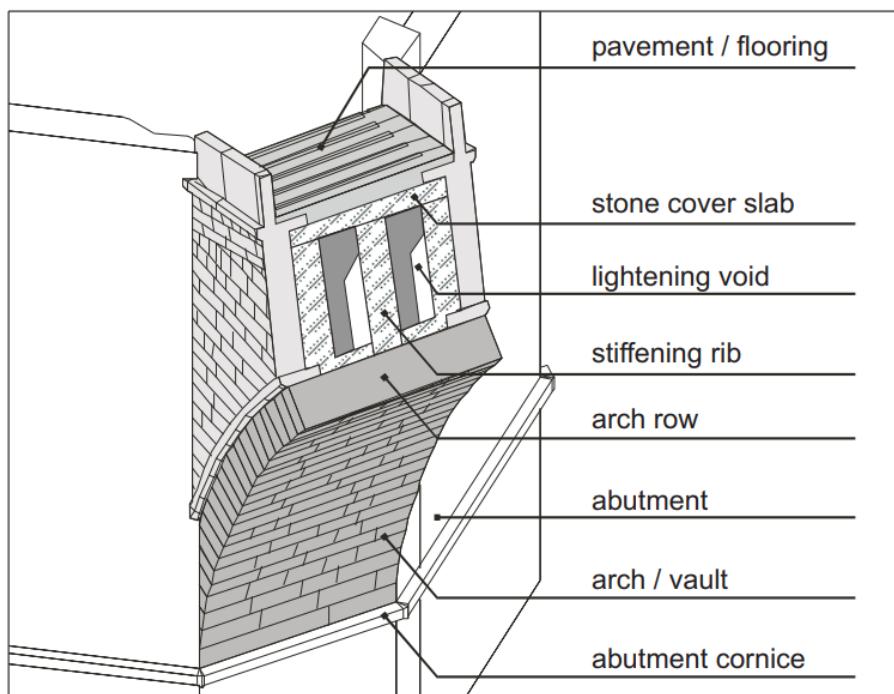
In the first studies and surveys, there was a possibility to further analyse the old stone used in the construction. Despite this being an opportunity for a potentially very important scientific study, it was decided to continue with restoration in order to keep the project

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<sup>163</sup> Popovac (2006), 53; Forde (2016), 474.

<sup>164</sup> Popovac (2006), 51.

on schedule.<sup>165</sup> This raises concerns on rushing into a physical reconstruction of Palmyra. Evidence of earlier settlements, not just the Roman period (which is the main focus of this dissertation), could have been uncovered by the destruction, allowing for further archaeological study. It would be an oversight to have not explored this possible avenue, in order to have a physical reconstruction completed whilst the memory of the invasion is still in the media and public psyche.



*Fig. 45: Diagram showing the structural elements of the bridge.*

In an effort to create a historical reconstruction, traditional building methods were also used. In the original structure a crucial component was lead, which was used, in effect, to “seal” the metal clamps and dowels in the voussoirs.<sup>166</sup> The original centring was believed to be wood, and although wooden beams were included on the reconstruction they were

<sup>165</sup> Armaly et al. (2004), 14.

<sup>166</sup> Popovac (2006), 58.

now reinforced with steel girders (*Figs. 45 and 46*).<sup>167</sup> This was because of the need to ensure that the structure would be secure for many years to come, also meaning it would need less repairs in the future. This is something to possibly take into account when looking at a physical anastylosis of sites in Palmyra. It could be considered necessary to reconstruct with modern technological advantages to increase the stability of a structure, but it can also be at the cost of historical and cultural integrity; calling into question the idea of reconstruction in the first place.



*Fig. 46: Original method of construction on the new arch*

What was central to this bridge being reconstructed as closely as possible to the original, has many similarities to the reasons for reconstruction in Palmyra. UNESCO stated that the bridge is now a ‘symbol of reconciliation, international co-operation and of the coexistence of diverse, cultural, ethnic and religious communities.’<sup>168</sup> For the population of Mostar, the bridge was an important symbol for the city’s landmark and was part of

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<sup>167</sup> Popovac (2006), 50, 54.

<sup>168</sup> ‘Old Bridge Area of the Old City of Mostar’ website.

their cultural identity (*Fig. 47*).<sup>169</sup> However, some locals did express feelings of ‘disconnect’ towards the structure as they themselves were denied involvement in the restoration process, which will be further discussed in Chapter 3.<sup>170</sup> This can be understood in the context of Palmyra, and marks a rapidly-growing awareness in the international community of the need for a post-conflict dialogue in the restoration of heritage sites and their communities.<sup>171</sup> This is markedly important, given the speed at which information can travel through social media; one image/video of a destroyed building or monument can become the catalyst for international recognition of crises and conflict, and those buildings, if reconstructed, become the symbol of peace in the aftermath. However, there is a danger with reconstruction of a site so widely known, of the occurrence of ‘dark tourism’.<sup>172</sup> In the sense that these sites are remembered for what happened, rather than their original historical narrative, and they lose their original identity. Stari Most has become ‘sanitised’ in its purpose, as a national monument for peace, rather than for its Ottoman architecture and history it was originally known for.<sup>173</sup> Although, if reconstruction is accused of removing pieces of history it begs the question of what part of history is removed? Is it its original purpose or the narrative of the atrocity just committed?

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<sup>169</sup> Armaly et al. (2004), 13.

<sup>170</sup> Munawar (2017), 43.

<sup>171</sup> Forde (2016), 468.

<sup>172</sup> Forde (2016), 477.

<sup>173</sup> Forde (2016), 477.



*Fig. 47: The reconstructed Stari Most*

### Palmyra

In all of the above case studies, physical reconstruction has proved to have been a success.

In their own way they have each demonstrated how anastylosis was achieved, from the surveys and analysis done on the Frauenkirche, to maintaining accurate building techniques at the Old Bridge in Mostar, and finally why anastylosis is considered so important for communities to heal, seen in Timbuktu, Mali. It is striking that there seems to be a specific need for physical reconstruction to happen, and this is directly related to how the site is first destroyed. When sites are violently destroyed there is a societal need to heal; if buildings/monuments succumb to natural erosion the international community is far more likely to not have such an emotional response.<sup>174</sup>

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<sup>174</sup> Al Quntar et al. (2015), 154.

These case studies have been met with a solid reception by the international community, but they do raise the question of why physical anastylosis has not been done more. An obvious reason would be the cost, also a reason why smaller-scale reconstructions have been favoured. Physical reconstructions are highly expensive; the mausolea in Mali had a budget of €500,000, and required much less groundwork and planning than a reconstruction at Palmyra would consist of, as they are smaller and constructed of cheaper materials.<sup>175</sup> Logistically, there are issues surrounding safety in Palmyra, due to the mines and buried explosives that need clearing, which will impede access to the site for some time. In order for a full scale reconstruction to take place, a consensus would first need to be met among scholars and local and national authorities on a virtual reconstruction. The lack of scholarly review on most virtual reconstructions would need to be avoided. This could be combatted by creating a virtual database of all reconstructions of Palmyra in one place.<sup>176</sup> In this way each could be debated and reasons could be given for each element of the different reconstructions. In this virtual forum of accredited scholars, a reconstruction could be built based on a possible consensus, which would enable the idea of a physical reconstruction to be entertained.

