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THE VIRTUAL ILLÉS INITIATIVE

Remediating architectures of information within a 3D real-time visualisation of 19th-century Jerusalem

Maryvelma Smith O'Neil and Andrew Yip

Introduction

The Virtual Illés Initiative is a transdisciplinary digital heritage project that develops a high-fidelity, three-dimensional (3D) virtual replica of a relief of Jerusalem known as the *Illés Relief* (see Figure 11.1). The Relief is a rare 19th-century topographical and architectural model of Jerusalem notable for its geospatial accuracy (with some exceptions), its recording of non-extant parts of the city, and its extraordinary reception by international public audiences when it was exhibited in a European tour that included the Ottoman Pavilion of the 1873 Vienna World's Fair (Smith O'Neil 2020).

Following in the footsteps of traditions, established in the 19th century, of employing spectacular technologies of vision to bring the holy city of Jerusalem to Western viewers, our investigative methods derive from presenting the virtual replica as a contextually augmented immersive environment on a variety of interactive platforms.[1] These range from a single-user PC application to stereoscopic cinema projections for museum installations. The interactive augmentations of the digital replica extends Illés' vision by broadening its object life as a cartographic and documentary artefact. These augmentations primarily take the form of a spatially mapped and annotated archive of documentary materials – images, textual records, maps, and 3D models – that communicate the spatial, temporal, and cultural history of late-Ottoman Jerusalem and its environs, using the physical features of the original model to inspire new research in social, economic, cultural history, architecture and urban planning. The hotspots have been selected with a view to comprehensiveness in terms of typology, such as synagogues, churches, mosques, hospices, baths, markets, and cemeteries. Thus far, over 100 historic monuments have been documented

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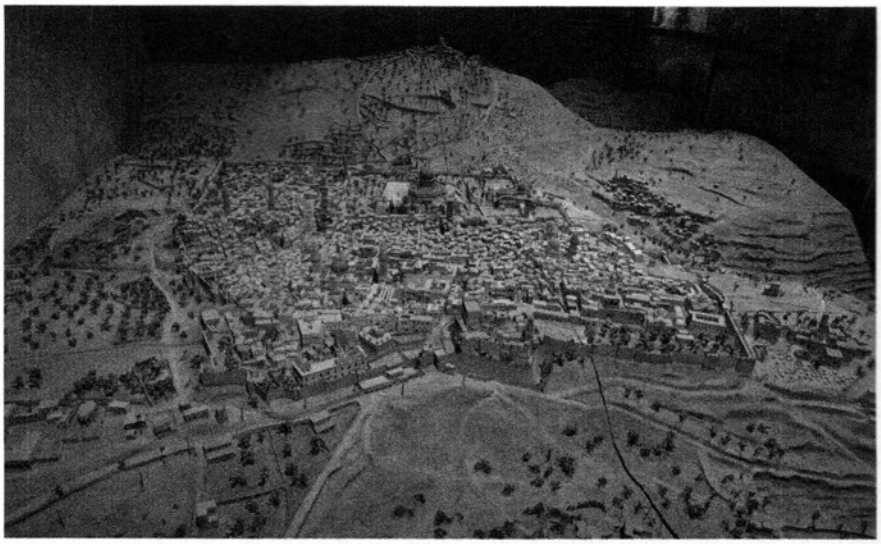

FIGURE 11.1 *Illés Relief*, 1873.

Image: Sani Zugthayer.

using the Dublin Core Metadata Element Set (DCMES). Nineteenth-century photographs have been prioritised to obtain visual consonance with the date of the relief. By extension, they also bring the living heritage of contemporary Jerusalem into purview by visualising what was lost in subsequent changes to the built environment of the Old City as well as the spatial transformation of the landscape. An interactive, multimodal database open to contribution from researchers and citizen historians is the major tool used for this purpose.

In this chapter we, firstly, trace how the original *Illés Relief* model was produced through a process called 'remediation' (Bolter and Grusin 2000). Bolter and Grusin's concept of remediation expresses the process for how 'new media' emerge as a 'refashioning of an actor-network' that involves a broad set of actors (Herman 2023) and can include both 'old' and 'new' media. Using historical documentation, we explain how the historical model emerged through a network of (human and nonhuman) actors that included a Hungarian bookbinder turned model-maker, three German documentarians, sites of historical importance, cultural and religious beliefs, surveys, maps, inscriptions, military intelligence, Protestant pastors, Gustave Moynier (a co-founder of the International Committee for Relief to the Wounded, which became the International Committee of the Red Cross after 1876), the citizens of the Republic and Canton of Geneva, and Roger Dafflon, mayor of Geneva in 1984, who expressed the desire of the Administrative Council that, due to its "scientific, historical and religious value," the relief would be returned from its permanent loan to the Tower of David Museum in Jerusalem in a few years.[2]

Secondly, we explain the process of reproducing it today. The Relief's current-day remediation allows for a close inspection of how such processes bring together new sets of actors that allow for cultural knowledge to be recreated, recontextualised, and also re-mobilised in a number of ways: in providing public access to heritage objects in the face of geopolitical complexities; in designing modular information architectures portable across digital platforms; and in using digital methods to extend the legacy of material objects.

This raises some important questions which we consider herein: What social, cultural and political knowledge is reproduced in the processes of remediating the model and how/where/to whom is it remobilised? This question becomes particularly urgent given geopolitical sensitivities around Jerusalem. We also consider how virtual and immersive experiential tools allow us to better understand the original, make sense of its material translation into virtual space, and reconfigure the modes of spectatorship and knowledge mobilisation that Illés intended. For example, while the original *Virtual Illés* allowed for 3D mobile spectatorship, virtual technologies allow for not only new types of 'spectator mobility' but also 'knowledge mobility' whereby spectators become users and users become contributors. We conclude by making a case for the use of immersive technologies as scholarly resources, given their potential for gaining new historical and cultural insights, and consider the challenges of sustainability and of working with (digital and material) objects that have social, cultural, historical, as well as current geopolitical sensitivities.