Anastylosis does not necessarily need to happen on site. Small-scale physical reconstructions of certain monuments, such as the IDA's Triumphal Arch, could potentially be placed in a museum or exhibit. Committing to a large-scale reconstruction with unequal data for every building/monument would be flawed. The Tetrapylon and Theatre had already undergone restoration before the conflict, and as such more data and

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<sup>175</sup> ‘UNESCO and European Union undertake to reconstruct the cultural heritage of Timbuktu’ website.

<sup>176</sup> Iconem releases their data online, where it is all accessible on a central site. There is no reason this could not be set up by the DGAM at a later date.

information, such as measurements and materials are known about them.<sup>177</sup> Seyrig and Amy excavated the Temple of Bel from 1929 onwards, and their extensive plans are excellent for reconstructive purposes.<sup>178</sup> However, the use of three-dimensional scanning technologies are not to be understated. In addition, a large-scale reconstruction would not currently be feasible as there would be no consensus of design, accuracy, or if the project should even take place. Small-scale models, such as one has seen, could be better suited to this effort in preserving Syrian cultural heritage. They would not need to be on site, and could be moved around as part of a campaign concerning the need for the protection of cultural heritage. However, it could be accused of sacrificing the historical integrity of Palmyra for publicity. This raises the issue of the ethics of reconstruction in itself, which will be discussed in the next chapter.

### Conclusion

Overall, it is apparent that virtual reconstruction has proven to be advantageous to studying archaeological sites as well as enabling cultural heritage to be more accessible to the wider public. It is extremely useful in providing an interactive visual experience rather than a two-dimensional image. However, there are downsides. The lack of peer review and the freedom of data sharing of some of the organisations currently attempting virtual reconstruction at Palmyra highlight the dangers of misinformation interfering with an academic discipline. If there was a way for this to be collated in one place with a systematic review of the work uploaded, then potentially this problem could be dealt with. Until an accurate virtual reconstruction has been agreed upon, a physical reconstruction will not be possible, and unfortunately an agreed-upon virtual reconstruction would

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<sup>177</sup> '#NEWPALMYRA (b)' website.

<sup>178</sup> Seyrig et al. (1975)

probably be years in the making. In some instances physical reconstruction has been successful, but in Palmyra the nature of its destruction needs to be taken into consideration, as well as logistics, cost and ethically why it should or should not be reconstructed. In conclusion, it may be possible in the future, but it would take a lot of international collaboration and a multi-disciplinary approach that would require an extensive amount of resources, especially at a time when the civilian crisis in Syria should be considered a more pressing matter to alleviate, no matter how important cultural heritage is.

### 3: Does one physically reconstruct at all?

The analysis of case studies surrounding physical reconstruction has proven that virtual and physical anastylosis is possible at Palmyra in an effort to repair its hugely important cultural heritage. Virtual reconstruction has already been proven to be successful, although there are flaws that arise from unrestricted public access to three-dimensional models, as has been argued. Whilst there are possibilities for physical reconstruction, it remains to be seen that whether such an extensive step should be taken now, in the future, or even at all. The decision taken by UNESCO to physically reconstruct has been met with opposition in the international community.<sup>179</sup> Vitally, it is the humanitarian crisis that requires attention first, which needs no justification. The uncertainty and volatility of the region also calls into question whether reconstruction would be safe and secure in the future, due to the current political turmoil and armed conflict that has no end in sight. One important factor surrounds the issue of selective history, and how recent events that occurred at the site make up Syrian cultural heritage today, which in itself needs preserving also. However, current discourse includes the importance of the societal need to heal, regroup, and recover from the barbarity of what has recently occurred. Arguments for the need of an inclusive environment for reconstruction as an act of solidarity has struck a chord in many in the international community. Regardless, of what has been decided by UNESCO, it is important to understand for whom we reconstruct, as they should be the sole focus of the decisions that will be made in the future surrounding reconstruction.

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<sup>179</sup> World Heritage Committee (2017), 64-65.

### Legislation

For the past 50 years the international community has been on the whole opposed to reconstruction in general due to a multitude of issues.<sup>180</sup> ICOMOS was one of the first organisations to create a landmark statement on the dangers of restoration, and was wholly against reconstruction as a possibility when preserving cultural heritage.<sup>181</sup> Since then, legislation has always advocated a strict policy of restoration up to ‘the point where conjecture begins.’<sup>182</sup> However, the Burra Charter of 1979 formed the first part of a re-examination of reconstruction in some circumstances that allow a ‘sustained cultural value.’<sup>183</sup> ICOMOS’ ‘Nara Document on Authenticity’ represented a move towards a greater acceptance of reconstruction, which recognised the need to evaluate possible sites for reconstruction on a more subjective basis, showing ‘respect for cultural and heritage diversity’ through avoidance of the ‘imposition of mechanistic formulae or standardised procedures in attempting to define/determine authenticity of particular monuments or sites.’<sup>184</sup> Following a widening in the international discourse of the changing perceptions of what can be defined as cultural heritage, UNESCO, and subsequently, its WHC moved towards a more accepting stance on reconstruction. This culminated in the bridge, Stari Most, in Mostar being reconstructed, among other projects, at a time when reconstruction started to be viewed more favourably.<sup>185</sup> This was acknowledged in the Nara+20 document created in 2014, where a true understanding of the ‘evolution of cultural values’ was shown, along with a need to try and create an easier process by ‘which authenticity

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<sup>180</sup> The Venice Charter created in 1964 by ICOMOS (International Council on Monuments and Sites), is now regarded as outdated in legislation regarding reconstruction, as seen in Khalaf (2017), 265.

<sup>181</sup> Cameron (2017), 57.

<sup>182</sup> ICOMOS (1964), 2.

<sup>183</sup> Cameron (2017), 57.

<sup>184</sup> ICOMOS (1994), 1.

<sup>185</sup> Cameron (2017), 58.

can be periodically assessed.<sup>186</sup> Overall, it is evident that reconstruction has started to be seen as acceptable when associated with ‘events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance.’<sup>187</sup> This understanding of the concept of the values of cultural heritage being in ‘flux’ is one of the main reasons that reconstruction has started to be looked upon more favourably.<sup>188</sup> This has been one of the reasons that has culminated in UNESCO’s decision to reconstruct Palmyra: the changing legislation in favour of a more subjective and needs-based approach, rather than a homogenous policy which did not factor in the context of sites; arguably, one of the key reasons in favour of reconstruction.

### To reconstruct...

A factor in favour of reconstruction that has been expressed widely in the scholarship is the increasing awareness of the dynamic nature of cultural heritage. As one can see throughout changes in legislation, this shift in the definition of what cultural heritage is, has evolved over time to be more inclusive of ‘changing values, perceptions’ and ‘circumstances.’<sup>189</sup> In this way, it has been argued that it is appropriate to reconstruct as it is ‘a continuous process of evolution of a cultural property.’<sup>190</sup> An argument that opposed this was concerned with how much one could still assign the classification of a WHS to a property that has been rebuilt after its destruction, as it might not be recognisable as World Heritage.<sup>191</sup> To maintain WHS status, a site needs to fulfil its title of having OUV, which requires a certain level of authenticity that favours palpable material evidence rather than unobservable heritage. This has changed slightly due to

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<sup>186</sup> Japan ICOMOS (2014), 2.

<sup>187</sup> World Heritage Committee (2012), 21.

<sup>188</sup> Araoz (2011), 58.

<sup>189</sup> Khalaf (2017), 263.

<sup>190</sup> Khalaf (2017), 269.

<sup>191</sup> Khalaf (2017), 263; Stanley-Price (2009), 42.

legislators becoming more aware of the importance of the context and significance of sites for not only their immediate vicinity, but the wider community as a whole.<sup>192</sup> The images of the destruction of Palmyra were met with a hugely powerful sentiment of the need to fix the damage caused by senseless violence. In this way, the events that have occurred at the site represent an additional layer of cultural heritage that is also part of its history, and I believe are a strong case for the site, regardless of whether it undergoes reconstruction to still be considered a WHS. The way in which the site was destroyed – violently and not following a natural process of decline - resonates with the wider public on a greater level than an ancient site slowly giving into time and decay. The unjustifiable events that took place struck a chord, not only with international NGOs, governments and organisations, but also with the public, which has enabled crowd-funded projects to attempt reconstruction in the virtual sphere.<sup>193</sup> The willingness of the multitudes of peoples involved in these efforts helps to solidify the reasoning behind the need to save cultural heritage at Palmyra, and how the changing nature of it is exemplified here, but does not make it any less important. The ability to re-create Palmyra would allow the cultural heritage to become connected ‘with acts of remembering’, connecting not only the Roman past of Palmyra, but also its very recent and emotive history to the present.<sup>194</sup>

The visceral reactions that the destruction has elicited from the international community and the world is thus a strong factor to lobby for reconstruction. Even if the devastation concerns an ancient past that one no longer holds a direct connection to, ‘the human instinct is to rebuild.’<sup>195</sup> Palmyra represented a fusion of cultures and ethnicities in

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<sup>192</sup> Bandarin and Van Oers (2012), 178; Araoz (2011), 58.

<sup>193</sup> ‘Perpetuity: Palmyra is a Vital VR Project to Preserve Syrian Culture’ website.

<sup>194</sup> Smith (2006), 44.

<sup>195</sup> Kealy (2016), 1.

antiquity whose united cooperation facilitated an economic powerhouse at its peak, with multiculturalism at its core. Rebuilding Palmyra does not necessarily mean solely the fabric of the buildings being salvaged, but also the accepting community spirit and identity, which carries a more powerful message now in the face of barbaric adversity.<sup>196</sup> In an effort to recreate this spirit of commonality, it seems valid that any reconstruction that would take place would need to do so in conjunction with the local community and stakeholders.<sup>197</sup> Alongside, cooperation with international organisations and governments, a reconstruction project done correctly, would bestow the site with the power ‘to remember, to admonish, and to elicit strong emotions.’<sup>198</sup> However, the flaw in this is that the ongoing political and armed conflict at the moment, does not have a foreseeable end in sight, and once it does end, reconstruction will be one area on a long list of problems to solve for those involved.<sup>199</sup>

The preservation of memory is an influential component of the decision taken to reconstruct. Harrowell’s argument is a convincing one: we build our space based on the memories we hope will endure, which is why the acts of destruction at Palmyra are one of a disconcerting nature, as they destroy the ‘kind of immortality that the individual cannot hope to attain.’<sup>200</sup> Preserving the memory of Palmyra, is not only important for its historical past and value, but also for recent events and how they form part of Syrian culture.<sup>201</sup> Those involved in reconstruction would need to take this into account in order to not censor elements of history they find disquieting.<sup>202</sup> This may need to involve

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<sup>196</sup> Kealy (2016), 1.

<sup>197</sup> Matero (2010), 3.

<sup>198</sup> Matero (2010), 5.

<sup>199</sup> Munawar (2017), 43.

<sup>200</sup> Harrowell (2016), 82.

<sup>201</sup> Potts (1998), 198.

<sup>202</sup> Araoz (2011), 59.

reconstruction in a different area or place, rather than directly on the site itself, unless part of the atrocities of the site can be reimagined themselves in another way – possibly a museum exhibit or a memorial on site. It would be important that this is determined before any attempts at anastylosis takes place, in conjunction with the local community and professional archaeologists and architects.<sup>203</sup>

#### Or not to reconstruct?

Despite UNESCO having taken the decision to reconstruct, there are ethical considerations that need to be examined. It was surprising to many that UNESCO's decision was made so soon after destruction, seeing as the conflict is not yet over. A press release from members of the board of Shirīn-international 'expressed concern' over a stated commitment between the UNESCO Director-General and Vladimir Putin to collaborate on Palmyra's reconstruction.<sup>204</sup> It is apparent that members of the board of Shirīn-international do want reconstruction to take place, but on a delayed scale. They are not alone in this respect, with many members of the international community, expressing concerns over the short amount of time it took for UNESCO to have released a directive. The political instability in not only the region, but also the country, is one reason that reconstruction cannot be instigated as of yet.<sup>205</sup> The possibility of the site being destroyed again in the recent future, is not a plausibility to take lightly.

In addition, the facsimile of the destroyed site, cannot be considered to have successfully reproduced 'contested heritage', especially when it has been used as a political tool in a war against cultural, religious and political ideologies.<sup>206</sup> The danger of reconstruction

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<sup>203</sup> Kalman (2014), 39; Abdulkarim (2016), 10.

<sup>204</sup> Al-Maqdissi et al. (2016), 1.

<sup>205</sup> Munawar (2017), 43.