3D modelling Jerusalem in the late-Ottoman era: An early 'remediation' story

Stefan Illés (b. 1839), a Hungarian bookbinder turned model-maker, resided in Jerusalem from 1864 to 1880 (Rubin 2007; Mack and Balint 2019). Historians have explained that during these years he crafted the homonymous model with the help of two assistants. By contrast to conventional two-dimensional cartography, the *Illés Relief* – measuring approximately 4.5 × 5m (15 × 16 feet), built at a scale of 1:500, was fabricated in 3D. Thousands of zinc sheets were melted, cut, shaped, soldered, glued, and painted. To facilitate transport and display, they were placed on eight topographic units mounted on individual wooden frames that had been covered with plaster of Paris. The model offered a comprehensive aerial view of the mediaeval Islamic city of Jerusalem, located on the southern spur of a plateau, surrounded by mountains and deep valleys. It represented Jerusalem from the Mount of Olives (which is almost unconstructed except for the Church of the Ascension) in the east and the Russian Compound in the West; from the spring of Ein-Rogel in the southeast to Damascus Gate in the north. Two gates (Herod's and New Gate) had yet to be built. The ancient Palestinian village of Silwan is represented, as is the nearly

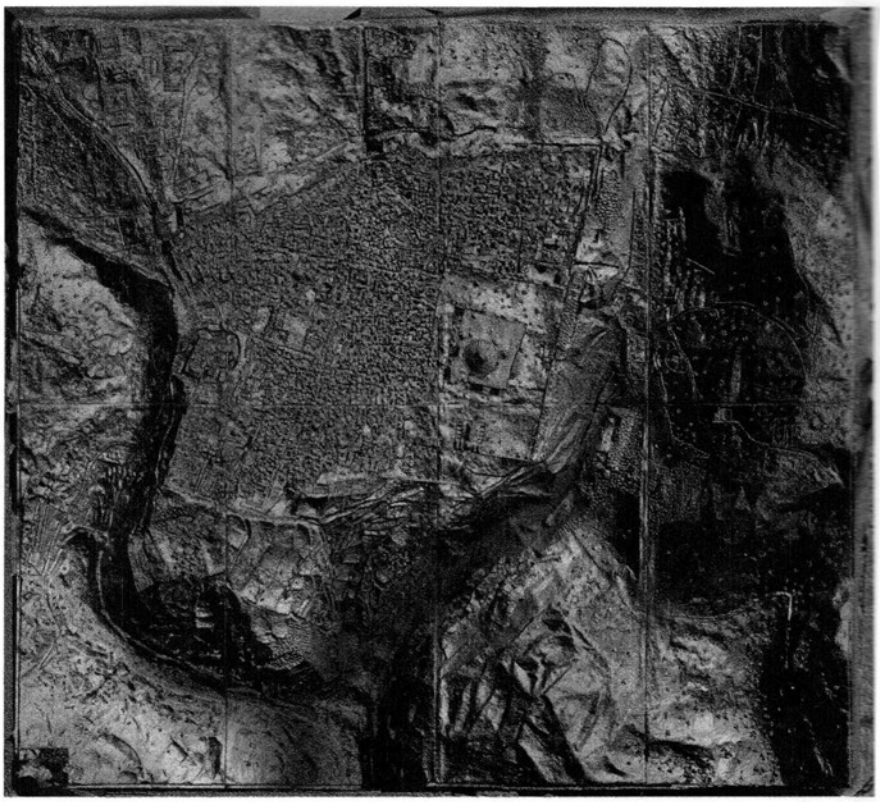

FIGURE 11.2 Illés Depth Elevation.

Image: Factum Foundation for © ARCH Jerusalem.

800-year-old Mughrabi Quarter that was razed in 1967 (Figure 11.2) (Lemire 2013).

While historical writers have indicated that the *Illés Relief* was created with the help of two assistants, the knowledge of Jerusalem it represented was the result of a plethora of actors and sources of information that shaped its particular topographical dimensions and cultural representations. Illés was well-acquainted with the coterie of foreigners who had arrived in Jerusalem during the second half of the 19th century to explore, survey, and document Palestine: amateur biblical archaeologists, missionaries, cartographers, and model-makers (Yehoshua 1975, 1979). Only French diplomat and archaeologist, Charles-Jean Melchior de Vogüé (1829–1916), had formal training. However, others transformed themselves into specialists on the ground. By dint of hard work and immense curiosity they acquired deep knowledge of local archaeology, the topography of Jerusalem, and the histories of architecture. Among the most significant were Dr Conrad Schick (1822–1901), German missionary,

archaeologist, carpenter, and model-maker, who settled permanently in Jerusalem in 1846 (Al-Jubeh 2016) until his death in 1901, and Dr Titus Tobler (1806–1877), the 'Father of German Exploration in Palestine,' who mapped Jerusalem in 1858 (Van de Velde 1858). Dr Carl Sandreczki (1810–1892), an Arabic-speaking German missionary, is barely known. He was a researcher in Jerusalem for two decades (1851–1872). In 1865, he undertook a highly original toponymy of the city that we will digitally map. (Goren 2002; Wallach 2020).

Central to the investigations of all three German documentarians was the *Ordnance Survey of Jerusalem* published by British Royal Engineer Charles Wilson. The first 'scientific mapping' of Jerusalem was undertaken during a ten-month sojourn in 1864–1865 (Wilson and Warren 1871; Moore 1909). Wilson been delegated to head the team to survey the city's cisterns, with the ostensible aim of improving sanitary conditions, chiefly the 'inferior quality of the water,' which caused serious and recurrent public health problems (Wilson and Warren 1871, 2). However, in reality the Secretary of War was the official patron, which indicates that the *Ordnance Survey* was a vehicle of military intelligence, the logic of which would establish British imperial hegemony in Palestine (Moscrop 2000).

Wilson's survey of Jerusalem (scale 1:2,500) displayed, documented, and presented the natural topographic contour lines, surface area, and built environment within the Ottoman walls that measured less than one square kilometre (Wilson and James 1865). He indicated four quarters (Jewish, Armenian, Christian, and Muslim) but within them represented in detail numerous interpenetrating neighbourhoods, or *harats* (sing. *hara*, an Arabic term that serves for neighbourhood, street, or lane).

Illés used the *Ordnance Survey* as his base map. He documented both the urban development underway within the Ottoman walls and the expansion outside that began shortly after the mid-19th century. Amongst notable monuments recorded are the large Latin and Greek patriarchates near Jaffa and New Gates, Sheikh Jarrah, Mishkenot Sha'anim, the first modern Jewish quarter, the sprawling Russian Compound, Bishop Grabar's School on Mount Zion, assorted missionary institutions, and Arab residences.

Many of these landmarks reflected European nations' use of 'soft power' to gain influence over the legacy of the Ottoman Empire. They purchased land and established churches, consulates, monasteries, pilgrim hostels, schools, as well as health and charitable institutions for the local populace. Imported architectural styles were introduced, and Jerusalem was sprinkled with an eclectic array of historical revival styles.