<sup>206</sup> Munawar (2017), 43.

when there is local disconnect has already been evidenced by the Stari Most bridge. Although disagreement regarding the reconstruction of Stari Most had deeper roots in the lack of involvement allowed to the local community rather than conflicting ideologies surrounding heritage, the same principle applies.<sup>207</sup> It begs the question – ‘for whom do we reconstruct?’<sup>208</sup> If the purpose of reconstruction is to be of benefit to the community involved, then not only do they need input on the project, but also should decide when it should take place. If Western organisations decide that reconstruction is for Syrian people yet exclude community involvement, then they are in danger of colonialism, whether virtual or physical.<sup>209</sup> For many Syrians, although the destruction of their heritage causes them pain, there are more pressing civilian and humanitarian issues that require their attention.<sup>210</sup>

The danger of reconstruction in Palmyra, when the country’s political situation lacks stability is the possible politicisation of the anastylosis. It is true that in previous conflicts within the Middle East, destruction of cultural heritage has also occurred. Palmyra and its cultural importance have played a ‘key symbolic role within IS’s visual and moral economy’, creating a far more impactful visual statement for not only the community involved, but also the wider world.<sup>211</sup> The reasons for destruction are not new and are part of a long-standing cultural ideology of backlash. For this reason it is not implausible to believe that anastylosis of Palmyra can make it a target once again. It also must be considered that it is not known who will succeed in this conflict in the future, or even for how long they will be in charge. It would be an insult to the work done by archaeologists

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<sup>207</sup> Lostal and Cunliffe (2016), 250; Harrowell (2016), 82-3.

<sup>208</sup> Khalaf (2017), 268.

<sup>209</sup> Potts (1998), 198. (Bond (2016), 1) comments on the public inaccessibility for the images produced by the IDA, despite their claims they are free for public use.

<sup>210</sup> Al-Maqdissi et al. (2016), 2.

<sup>211</sup> De Cesari (2015), 22.

and UNESCO for whomever succeeds ‘to marshal the resources and power to remake it in their own image.’<sup>212</sup> The politics of claiming cultural heritage cannot be understated, and one must be aware that reconstruction of Palmyra will not bring a residual peace or total comfort for those involved when hostilities are not yet mediated.<sup>213</sup> Although there is always the danger of this occurring, it seems defeatist to not undertake reconstruct in the hopes that history would not repeat itself. However, it does potentially mean that reconstruction should not take place until Syria has greater political stability.

The argument for the changing nature of cultural heritage, needs to be acknowledge that the events witnessed in the last few years at Palmyra are also now part of its history.<sup>214</sup> If reconstruction is needed to preserving the memory of the site, then it could be argued it is paradoxical to do so, when it censors its recent history.<sup>215</sup> It appears that this is overwhelmed by the societal need to heal in this case, due to the vitriolic nature of its destruction.

One of the most logical problems of reconstruction in general is the level of authenticity that cannot be totally guaranteed.<sup>216</sup> Reconstruction in itself is destructive - rebuilding can damage much of the existing remains, and then cover them with potentially erroneous information, despite best efforts to reduce this from happening, at a very high cost.<sup>217</sup> However, in the case of Palmyra it appears that the case for reconstruction lies in the sphere of humanitarian and societal justification. It has been accepted that errors may be made, but there are also cases in which reconstruction has been truly successful – the

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<sup>212</sup> Harrowell (2016), 83.

<sup>213</sup> Perring and van der Linde (2009), 200.

<sup>214</sup> Lostal and Cunliffe (2016), 254, Bandarin and Van Oers (2012), 178.

<sup>215</sup> Araoz (2011), 59; Stanley-Price (2009), 39.

<sup>216</sup> Matero (2010), 1; Stanley-Price (2009), 37.

<sup>217</sup> Stanley-Price (2009), 38-40.

Frauenkirche, in Dresden for one. Given how much Palmyra means to Syrians, it appears that to not reconstruct in fear of making mistakes is detrimental to not only morale, but also to the efforts needed to raise awareness of the need for the protection of cultural heritage.

Conclusion:

Overall, I believe that reconstruction is needed in Palmyra, but in a limited and controlled format. Virtual reconstruction has already proven successful in that, having promoted the importance of the preservation of cultural heritage in the international community and in the public sphere. It would benefit from a central site where there is an opportunity to see different attempts at virtual reconstruction, showing a ranging hypotheses of anastylosis. There are more reservations regarding physical reconstruction due to the danger of politicisation and its potential implications for involvement in political and religious turmoil. This is linked to the possibility of Palmyra becoming a target if reconstructed in future instability, which is strong reasoning for the delayed anastylosis until stability has returned to the country once more. This will also enable the local community and stakeholders to have significant influence over how they think restoration should be handled, and on what scale. It is important that the recent history of Palmyra be remembered, and not completely eroded. Whether this means only partial reconstruction, a museum exhibit, or a memorial, there are ways to incorporate this into anastylosis without halting reconstruction completely.

Reconstruction has been looked up in a far more favourable amount than previously as evidenced by changing conservation principles. The evolving nature of cultural heritage is apparent in this respect as it can now involve intangible heritage also. How Palmyra was destroyed speaks a lot to the drive for reconstruction – the need to repair, rebuild and

heal is possibly one of the most emotive reasons to do so. Most importantly, this reconstruction should remember to whom it matters the most – the local community and country as a whole. Any reconstruction that takes place needs to be aware of the risk of authenticity that anastylosis holds, but not censor history. Physical reconstruction should take place, in the future on a small scale, for cost as well as authenticity reasons, as well as functioning not only for the distant past but for recent events also. The need to fix problems may be a human reaction, but one must be aware that rushing into physical action could cause problems in the future way beyond imagination.

### Conclusion:

Virtual and physical reconstruction are two both highly versatile techniques that can be used to preserve the cultural heritage of Palmyra. Virtual reconstruction allows openness in public interaction, in that anyone can have access to it and it holds an important ideological message of collaboration. Despite its abilities there are disadvantages to this also. There is a lack academic critical review that diminishes its accuracy, which cannot be overlooked. The display of erroneous information on the Internet also has the potential to distort historical facts and information, working against the aim of preserving cultural heritage.

The response from NGOs and governments is an overwhelmingly positive step in the right direction, showing a united effort to save Palmyra. In the academic sphere this means a commitment to the conservation of Syrian cultural heritage on not only a national, but also an international scale. One way to better preserve this heritage is through a virtual database of completed reconstructions. If there were a site where models could be uploaded and checked by a consortium of scholars, showing their alternative interpretations, then this could help information to become more accurate. This could create a dialogue that would enable a potential consensus on some of the models in the future; aided further by the collection of more archaeological and architectural data from the site itself, through the use of photogrammetry and lasergrammetric techniques.

In the future, virtual reconstruction also has the potential to be developed into an interactive virtual reality model, as if one was walking underneath the Tetrapylon or the Arch of Triumph. As seen in Chapter 2, this technique has the possibility to engage the wider public in efforts to raise awareness of the importance of heritage, as it can be transported to different museums and heritage sites around the world.

Physical reconstruction on a small-scale has proven to be successful at Palmyra, however there remains only a few instances where this has taken place. It appears that physical anastylosis can be undertaken on the monuments and buildings that we have the most information for surrounding previous reconstructions - the Lion of Al'lāt, the Triumphal Arch and the Tetrapylon. Although for this physical reconstruction to take place a virtual one would need to be agreed upon in order to draw up sufficient archaeological plans, which may take time. As authenticity and accuracy cannot be determined fully, restoration and reconstruction should only be on a small-scale in order to protect the historical integrity of the site. Large-scale reconstruction is not only extremely expensive but also depends on the quality of data a three-dimensional scanner could collect from the remains, limiting a precise reconstruction further.

Reconstruction, whether virtual or physical, is of the upmost importance at Palmyra. However, there is a need to allow for an accurate portrayal of the history of the site, without removing selective events from the record. The societal need to heal is one of the most stirring reasons to reconstruct Palmyra. One must also reconstruct with the purpose of providing benefit to the community that has experienced its destruction. Due to the possibility of politicisation of any reconstruction, it should potentially be delayed until the country is in a period of stability, ensuring the site will not be used as a target.

Overall, both physical and virtual reconstruction can be undertaken at Palmyra. Virtually, there are many possibilities but accuracy needs to be better enforced. However, physical reconstruction on site should be limited so as not to censor the history it has endured. This history, like every moment, is now part of its fabric.

### Bibliography:

#### Primary Sources:

Pearse, R. (2002), tr., *Zosimus: New History*, London.

#### Secondary Literature:

Al-Maqdissi, M., Braemer, F., Gawlikowski, M., Lebeau, M., Schmidt-Colinet, A, and Members of the Board of Shirīn-international (2016), ‘Restoring Palmyra: Yes! Hastily: No!!! A motion aimed to encourage UNESCO to act as a neutral organisation.’ Available at: <http://shirin-international.org/wp-content/uploads/2015/03/Palmyra-Motion-Supports.pdf> (accessed 18/01/18).

Al Quntar, S., Hanson, K., Daniels, B.I., Wegener, C. (2015), ‘Responding to a Cultural Heritage Crisis: The Example of the Safeguarding the Heritage of Syria and Iraq Project’, *Near Eastern Archaeology* 78:3, 154-160.

Abdulkarim, M. (2016), ‘Challenges facing cultural institutions in times of conflict: Syrian cultural heritage’, *Post-trauma Reconstruction Colloquium at ICOMOS Headquarters, Volume I Proceedings, 4<sup>th</sup> March 2016*, Charenton-le-Pont, 9-11. Available at: [http://openarchive.icomos.org/1707/1/ICOMOS-Post-Trauma\\_Reconstruction\\_Proceedings-VOL1-ENGok.pdf](http://openarchive.icomos.org/1707/1/ICOMOS-Post-Trauma_Reconstruction_Proceedings-VOL1-ENGok.pdf) (accessed 04/04/18).

Abernathy, D. and Johanson, C. (2005), ‘Evolving Strategies: Projects of the UCLA CVRLab’, in M. Forte (ed.), *The Reconstruction of Archaeological Landscapes through Digital Technologies: proceedings of the 2nd Italy-United States Workshop, Rome, Italy, November 3-5, 2003, Berkeley, USA, May 2005*, Oxford, 221-228.

Ali, C. (2013), ‘Syrian Heritage under Threat’, *Journal of Eastern Mediterranean Archaeology & Heritage Studies* 1:4, 361-366.

Apollonj, P.M. (2014), *UNESCO: Étude sur les mausolées de Tombouctou*, Paris.

Araoz, G. (2011), ‘Preserving Heritage Places Under A New Paradigm’, *Journal of Cultural Heritage Management and Sustainable Development* 1:1, 55–60.

Arkawi, A. (2017), ‘Vision of the Reconstruction of Destructed Monuments of Palmyra (3D) as a Step to Rehabilitate and Preserve the Whole Site’, *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences* XLII-2/W5, 41-48.

Armaly, M., Blasi, C, and Hannah, L. (2004), ‘Stari Most: rebuilding more than a historic bridge in Mostar’, *Museum International* 56.4, 6-17.

Bandarin, F., and Van Oers, R. (2012), *The Historic Urban Landscape: Managing Heritage in an Urban Century*, Chichester.

Browning, I. (1979), *Palmyra*, London.

- Cain, K. and Martinez, P. (2005), ‘Multiple Realities: Video Projection in the Tomb of Ramesses II’, in M. Forte (ed.), *The Reconstruction of Archaeological Landscapes through Digital Technologies: proceedings of the 2nd Italy-United States Workshop, Rome, Italy, November 3-5, 2003, Berkeley, USA, May 2005*, Oxford, 251-263.
- Cameron, C. (2017), ‘Reconstruction: Changing Attitudes’, *UNESCO Courier* July-September: 2, 56-60. Available at: <http://unesdoc.unesco.org/images/0025/002523/252318e.pdf> (accessed 04/04/18).
- Colledge, M.A.R. (1976), *The Art of Palmyra*, London.
- Collins, B., Williams, D., Haak, R.M., Trux, M., Herz, H., Genevriez, L., Nicot, P., Brault, P., Coyere, X., Krause, B., Kluckow, J. and Paffenholz, A. (1993), ‘The Dresden Frauenkirche – Rebuilding the Past’, *CAA*, 19-24. Available at: <https://pdfs.semanticscholar.org/63b4/9366bdedd49f99a65c7b0a214b4518e77279.pdf> (accessed 13/04/18).
- Danti, M., Paulette, T., Gordon, L.B., Moaz, A., Ali, C., Franklin, K. and Elitzer, D. (2015), ‘Special Report on the Importance of Palmyra’, *ASOR Cultural Heritage Initiatives*, 1-8. Available at: <http://www.asor-syrianheritage.org/special-report-on-the-importance-of-palmyra/> (accessed 20/03/18).
- De Cesari, C. (2015), ‘Post-Colonial Ruins: Archaeologies of Political Violence and IS’, *Anthropology Today* 31, 22-26.
- Denker, A. (2016), ‘Virtual Palmyra: 3D Reconstruction of the Lost Reality of the “Bride of the Desert”’, *Arqueológica 2.0 – 8<sup>th</sup> International Congress on Archaeology, Computer Graphics, Cultural Heritage and Innovation*, 318-320. Available at: <http://ocs.editorial.upv.es/index.php/arqueologica20/arqueologica8/paper/viewFile/3540/2237> (accessed 14/04/18).
- Denker, A. (2017), ‘Rebuilding Palmyra virtually: recreation of its former glory in digital space’, *Virtual Archaeology Review* 8:17, 20-30.
- Forde, S. (2016), ‘The Bridge on the Neretva: Stari Most as a stage of memory in post-conflict Mostar, Bosnia-Herzegovina’, *Cooperation and Conflict* 51:4, 467-483.
- Gaiani, M and Micoli, L.L. (2005), ‘A Framework to build 3D Models from Real World Data for Historical Architecture and Archaeology’, in M. Forte (ed.), *The Reconstruction of Archaeological Landscapes through Digital Technologies: proceedings of the 2nd Italy-United States Workshop, Rome, Italy, November 3-5, 2003, Berkeley, USA, May 2005*, Oxford, 103-125.
- Gandreau, D. and Delboy, L. (2012), ‘UNESCO: World Heritage Earthen Architecture Programme: Inventory of Earthen Architecture’, 1-286. Available at: <http://unesdoc.unesco.org/images/0021/002170/217020e.pdf> (accessed 16/03/18).
- Guidetti, M., and Perini, S. (2015), ‘Civil War and Cultural Heritage in Syria, 2011-2015’, *Syrian Studies Association Bulletin* 20:1, 1-42.