Illés cleverly colour-coded the model to signal these differences. He painted the ancient Jerusalem limestone structures a tawny brown, in contrast to the straw-yellow modern buildings. He highlighted in white the new roads for wheeled vehicles that led outside the Ottoman walls through an abundance of

olive groves. He rendered roofs of important churches in red and metal domes of mosques in black. He took pains to include symbols of modernity: new consular flags, glass windows, and telegraph poles recently installed outside Jaffa Gate (in 1865) (Figure 11.3).

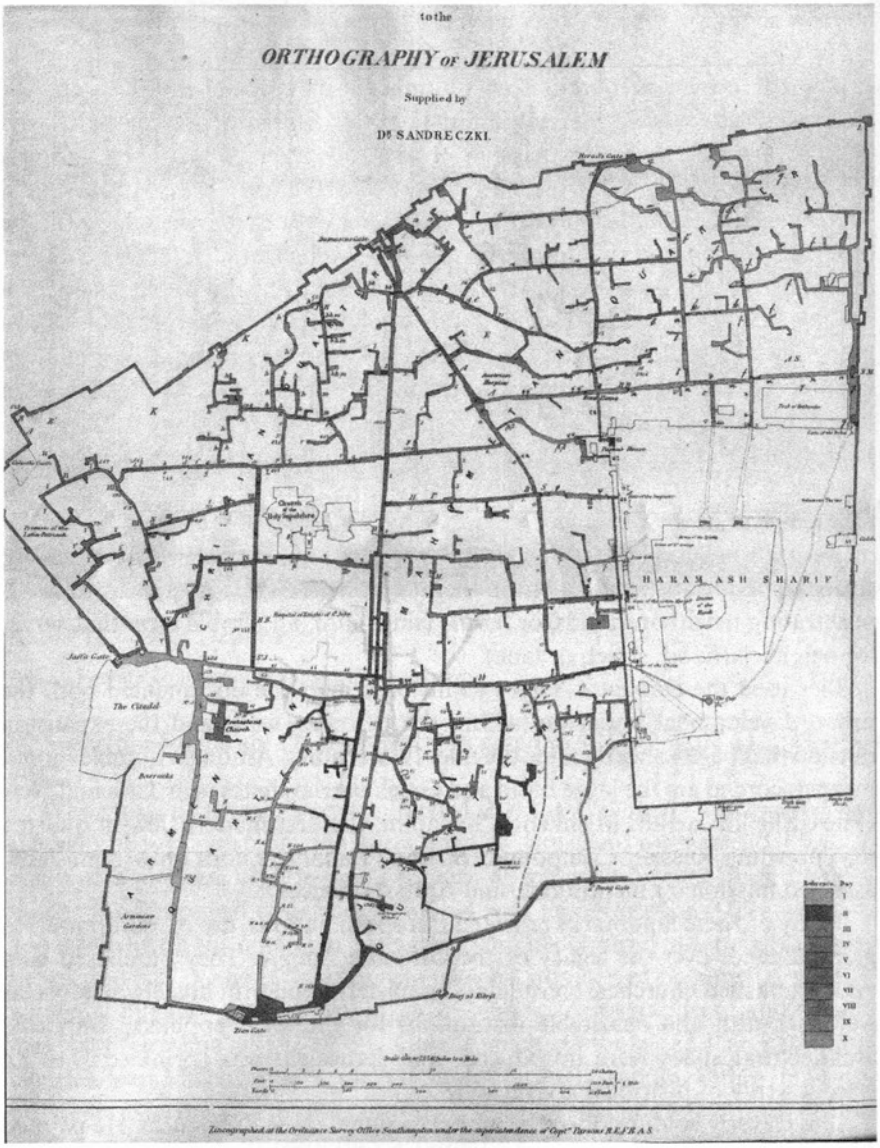

FIGURE 11.3 Carl Sandreczki, *Index to the Orthography of Jerusalem.*

Image: École biblique et archéologique française de Jérusalem.

Wilson's survey was also the foundational document for Sandreczki's toponym investigation. During a ten-day tour in April and May of 1865, he explored the Old City "together with Mr. Ohly, Chancellor of the Prussian Consulate, accompanied by a Native of Jerusalem, Mr. Yakub as Saaly" (np). A colour-coded map of the itinerary that appears on the first page is followed by the 13-page manuscript composed in English with copious Arabic marginal notes made by a learned sheikh at Al-Aqsa (Wilson 1865). Sandreczki's record of these Arabic toponyms – names of streets, buildings, pools, squares, monuments, cul-de-sacs, Arabic inscriptions – was dedicated to Captain Charles Wilson "in order assist him in his arduous and highly interesting undertaking" (np). As noted above, Wilson profited from his presentation of the complex toponymy of Jerusalem with its mosaic of *harats* (neighbourhoods). Sandreczki later published a lengthier version of his Index to the Orthography of Jerusalem in German. (Sandreczki 1882).

Sandreczki also adhered to the general division of Jerusalem into four religious quarters that may have originated with the map made by military surveyors, Aldrich and Symonds, in 1840–1841 (Teller 2022) and was set in stone by Wilson (np). However, in order to be 'free of all influence' (np), as he firmly stated in a concluding comment, he had chosen a veteran Palestinian Jerusalemite as guide and included numerous marginalia, often translated into English. In so doing, he conveyed the deeply rooted Middle Eastern understanding of urban topography in terms of landmarks, localities, and social constructions, rather than named streets (Wallach 2020). For example, when the group explored the consular area on the eighth day, they paused at

> Ḥosh [open courtyard] Bakir or Ḥosh Bezbezé (which means a vehement propulsion - and the sputtering of water, when it comes forth from the ground all of a sudden). The eastern extremity of the alley borders the backside of the Church of the Flagellation, or of the Dar or Deïr al Ḥabs, i.e., the House (or the Convent) of the Prison, as the Natives called it.
>
> *(Sandreczki, 1865, np)*

Sandreczki, who had travelled from Mosul through Kurdistan to Urumia in 1857, clearly recognised that Jerusalem did not follow the typology of a typical Muslim city, as its symbolic spiritual centre – the Noble Sanctuary (Haram Ash Sharif) – that predated its Islamic conquest, was not located in the city centre (Sandreczki 1857; Kark 1981). The flat, elevated, trapezium platform topographically and spatially dominates the city. Its approximately 150,000 square metres constitutes one-sixth of it and contains extraordinary mediaeval monuments. The Ottomans sponsored major renovations to the upper terrace of the Noble Sanctuary as well as the revetting of the Dome of the Rock with large polychrome ceramic tiles and mosaic inscriptions. (St Laurent 2017).