- Haas, F. (2013), 'Dresden city models: On the interrelation of virtual reconstructions and the image of a city', *2013 Digital Heritage International Congress (DigitalHeritage)*, 99-102.
- Harrowell, E. (2016), 'Looking for the future in the rubble of Palmyra: Destruction, reconstruction and identity', *Geoforum* 69, 81-83.
- Jäger, W. (2003), 'A Short Summary of the History of the Frauenkirche in Dresden', *Construction and Building Materials* 17, 641-649.
- Jäger, W., Bergander, H. and Pohle, F. (2003), 'The Reconstruction of the Sandstone Dome of the Frauenkirche', *Construction and Building Materials* 17, 679-686.
- Kalman, H. (2014), *Heritage Planning: Principles and Process*, London.
- Kealy, L. (2016), 'Post-trauma Reconstruction: Concept Paper', *ICOMOS Colloquium 4<sup>th</sup> March 2016*, Charenton-le-Pont, 1-5. Available at: [https://www.icomos.org/images/DOCUMENTS/Secretariat/2016/Reconstruction\\_conference/ICOMOS\\_Pos-trauma\\_Reconstruction\\_Concept\\_Paper.pdf](https://www.icomos.org/images/DOCUMENTS/Secretariat/2016/Reconstruction_conference/ICOMOS_Pos-trauma_Reconstruction_Concept_Paper.pdf) (accessed 04/04/18).
- Khalaf, R.W. (2017), 'A Viewpoint on the reconstruction of destroyed UNESCO Cultural World Heritage Sites', *International Journal of Heritage Studies* 23:3, 261-274.
- Lablaude, P., and Russo, S. (2017), 'Report on the Technical Assistance Workshop for the World Heritage Sites of the Crac des Chevaliers, Palmyra and the Ancient City of Damascus', *Beirut*, 1-70. Available at: <https://whc.unesco.org/en/events/1386/> (accessed 22/02/18).
- Lancaster, L. (2005), 'Virtual Reality within the Humanities', in M. Forte (ed.), *The Reconstruction of Archaeological Landscapes through Digital Technologies: proceedings of the 2nd Italy-United States Workshop, Rome, Italy, November 3-5, 2003, Berkeley, USA, May 2005*, Oxford, 1-8.
- Lostal, M. (2017) *International cultural heritage law in armed conflict: case-studies of Syria, Libya, Mali, the invasion of Iraq, and the Buddhas of Bamiyan*, Cambridge.
- Lostal, M and Cunliffe, E. (2016), 'Cultural heritage that heals: factoring in cultural heritage discourses in the Syrian peacebuilding process', *The Historic Environment: Policy and Practice* 7:2-3, 248-259.
- Matero, F. (2010), 'Making Archaeological Sites: Experience or Interpretation?', *CRM: The Journal of Heritage Stewardship* 7:2, 1-5.
- Mechtild, R. (2016), 'World Heritage Sites under threat by terrorists and UNESCO's response', in C. Cameron and M. Wilson (eds), *Verbal Proceedings from the Round Table 2016: "From Conservation to Reconstruction: How World Heritage is Changing Theory and Practice"*, Montréal, 29–35. Available at: [http://www.patrimoinebati.umontreal.ca/documents/2016\\_Proceedings\\_FINAL.pdf](http://www.patrimoinebati.umontreal.ca/documents/2016_Proceedings_FINAL.pdf) (accessed 16/03/18).

- Moshenska, G. (2015), ‘Curated Ruins and the Endurance of Conflict Heritage’, *Conservation and Management of Archaeological Sites* 17:1, 77-90.
- Mulliez, M., Jockey, P. and Vincitore, M. (2013), ‘Virtual Reconstruction and Experimental Attempt in Archaeology: The Massalian Treasury in Delphi’, *Digital Heritage International Congress* 1, 579-585.
- Munawar, N.A. (2017), ‘Reconstructing Cultural Heritage in Conflict Zones: Should Palmyra be Rebuilt?’, *EX NOVO Journal of Archaeology* 2, 33-48.
- Perring, D. and van der Linde, S. (2009), ‘The Politics and Practice of Archaeology in Conflict’, *Conservation and Management of Archaeological Sites* 11:3-4, 197-213.
- Pietroni, E. (2005), ‘3D Data Acquisition and 3D Modelling applied to Cultural Heritage: From Laser Scanner to Virtual Reality Applications’, in M. Forte (ed.), *The Reconstruction of Archaeological Landscapes through Digital Technologies: proceedings of the 2nd Italy-United States Workshop, Rome, Italy, November 3-5, 2003, Berkeley, USA, May 2005*, Oxford, 241-249.
- Popovac, M. (2006), ‘Reconstruction of the Old Bridge of Mostar’, *Acta Polytechnica* 46.2, 50-59.
- Potts, D.T. (1998), ‘The Gulf Arab states and their archaeology’, in L. Meskell (ed.), *Archaeology under fire: Nationalism, politics and heritage in the eastern Mediterranean and Middle East*, London, 189-199.
- Schnädelbach, K. (2010) *Topographia Palmyrena: Documents d’archéologie syrienne* 18, Damasucs.
- Seyrig, H., Amy, R. and Will, E. (1975) *Le temple de Bel à Palmyre: Bibliothèque archéologique et historique* 83, Paris.
- Smith, L. (2006), *Uses of Heritage*, London.
- Stanley-Price, N. (2009), ‘The Reconstruction of Ruins: Principles and Practice’, in A. Bracker and A. Richmond (eds), *Conservation: Principles, Dilemma and Uncomfortable Truths*, Amsterdam, 32-46.
- Stoneman, R. (1992), *Palmyra and Its Empire*, Michigan.
- Southern, P. (2008), *Empress Zenobia: Palmyra’s Rebel Queen*, London.
- Online Reports and Resources:
- ‘A 1,000 year history’, <http://www.frauenkirche-dresden.de/en/history/> (accessed 16/03/18).
- ‘American Schools of Oriental Research: About Asor’, <http://www.asor.org/about-asor/> (accessed 22/02/18).