Illés' model reflects the paramount spiritual and political significance of the Dome of the Rock by increasing its size.

The first significant public audience for Illés' model was at the 1873 Vienna World's Fair. The Austrian Consul in Jerusalem proposed that Conrad Schick and Stefan Illés submit small models to demonstrate their skills for display in the Ottoman Pavilion, which, as the largest non-European space, conveyed a desired diplomatic and economic rapprochement between historic imperial rivals – the Hapsburgs and the Ottomans (Fulco 2017).

The director of the Ottoman Commission, İbrahim Edhem Pasha, then minister of trade and public works, oversaw the compilation of the *Usul-I Mimari-I Osmani* ('The Fundamentals of Ottoman Architecture'), a compendium of essays, technical drawings, and analyses of Ottoman architectural forms that was not only a landmark in architectural history, but has continued to exert influence in debates about Turkish national styles (Roberts and Williams 2021; Ersoy 2016). Published in the Vienna exhibition's Palace of Industry, it may also have been made available to visitors of the Ottoman Pavilion alongside its major attractions: a 1:1 scale replica of the Fountain of Ahmed III, a contemporary Turkish house, a two-story Turkish bazar with commercial vendors, and a Turkish coffee house, and, of course, the miniature Jerusalem models of Schick and Illés.

The Ottomans aimed to display soft power in the face of Western hegemony at a time of severe economic crisis: a relative, if not absolute, stagnation, of the Ottoman economy during the 'Great Depression' of 1873–1896 (Pamuk 1984). Jerusalem was a semi-autonomous Ottoman province in Palestine with special administrative status (Büssow 2011, 2014; Lemire et al. 2014), and the Ottoman stamp was visible in all walks of life, especially in the modernisation underway. Local Palestinians served in the Ottoman administration; they built railway infrastructure and European edifices and generally found employment. They imported and exported products via train and steamship; they sent petitions to Istanbul via telegraph; they attended schools built by Christian missionaries, established by local religious communities of long standing. Others were funded by endowments by benefactors who were not locals, but for whom Jerusalem had great religious significance. Michael Dumper describes this "international network of allies and supporters that has evolved through and is maintained by pilgrimage and educational activities" (Dumper 2002, 9). The inclusion of the Illés Relief in the Ottoman Pavilion was meant to display the Holy City to the Western world as well-governed, protective of the rights of diverse religious communities, welcoming to foreign consulates and commerce, and engaged in expansion and modernisation. This was important messaging for Ottoman Sultan Abdülaziz, whose presence at the 1867 Paris Exposition was intended "to convince European powers of their commitment to modernization and hence their desire to become part of the European system" (Çelik 1992, 36).

Approximately 7.3 million visitors viewed Ottoman Jerusalem in Vienna (Zschokke 1874). It is clear that Illés designed his model with public spectacle in mind – to use physical immersion to entrance and delight audiences. In fact, Illés was, himself, immersed as a spectator of his own model. He made a bird's eye drawing from a perch in the exhibition hall (see Figure 11.4); it shows a rare "oblique, southwest perspective of the city" that was subsequently engraved and published as a print with a legend (Rubin 2007, 1).

Illés was certainly aware of the spectacular technologies of vision that had earlier been used to bring the holy city to Western viewers in New York, London, Edinburgh, and Paris (Wharton 2006). Pierre Prevost's Panorama of Jerusalem, exhibited in Paris in 1819, enthralled the prominent American expatriate, Harriet Preble, "It is truly a rare invention that causes you thus to contemplate, as in a dream, those cities of ancient and illustrious memory; which enables you to meditate among their ruins, and to travel, as it were, without moving!" (Lee 1856, 62). The detailed panorama of Jerusalem created by Frederick Catherwood (1799–1854), English architect, artist, and explorer and Robert Burford, an English panorama painter, was first exhibited in London's Leicester Square in 1835 (see Figure 11.5). The panorama then had a highly successful run in New York (1838–1842), where it was displayed in a specially

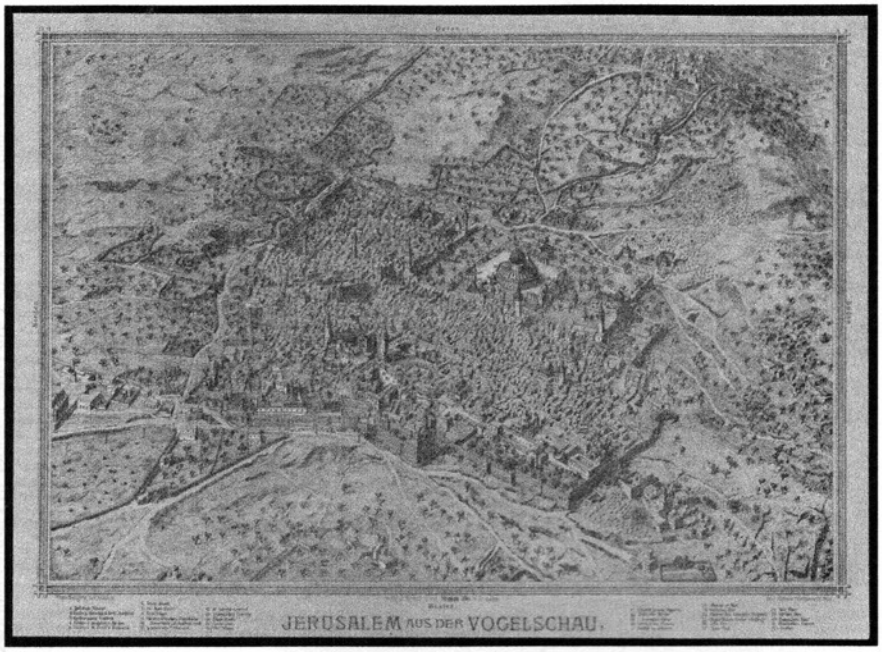

FIGURE 11.4 Stephan Illés, *Jerusalem aus der Vogelschau.*

Image: National Library of Israel, Eran Laor Cartographic Collection.

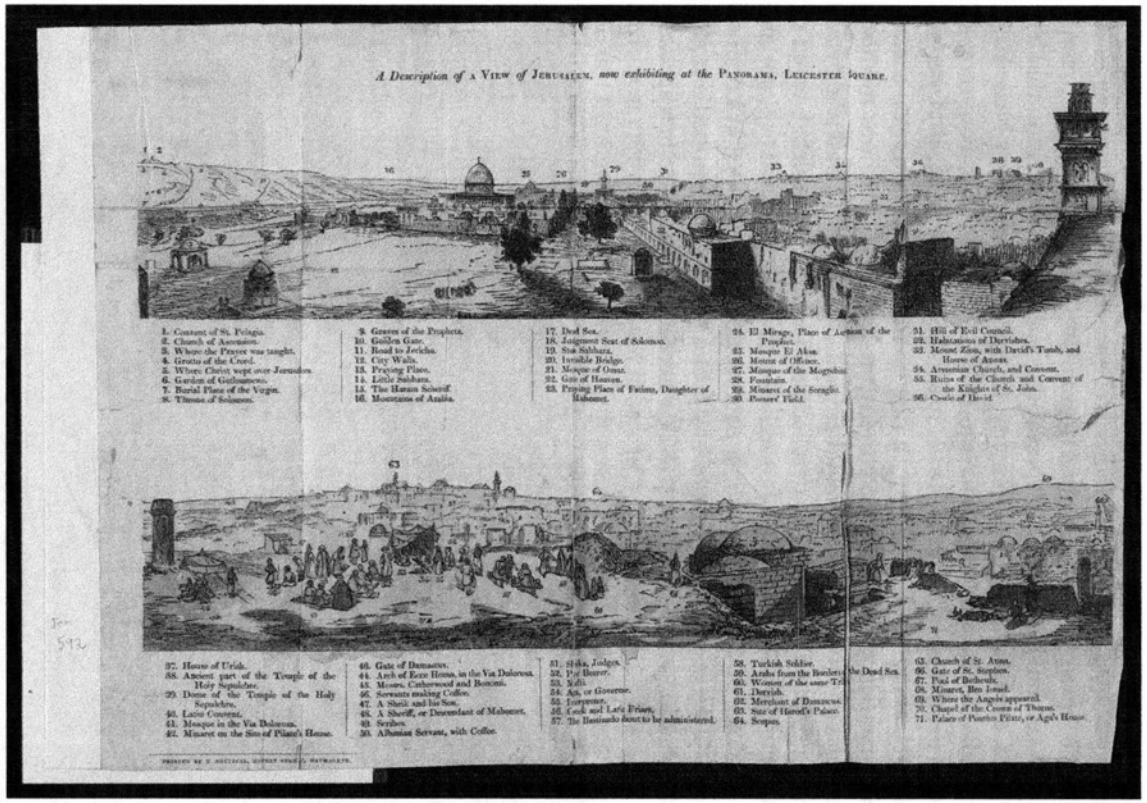

FIGURE 11.5 A Description of a View of Jerusalem, Now Exhibiting at the Panorama, Leicester Square. Printed by T. Brettell, 1835.

Image: National Library of Israel, Eran Laor Cartographic Collection.

designed and built rotonda on Broadway. The booklet sold to viewers contained a schematic print in the form of a folded leaf of plates with a legend identifying 71 major sites.

By contrast, Illés encouraged a type of 'mobile spectatorship' by representing sites using the 3D model. Buildings have heights, volumes, and roof shapes that can be visually apprehended; mounts can be visually climbed, and valleys explored. It invited visitors to bend down and survey the silhouette of the city from any vantage point.

In the booklet printed in Basel (1878) for the Swiss tour of the Illés Relief, Illés distinguished his work:

> The topographic relief of Jerusalem is the only one that faithfully gives a precise and detailed representation of Jerusalem and its surroundings; other works of this type have the major shortcoming of not having been created with the artist's eye, and consequently cannot give an exact and detailed representation of Jerusalem and its environs as it is today.
>
> *(Translation from French, Illés 1878)*[3]

Viewers in London, Munich, Cologne, and Switzerland flocked like pilgrims to marvel at the miniaturisation of the Holy City. The relief received a particularly enthusiastic reception in Switzerland, which had a strong tradition of terrain models, notably the Dufour Map of 1864. After the federal constitution of 1848 that established the Swiss federal state, reliefs had become a popular way to inspire patriotism – uniting the country's ethnicities, religions, and language groups.

The relief was exhibited in Zurich, Luzern, Basel, and Neuchâtel. Pastor Félix Bouvet, a distinguished Swiss professor of theology, educator, and bibliophile at the University of Neuchâtel, was deeply moved. He wrote on 14 February 1878: "We do not believe it an exaggeration to state that – given the religious and poetic emotions [elicited] . . . the spectacle of this relief replaces a journey to Jerusalem" (Littman 1986).

On 26 October 1878, the model was purchased for biblical instruction in Geneva by public subscription for the sum of 9,500 Swiss francs (about 250,000 CHF / C today). For 40 years (1879–1919), it was displayed two days a week in the Calvin Library run by the Maison de la Réformation SA, a private evangelical association in the centre of Geneva that had assumed its legal ownership. After 1920, exhibition space became a problem, and it was moved to several venues. In 1984, it was permanently loaned to the Museum of the Tower of David in Jerusalem, where it remains today.

Extending Illés' 3D vision: A case for scholarly resources

Despite the geopolitics surrounding the Relief, Illés' initial vision was public and educative. We extend these two aims of the practice of virtual heritage

visualisation on the sesquicentenary of the *Illés Relief*'s exhibition. The knowledge of Jerusalem that Illés preserved has increased in value tremendously in the intervening years due to changes to the city between then and now. Since 1873, Jerusalem has been damaged by natural disasters, divided by war (1948/1967), scarred by the destruction of cultural heritage (Lemire 2013), diminished by closure of Palestinian cultural and intellectual societies, deliberately placed in 'development limbo,' cut off from an ecological, economic, and social relationship with surrounding villages, fragilised by ideological archaeology (Galor 2017), significantly altered in character by illegal expansion and military occupation, weaponised by urban planning and monetised by a for-profit, Disneyesque tourist destination. Since 1982, the 'Old City of Jerusalem and its Walls' have been inscribed on UNESCO's List of World Heritage in Danger. By contrast, Illés' model shows the historic landscape around the Ottoman walls which was just being developed, and which is now under intense development pressure to build new settlements. The model thus provides us with rare data to evaluate these modern changes.