- ‘Ancient Statue Damaged by ISIS Resurrected in Damascus’, <https://www.smithsonianmag.com/smart-news/ancient-statue-damaged-isis-resurrected-damascus-180965091/> (accessed 14/04/18).
- ‘BBC News (a): Islamic State Photos “Show Palmyra Temple Destruction”, <http://www.bbc.co.uk/news/world-middle-east-34051870> (accessed 16/12/2017).
- ‘BBC News (b): Museum of Lost Objects: Temple of Bel’, <http://www.bbc.co.uk/news/magazine-35688943> (accessed 18/12/2017).
- ‘BBC News (c): Palmyra’s Baalshamin Temple “blown up by IS”, <http://www.bbc.co.uk/news/world-middle-east-34036644> (accessed 22/02/18).
- ‘BBC News (d): Syria: IS destroy part of Palmyra’s Roman Theatre’, <http://www.bbc.co.uk/news/world-middle-east-38689131> (accessed 16/12/2017).
- Bond, S. (2016), ‘The Ethics of 3D-Printing Syria’s Cultural Heritage’. Accessible at: <https://www.forbes.com/sites/drsarahbond/2016/09/22/does-nycs-new-3d-printed-palmyra-arch-celebrate-syria-or-just-engage-in-digital-colonialism/> (accessed 03/04/18).
- ‘Bosnia and Herzegovina – Stari Most, Old Bridge of Mostar’, <http://whc.unesco.org/en/activities/349/> (accessed 17/03/18).
- ‘British Council: Preserving Syrian Heritage’, <https://www.britishcouncil.org/arts/culture-development/cultural-protection-fund/projects/preserving-syrian-heritage> (accessed 22/02/18).
- ‘Building a Future upon the Past’, <http://www.newpalmyra.org/> (accessed 22/02/18).
- ‘Business Insider: London replica of Arch of Triumph in Palmyra destroyed by ISIS’, <http://uk.businessinsider.com/london-replica-of-arch-of-triumph-in-palmyra-destroyed-by-isis-2016-4> (accessed 13/12/2017).
- ‘CBC News: How a 3D-printed piece of Palmyra landed in Toronto’, <http://www.cbc.ca/news/technology/3d-printed-tetrapylon-palmyra-syria-creative-commons-1.4090368> (accessed 22/02/18).
- ‘CNN: ISIS destroys Arch of Triumph in Syria’s Palmyra Ruins’, <https://edition.cnn.com/2015/10/05/middleeast/syria-isis-palmyra-arch-of-triumph/index.html> (accessed 22/02/18).
- ‘Director-General praises the people of Timbuktu for the reconstruction of the city’s mausoleums’, <http://whc.unesco.org/en/news/1324/> (accessed 17/03/18).
- Direktorate General of Antiquities and Museums (DGAM) (2017), ‘State Party Report on the State of Conservation of the Syrian Cultural Heritage Sites’, *Ministry of Culture: Damascus*, 1-35. Available at: <file:///C:/Users/s1423464/Downloads/7A%20-%20Syria%20-%20All%20sites%2020170119%20public.pdf> (accessed 20/02/18).

- Direktorate General of Antiquities and Museums (DGAM) (2018), ‘State Party Report on the State of Conservation of the Syrian Cultural Heritage Sites’, *Ministry of Culture*: Damascus, 1-22. Available at: <file:///C:/Users/s1423464/Downloads/7A%20-%20Syrian%20Arab%20Rep.%20-%20All%20sites%2020180122%20public.pdf> (accessed 22/03/18).
- ‘DGAM: Urgent Mission for Damage Assessment in Palmyra Museum’, <http://www.dgam.gov.sy/index.php?p=314&id=1971> (accessed 22/02/18).
- ‘Dresden Frauenkirche’, <https://www.atlasobscura.com/places/dresden-frauenkirche> (accessed 13/04/18).
- ‘EAMENA: Endangered Archaeology in the Middle East and North Africa’, <http://eamena.arch.ox.ac.uk/> (accessed 22/02/18).
- ‘Emergency Safeguarding of the Syrian Cultural Heritage Project’, <https://en.unesco.org/syrian-observatory/emergency-safeguarding-syrian-cultural-heritage-project> (accessed 22/02/18).
- ‘IB Times: Palmyra: Ancient UNESCO World Heritage Site in Danger of Being Destroyed by ISIS’, <http://www.ibtimes.co.uk/palmyra-ancient-unesco-world-heritage-site-danger-being-destroyed-by-isis-pictures-1502233> (accessed 16/12/2017).
- ICOMOS (1964), ‘The Venice Charter: International Charter for the Conservation and Restoration of Monuments and Sites’. Available at: [http://www.icomos.org/charters/venice\\_e.pdf](http://www.icomos.org/charters/venice_e.pdf) (accessed 04/04/18).
- ICOMOS (1994), ‘Nara Document on Authenticity’. Available at: <http://www.icomos.org/en/179-articles-en-francais/ressources/charters-and-standards/386-the-nara-document-on-authenticity-1994> (accessed 04/04/18).
- ‘Iconem (a): The Antiquities Museum of Palmyra’, <http://iconem.com/museumpalmyra/> (accessed 22/02/18).
- ‘Iconem (b): Temple of Bel’, <http://iconem.com/palmyra/#prettyPhoto> (accessed 18/12/2017).
- ‘Institute of Digital Archaeology: Building the Arch’, <http://digitalarchaeology.org.uk/building-the-arch/> (accessed 14/03/18).
- Japan ICOMOS (2014), ‘Nara+20: On Heritage Practices, Cultural Values, and the Concept of Authenticity.’ Available at: [http://www.japan-icomos.org/pdf/nara20\\_final\\_eng.pdf](http://www.japan-icomos.org/pdf/nara20_final_eng.pdf) (accessed 04/04/18).
- ‘NPR: Replicas of Artefacts Destroyed by ISIS ‘Rising from Destruction’ in Rome’, <https://www.npr.org/sections/parallels/2016/10/10/497350345/monuments-and-artifacts-destroyed-by-isis-rising-from-destruction-in-rome> (accessed 15/12/2017).

‘Old Bridge Area of the Old City of Mostar’, <http://whc.unesco.org/en/list/946> (accessed 17/03/18).

‘Perpetuity: Palmyra is a Vital VR Project to Preserve Syrian Culture’, <https://uploadvr.com/perpetuity-palmyra-vital-vr-project-preserve-syrian-culture/> (accessed 11/04/18).

‘Revival: Technological Support for Syrian Heritage’, <http://syrianheritagerevival.org/> (accessed 22/02/18).

‘Shirīn International: Protecting Syria Heritage’, <http://shirin-international.org/> (accessed 22/02/18).

‘Sketchfab (a): Arch of Triumph in Palmyra by Arc/k Project’, <https://sketchfab.com/models/38315a821d0342a5a1189a7144f18b25> (accessed 13/12/2017).

‘Sketchfab (b): Lion by Iconem’, <https://sketchfab.com/models/e284789e9ce44201b772b90ab00b52a8> (accessed 13/12/2017).