The *Illés Relief* is inaccessible to viewers unable to travel to Jerusalem, which includes most Palestinians, who are not able to gain permits. Their freedom of access is dependent upon the recognition of their sovereignty

> in all areas east of the 1949 Armistice Lines and de facto borders that existed in 1967 and that Israeli sovereignty will be recognized on the western side of those lines, subject to mutual territorial exchanges, equal in size and value.
>
> *(Dumper 2014, 223)*

Until such a comprehensive agreement takes place, the creation of digital resources for Palestinians, which will also serve researchers and the general public, is critical to providing meaningful access to cultural knowledge.

Despite this, like the real world, access to the metaverse is unevenly distributed between institutions and audiences. Practitioners in digital cultural heritage continue to face challenges of communication and collaboration. As Champion and Rahaman (2019) argue, digital heritage resources are dogged by problems of access. High-quality digital heritage models, where they exist, are rarely seen in contexts beyond specialist conferences and publications. They may have a single use for a researcher, may lack a platform for public interaction, not be shareable, or be afflicted by application obsolescence. These and other factors lead them to conclude that there are "serious problems in the field of digital heritage as a sustainable scholarly activity" (Champion and Rahaman 2019, 3). That is because, they argue, 3D models should not be understood only as end products in and of themselves, but as pedagogical building blocks for multiple uses and users.

There is a real need to improve the promotion and adoption of 3D objects as scholarly resources. In a survey of 3D heritage platforms, Champion and

Rahaman (2020) also identified a number of structural shortcomings in data repositories as well as a lack of consistency in tools and interactive methods. While some projects may be hosted on commercial platforms such as Sketchfab, or built into web browsers on institutional sites, which allow for public access, few platforms provide for annotation, cross-application use, or meaningful user play and exploration. In the case of the standard format of online 3D browsers that limit user navigation to rotation and zoom, they identify a total lack of spatial immersion, which frustrates users' expectations of interacting with virtual environments. They suggest a baseline of useful interactive affordances for virtual heritage repository systems, which include the following: the ability to rotate and shift views in real time; integrating intuitive human experiences of meaning-making by allowing 'pedestrian level' model navigation and interaction; and allowing typological annotations. Other desirable features are noted: a focus on intuitive graphical user interfaces (GUIs); dynamic camera rotation; clickable labels and the linking of datasets; and dynamic lighting; maps. Comparative and analytical tools are also valuable, such as the ability to measure the physical dimensions of models, dynamic timelines, and the ability to embed applications (Champion and Rahaman 2019).

Enabling accessible and mobile digital heritage extends beyond the initial capture and analysis of research data. Virtual projects are also artefacts themselves with an object life that incorporates their physical hardware as well as software distribution. It continues with their archiving and digital conservation, providing for format obsolescence and future emulation. This discipline context informs our design of *The Virtual Illés Initiative* as an evolving, publicly accessible digital resource. To begin with, in 2019 the Alliance to Restore Cultural Heritage (ARCH) Jerusalem commissioned the Factum Foundation to conduct a photogrammetric survey of the *Illés Relief*. A total of 215GB of photographs were compiled into an ultra-high-resolution 3D model, 12K texture map, and extensive orthographic aerial photograph, which form the basis for our visualisation (see Figure 11.6).

Spatial simulation and navigation through the digital replica allow for a re-examination of what is currently known about the original model. The most readily addressable questions are those of engineering scale. Although Illés acknowledged his debt to Schick (Goren and Rubin 1996), their models are scaled differently by a factor of 10, with Schick's set at 1:50 and Illés at 1:500. Precise measurements of the Dome of the Rock and other monuments in the Illes' Relief, made possible from the photogrammetric data, enables us to determine if the scale of some buildings was exaggerated, a starting point for researching why. 3D first-person perspective navigation of the model allows for the analysis of vertical features such as towers, plateau, and hills that dominated the skyline in a city with great topographical variance.

Expanding to cultural analyses, the digital model provides a baseline for the reconstruction of the ecological, social, and economic relationships of

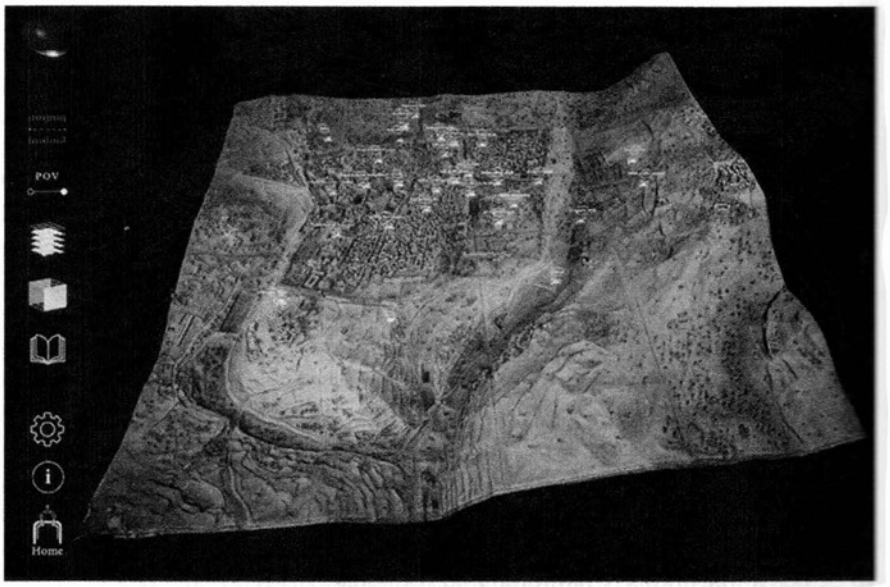

FIGURE 11.6 Screenshot of the Virtual Illés Initiative.

Image: Andrew Yip.

late-Ottoman Jerusalem with its surrounding villages and comparative analysis with alterations to the built environment since 1873. This opens the potential for experimental network analyses. The monumental task of creating the relief demanded space and money for zinc sheets, wood, and other materials – patterns of production and patronage that could be visualised. So too can social and collective domains be mapped – Carl Sandreczki's 1865 tour in particular provides a beginning point for tracing human movement through 28 interpenetrating *harats* and a model for visualising demographic and spatial patterns that can be extrapolated from textual sources to reveal how Jerusalemites of all backgrounds interacted within the city and shaped its social spaces during the late-Ottoman era.

Exploring these ideas relies on the implementation of a modular and sustainable platform. *The Virtual Illés Initiative's* method uses the physical properties of Illés' model as an information architecture framework for presenting spatial and temporal data, compiled from a multimedia database.

Architectures and typologies of virtual heritage simulations: Remediating Illés' Relief into the digital

The remediation of the *Illés Relief* into the virtual brings together networks of 'old' technologies (e.g. maps and surveys), as well as 'new' technologies (e.g.

interactive tools, data repositories, and engines), along with a host of other actors. Unity 3D – an industry-standard engine designed for cross-platform flexibility – was used to create a real-time visualisation of the *Illés Relief* that extends the general viewing experience that Illés intended. The principal form of augmentation is spatially located hotspots, located at sites of cultural significance, that link to archival materials. The initial source for selecting relevant contemporaneous sites, as well as determining their historic naming conventions, was Wilson's *Ordnance Survey*. One hundred sites were selected from categories including major religious monuments, consulates, schools, barracks, excavations, gates, and gardens. Streets, *harats*, markets, cemeteries, watch houses, cisterns, wells, pools, and villages were also included. Texts were written for each site contextualising their use and significance during the period; these were vetted by a consultative body of ten research advisers from institutions across Europe, the Middle East, and America. Some texts were vetted but certainly not all, especially since the list of hotspots grew over time and the advent/continuation of war dampened enthusiasm for participation. Each site was then populated with 19th-century images sourced archives with open-access permissions.

While European cartography provides the starting point for augmentation, recovering the spatial and temporal history of late-Ottoman Jerusalem requires further research into wider sources, including Ottoman governance and local leadership, census data, Shari'a Court documents, the impact of socio-economic and geopolitical processes on the built environment, foreign commerce and trade, the pilgrim industry, pious endowments, guilds, community centres, crime control, transport, medical care, shops, storerooms, architectural renovations, markets, courts, schools, hammams, fountains, coffee houses, hospices, workshops, festivals, weddings and funerals, recreational centres, as well as liminal spaces such as gates, cisterns, stepped ascents and descents, cul-de-sacs, and viewpoints. The ability to expand content over time was a core concern of the design of the information architecture.

A suite of interactive tools was developed to facilitate multiple pathways for exploration, the design of which was informed by discipline needs including those documented by Champion and Rahaman (2020). They include the following:

Interactable hotspots: spatially located hotspots link to the archival database.

Realtime lighting and time of day simulation: an interactive sun tool allows users to light the environment and archival 3D models.

Interactive multimedia: video, image, and 3D materials can be inspected in 3D space.

Measurement: a comparative measurement tool allows users to measure 3D objects at natural scale, and map objects at world scale.

Dynamic camera system: the virtual camera allows full 3D control and adapts to user context. When zoomed out, its rotation function orbits the digital replica. When zoomed closer to ground level, it adjusts to mimic natural gaze mechanics.

First-person navigation: a 'street view' mode allows users to navigate the terrain on foot using keyboard and mouse controls.

Contemporary GIS overlays: a 3D model of contemporary Jerusalem has been correlated with Illés model to provide spatial context.

Intuitive GUI: an icon-based GUI provides access to tools and archival materials. A real-time aerial mini-map illustrates user location and visual focus.

Typological archive: an architectural typology allows users to sort visualised hotspot by type.

The use of video game engines to construct virtual data spaces offers advantages over more traditional database methods – such as table-based relational catalogues – due to their object-oriented programming frameworks, as they allow data to be embedded with interactive methods that can be called in real time. *The Virtual Illés Initiative* makes use of this framework to create a state-based information architecture that allows knowledge to be nested in structures that are meaningful to the interpretation of a site over time. For example, a dynamic timeline tool allows archival materials including textual records and images to be embedded within modular hierarchies that can be located geographically, sorted by theme, by the city's archaeological phases, as well as by the specific context of any particular cultural site. Within this framework, the use of scriptable objects allow interactive features such as hotspots to be further nested within individual archival assets that may already be included in a list structure, which allows for the deep annotation and linking of assets. For example, the hotspot for the Dome of the Rock loads a separate 3D architectural model that itself is annotated with more detailed archival hotspot locations that present photographs and drawings consistent with the visualisation's current state. This information architecture uses scriptable objects to define its taxonomies allowing for the creation of faceted schemes.

Developing this framework in Unity 3D allows for cross-platform publication, increasing the range of contexts in which the project can be experienced. Version 1.0 of the Virtual Illés Initiative was published in 2023 as a free PC application (with a MacOS version to follow) delivered on the Steam software distribution client.[4] Using a client distribution model allows periodic updates to content and capabilities to be automatically 'pushed' to users, extending the application's currency and useability. Importantly, the application integrates the High-End Visualisation System, engineered at the University of New South Wales' Expanded Perception and Interaction Centre, which allows 3D applications to be configured for clustered, stereoscopic projection systems such as

immersive cylinders and geodesic domes used in museum displays; a large-scale, flatscreen stereoscopic projection of the Initiative has already been trialed. The high quality of the initial 3D scan of the *Illés Relief* also opens it to physical reconstruction. The original data has been post-processed to produce a miniature, high-detail, stereolithographic resin print. It is possible to reproduce small sections of the original model at 1:1 scale for future physical analysis.

Spectator mobility and new networks of knowledge

It is important to consider where *The Virtual Illés Initiative* fits into the typology of historical simulations. The affordances of virtual systems to enable non-linear exploration and meaning-making are rapidly gaining academic application in fields such as archaeogaming, which considers the use of video games for historical reconstructions, the use of archaeological methods to analyse virtual artefacts, and the role of the player in enacting pop-cultural conceptions of the work of the archaeologist (Reinhardt 2018).

The ideas of role-play and enactment are central to how knowledge is experienced in virtual platforms and can take various forms. Chapman (2016) proposes two pillars that define approaches to historicism in gameplay-based scenarios: whether the user is placed in a position of historical witnessing or enabled to understand the past through higher level contexts – a realist versus conceptual epistemological split. *The Virtual Illés Initiative* occupies an intermediate space. There are some reconstructionist elements in transliterating the viewing modes of Illés' original into digital perspectives. However, the interactive aesthetics are ludic and constructivist – users interact with the object through curiosity-driven approaches, accessing contextual material in a non-linear order. In this, it joins more recent forms of heritage visualisation that take history as a 'play space,' which demands a more dialogical than top-down exchange between cultural place and viewer/user.

However, the provision of meaningful exchange within digital platforms is not a fait accompli. As Ross (2009) has argued in the case of interactive, augmented reality art forms, the presence of automated interaction alone is not sufficient to locate spectators at a particular site or within a community of participants. We should not assume in any case that any act of cultural spectatorship is passive by nature, to be suddenly made active by mere platform mobility.