‘Sketchfab (c): Palmyra Theatre Before/After by Iconem’, <https://sketchfab.com/models/b13746f5ff72444ea1d3747d5bdd9011> (accessed 16/12/2017).

‘Sketchfab (d): Tetrapylon Of Palmyra (Before/After)’, <https://sketchfab.com/models/c17bc13761904764a7ab21e8d02b75f5?ref=related> (accessed 11/04/18).

‘Sketchfab (e): Temple of Baalshamin by #NEWPALMYRA’, <https://sketchfab.com/models/0c428b9c67254b50b2415a66042ec1ac> (accessed 16/12/2017).

‘Syrian Heritage Archive Project: Arachne’, <https://arachne.dainst.org/project/syrher> (accessed 22/02/18).

‘Temple of Bel’, [https://commons.wikimedia.org/wiki/File:Temple\\_of\\_Bel.JPG](https://commons.wikimedia.org/wiki/File:Temple_of_Bel.JPG) (accessed 18/12/2017).

‘The Arc/k Project: Perpetuity Palmyra’, <http://the-arkives.org/> (accessed 22/02/18).

‘The first stage in the rehabilitation of cultural heritage of Timbuktu (Mali is complete)’, <http://www.unesco.org/new/en/media-services/in-focus-articles/the-first-stage-in-the-rehabilitation-of-cultural-heritage-of-timbuktu-mali-is-complete/> (accessed 17/03/18).

‘The Guardian (a): Bull of Nimrud destroyed by Isis to be recreated in Rome’, <https://www.theguardian.com/world/2016/oct/06/bull-nimrud-destroyed-isis-recreated-rome-colosseum> (accessed 18/12/2017).

- ‘The Guardian (b): Palmyra’s Arch of Triumph recreated in Trafalgar Square’, <https://www.theguardian.com/culture/2016/apr/19/palmyras-triumphal-arch-recreated-in-trafalgar-square> (accessed 22/02/18).
- ‘The Guardian (c): Restoring Syria’s Pearl of the Desert: A reason for optimism amid the storm of terror’, <https://www.theguardian.com/commentisfree/2016/mar/26/palmyra-syria-isis-maamoun-abdelkarim> (accessed 22/02/18).
- ‘The Million Image Database: Introducing 3D’, <https://www.millionimage.org.uk/introducing-3d/> (accessed 14/03/18).
- ‘The New York Times (a): Archaeological Victims of ISIS Rise Again, as Replicas in Rome’, <https://www.nytimes.com/2016/10/07/world/europe/rome-artifact-reconstruction-isis.html> (accessed 11/12/17).
- ‘The New York Times (b): Damaged by War, Syria’s Cultural Sites Rise Anew in France’, <https://www.nytimes.com/2016/12/31/world/europe/destroyed-by-isis-syrias-cultural-sites-rise-again-in-france.html> (accessed 18/12/2017).
- ‘The Reconstruction of the Frauenkirche: the Return of Dresden’s landmark’, <http://www.frauenkirche-dresden.de/en/reconstruction/> (accessed 16/03/18).
- ‘The Telegraph (a): Palmyra’s Arch of Triumph recreated in London’s Trafalgar Square, in pictures’, <http://www.telegraph.co.uk/news/2016/03/27/first-pictures-from-inside-the-recaptured-city-of-palmyra/> (accessed 13/12/2017).
- ‘The Telegraph (b): Stone Sculptures Smashed by Isil in ancient city of Palmyra restored to former glory by Italian experts’, <http://www.telegraph.co.uk/news/2017/02/16/stone-sculptures-smashed-isil-ancient-city-palmyra-restored/> (accessed 13/12/2017).
- ‘UNESCO and European Union undertake to reconstruct the cultural heritage of Timbuktu’, <https://en.unesco.org/news/unesco-and-european-union-undertake-reconstruct-cultural-heritage-timbuktu> (accessed 17/03/18).
- ‘UNESCO Executive Board 199<sup>th</sup> Session: Item 28 of the Agenda’. Available at: <http://unesdoc.unesco.org/images/0024/002443/244379e.pdf> (accessed 22/02/18).
- ‘UNESCO: Restoration completed on Lion of Al-lāt statue from ancient city of Palmyra, damaged by ISIL’, <https://en.unesco.org/news/restoration-completed-lion-al-lat-statue-ancient-city-palmyra-damaged-isil> (accessed 13/12/2017).
- ‘World Heritage Centre: Conservation completed on Lion of Al-lāt statue from ancient city of Palmyra, damaged by ISIL’, <http://whc.unesco.org/en/news/1727> (accessed 22/02/18).
- World Heritage Centre (2016), ‘Report of the UNESCO Rapid Assessment Mission to the World Heritage “Site of Palmyra”’, Paris, 1-33. Available at: <http://whc.unesco.org/en/documents/142423> (accessed 22/02/18).

World Heritage Committee (2008), ‘32<sup>nd</sup> Session: Mission Report on the Old Bridge Area of the Old City of Mostar’, *Québec*, 1-28. Available at: <http://whc.unesco.org/document/100757> (accessed 17/03/18).

World Heritage Committee (2012), ‘Operational Guidelines for the Implementation of World Heritage Convention: Intergovernmental Committee for the Protection of the World Cultural and Natural Heritage’. Available at: <https://whc.unesco.org/archive/opguide12-en.pdf> (accessed 10/04/18).

World Heritage Committee (2013), ‘Convention Concerning the Protection of the World Cultural and Natural Heritage: 37<sup>th</sup> Session, Item 7A of the Provisional Agenda’, *Phnom Penh*, 1-96. Available at: <http://whc.unesco.org/archive/2013/whc13-37com-7A-Add-en.pdf> (accessed 17/03/18).

World Heritage Committee (2014), ‘Convention Concerning the Protection of the World Cultural and Natural Heritage: Decisions adopted by the World Heritage Committee at its 38th Session’, *Doha*, 1-274. Available at: <https://whc.unesco.org/archive/2014/whc14-38com-16en.pdf> (accessed 17/03/18).

World Heritage Committee (2016), ‘Report of the Decisions adopted during the 40<sup>th</sup> session of the World Heritage Committee’, *Istanbul*, 1-271. Available at: <http://whc.unesco.org/archive/2016/whc16-40com-19-en.pdf> (accessed 22/02/18).

World Heritage Committee (2017), ‘Report of the Decisions adopted during the 41<sup>st</sup> Session of the World Heritage Committee’, *Krakow*, 1-290. Available at: <http://whc.unesco.org/archive/2017/whc17-41com-18-en.pdf> (accessed 17/03/18).

‘#NEWPALMYRA (a): Temple of Baalshamin’, <http://www.newpalmyra.org/models/temple-of-baal-shamin/> (accessed 16/12/2017).

‘#NEWPALMYRA (b): Tetrapylon’, <http://www.newpalmyra.org/models/tetrapylon/> (accessed 12/12/2017).