Where then does this locate our spectators, and *when* does it locate them? In 1873, Illés' Relief took a vision of Jerusalem to the world. Its knowledge was made mobile through extraordinary political intervention from the Austrian Consul in Jerusalem and then the Ottoman government. By dint of great efforts, it created its own network of audiences and engagements from Jerusalem across Europe. The situation today is markedly different, with the

Relief's location in Jerusalem functionally excluding access to it for a significant population of Palestinians to whom it bears cultural significance. The very act of mapping Jerusalem, the occupied Palestinian territory, or Israel are contested political actions with implications for Palestinian and Israeli borders. In this regard, access to knowledge is fought over unequal terrain; Quiquivix (2014) has documented efforts by Palestinian refugees to remap unacknowledged or erased sites of Palestinian heritage onto Google Earth maps via grassroots participation. These are acts of counter-cartography that maintain cultural claims in the face of the dominant borders of nation states. Clearly, there is great political power in making these layers of knowledge globally visible.

Conclusion: Digital sustainability, mobile spectators, and future directions

Our act of digital remediation is also an act of spatial and temporal repositioning. Not only does it bring the Relief to new audiences in their own settings and with their own sets of readings, but it allows for a particular mobility of knowledge by which interpretive contributions from such users can enrich and sustain its layered meanings. Central to the continuity of knowledge mobilisation through spectator participation is the sustainability of the virtual model. UNESCO's Charter on the Preservation of Digital Heritage (2023) defines the practice of sustainability in virtual heritage to include the sharing of resources, the dissemination of knowledge, and the training of scholars and participants in the production and use of digital resources. These concerns naturally lead to questions about the legacy of digital projects, but this case raises concerns beyond the initiative itself: How do digital tools not only further the field but also help in the preservation and sustenance of real-world sites? The digital framework of *The Virtual Illés Initiative* described above has been designed to meet the first two criteria. The third, the training of participants in digital methodologies, is of particular importance considering the cultural context of the *Illés Relief* and is the focus of the next stage of the project.

Since its inception in 2019, the Initiative has been conceived to incorporate crowdsourced content from researchers and citizen scientists of all cultural backgrounds – thus, the platform allows for mobile spectatorship as well as two-way knowledge mobilisation whereby spectators can also contribute to the knowledge base about and for the virtual Relief. It was envisaged that an international team of Ottomanists, Jerusalemite historians, sociologists, economists, local NGOs, students, members of ethnic communities, the Palestinian diaspora, and others would contribute multivocal content that represented the diverse cultural experiences of the Old City extending the scope of the project from 19th-century Ottoman Jerusalem to the present.

The public launch of *The Virtual Illés Initiative* website in 2023 included a call for contributions, and scholars, students, and community representatives were invited to contribute academic research and multimedia content.[5] Content submitted via the website, including shoe box archives (documents, photos, drawings, and memorabilia), and audiovisual data is vetted by certain parameters and then curated and managed by a research associate. This has so far resulted in a network of contacts in academia and public institutions who have lent their various expertise on content, cultural representation, and the development of public programmes in Jerusalem. Crucial steps towards building a new global network of contributors were made when Maryvelma Smith O'Neil presented early aspects of the Initiative at the annual colloquium of Humanistica, the Francophone association for digital humanities in Geneva, held in 2022 in Geneva. O'Neil later unveiled the Initiative at Dar Al-Kalima University (Bethlehem) and at the Institut des Cultures Arabes et Méditerranées (ICAM) in Geneva (2023).

Through these conduits a hands-on professional development workshop was scheduled with the intention of engaging Jerusalemite university students in digital fieldwork and data processing to take an active part in the research as citizen scientists. This programme, developed by Andrew Yip from successful trials with secondary and tertiary students during three seasons of fieldwork on the archaeological site Glac in Serbia, includes skills training in digital tools for geospatial mapping, 3D modelling, photogrammetry, and data visualisation.[6] Unfortunately, the outbreak of the Israel-Hamas war on the 7th of October 2023 diverted attention to more urgent matters.

Any inclusion of public participants raises questions about the ethics of participatory practice in digital heritage projects and the steps necessary to maintain a level of ecumenicalism in historical voicing. These factors include being cognisant of complex community relationships, negotiating power imbalances between the academy and public, as well as mediating community concerns in the case of contested histories (Richardson 2018). In the current case, the military occupation of Jerusalem and its consequences present major challenges to overcome in practical and professional terms. These are but the most immediately visible challenges to wider public engagement. *The Virtual Illés Initiative* must adapt to meet challenges more familiar to the field of public digital archaeology in which community sourcing raises specific concerns about ensuring the privacy of records, freedom from digital surveillance and online abuse (Ess 2009). The Initiative has taken account of some of these factors: contributions are vetted and can be anonymised, its database is protected by a virtual private network, distribution of the application is via secure client, online comments are moderated by the publishers, changes to the interactive application cannot be made directly by users, and configuring for institutional exhibition must be done by the project team. These accommodations are becoming standard considerations for creating the digital heritage

platforms that are the 21st-century descendants of Illés' initial vision of a transportable, educative, and entrancing visualisation of one of the grandest products of humankind.

Notes

1 A note on terminology: in this chapter, we use the term 'virtual' to refer to our digital 3D reconstruction of the *Illés Relief* irrespective of the XR hardware platform on which it is exhibited. Likewise, we use the term 'immersive' primarily to refer to the use of 3D, navigational, and interactive techniques that encourage user experimentation rather than as a reference to deployment of the application in VR or in the large format cinemas for which it is also configured.
2 Bibliothèque de l'Universite de Genève, 17, 1984–1994. 1994/14/19. "In view of the scientific, historical and religious value of the Jerusalem Relief, acquired at the time thanks to a public subscription, the Administrative Council very much hopes that this work can be returned to the Geneva community in a few years' time, according to terms to be determined at the appropriate time." Translated from French.
3 Original text in French: "Cette topographie en relief de Jérusalem est la seule qui rende fidèlement les lieux qu'elle représente; les autres œuvres de ce type ont le défaut essentiel de ne pas avoir été réalisées sous les yeux de l'artiste, et ne peuvent donc pas donner une représentation exacte de Jérusalem et de ses environs dans tous leurs détails" (Illés 1878).
4 A free copy of the *Virtual Illés Initiative* can be downloaded from the Steam Store, via https://store.steampowered.com (accessed 3 May 2024).
5 Details of The Virtual Illés Initiative can be found on its homepage at https://virtual-illes.org (accessed 3 May 2024).
6 An overview of the Glac Project can be found at https://glac-project.sydney.edu.au/ (accessed 3 May 2024).

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