GRANULAR REALISM / Ontology And Counter-Dominant Practices of Spatial Photography

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Declaration of Authorship

I **Ariel Caine** hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly stated.

Signed: Date: 30.04.2019

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ABSTRACT

New forms of computational 3D imaging have given rise to a new photographic condition—one in which the flat image is replaced by an omni-directional spatial data constellation, and in which viewing is defined by immersive navigation. The 'spatial photograph', as I term it, does not flatten reality onto a chemical grain emulsion surface or a plane of discrete pixels, rather, in this highly computational environment, physical surface is transcoded onto a mirrored digital terrain of spatially distributed, discrete coordinate points.

'Spatial Photography' comes to contest both the ocular perspectival gaze of monarchic land ownership and control as well as the Cartesian flat abstraction of the map with its view from nowhere (or from a satellite). Fusing survey and perspectival imaging, optical media has gradually technologically developed to incorporate a multiplicity of images and sources, that are both perspectival and projective, communal, situated and multiple. While primarily developed by states, military and industry, permeating and restructuring them from the inside, it simultaneously opens new spaces for civic-led counter practices.

Situated predominantly within the geo-political context of Israel, my homeland, I follow the changing role of the photographic as it is implicated within the larger ethno-political conflict, manifesting through a spatial entanglement of volume, control, opacity and vision.

Constructed in an intertwined manner between a research project and an artists practice, through two dedicated projects, one in East Jerusalem (Silwan and City of David), the other in the Naqab Desert (Unrecognised Bedouin village of al-Araqib), this thesis offers a counter-dominant spatial photographic practice, reframed within new epistemology. 'Spatial Photography' is not simply a changed mode of mechanical production but rather, a vehicle for the creation of relation between different people and machinic systems, taking, analysing and producing spaces, that together add up to a socio-techno-political community of practice.

Chapter 1

INTRODUCTION / FROM GRAIN TO PIXEL TO POINT CLOUD

Sovereignty and its control were historically exercised by two different and seemingly incompatible forms of survey. On the one hand the perspectival, magisterial gaze observed and organised land from a single view point from which all order was derived. Such were the etchings and paintings of renaissance cities, the landscapes of American romanticism, the grand hand drawn panoramas or the perspectival photographs and drawings of the Commission des Monuments Historiques.[1] On the other, the Cartesian flat abstraction of the map, which arrived in its modern scientific form around the 18th century was devoid of any particular, single viewpoint. While the first organized power around the body or eye of the king, the second abstracted geography as a surface to be organised and explored through a ocular scanning process. While afterlife of the first is today manifested in the photographic perspective, the second has been popularised through the mosaics of orthorectified satellite images.

Fusing survey and perspectival imaging optical media has gradually technologically developed to incorporate a multiplicity of images and sources, that are both perspectival and projective, situated and multiple. Interactive platforms first signalled by the TerraVision[2] project and then popularised and proliferated through google earth and maps allow for a form of viewing that is navigational. The user could move between satellite images, located ground photographs and data points. Yet, a new form of spatial representation

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1 In 1851 the French Ministry of Culture began the Missions Héliographiques, a project designated with the aim of photographically documenting all landmarks and monuments around France so as to assist in their future restoration. This project was an expansion of the Monument historyique. See more: http://www.culture.gouv.fr/Thematiques/Monuments-historiques-Sites-patrimoniaux-remarquables/Actualites-Articles/Commission-des-monuments-historiques-Proces-verbaux-1848-1950. "Procès-Verbaux de La Commission Des Monuments Historiques de 1848 à 1950." Accessed March 21, 2019. http://elec.enc.sorbonne.fr/monumentshistoriques/index.html.

2 Sauter, Joachim. "Joachim Sauter - Work - Terravision | 1994." Accessed February 17, 2019. http://www.joachimsauter.com/en/work/terravision.html.

has also emerged – and it is the subject of this thesis – and that is the three dimensional, spatial photograph.

In order to arrive at a three dimensional photographic representation - such as in photogrammetry where algorithms fused together images from the ground and from the air into a navigational volumetric environment - Our optical imaging systems operate through mechanisms of volume and movement, they do not depict and abstract but rather grasp and cloak the form of both our environments and our bodies. The optical imaging mechanism, the photographic sensor tied to computational processes is able to create a common reality from multiple single perspectives. As such the photographic environment created is the product of multiple optical sources, each becoming an anchor and nodal point that helps locate the others, each perspective adds crucial information into an environmental whole.

This, the thesis claims, is compatible with the way I think about knowledge production today. Rather than positivist objectivity (as the view from nowhere) or subjecting position of power, the creation of knowledge is articulated by the meshing together of multiple situated points of view, formed as an open ended dynamic constellation.

Today we inhabit a photographic reality that is spatial and navigational. We live inside the image space but still need to understand the social and political implications. What this thesis claims for is that spatial photography and its practices needs to be reframed within social political and epistemological sets of relations. It is not simply a changed mode of mechanical production but must be a vehicle for the creation of relation between different people and machinic systems, taking and analysing images, producing spaces, that together add up to a socio-political community of practice.

Following photography's shift from grain to pixel to point cloud there is a need to contend with its changed ontological state and an inherent paradox of its condition.
In a material sense, a section of the medium appears to have gradually shifted from a homogenous set of chemically based sensitised grains, becoming discrete image sensors, and then transforming into a spatial, nodal-based, cloud-like constellation. However, a theoretical account of this change and its possible implications has yet to be written. As a form of transcoded record and index, photography has followed a trajectory of increasing accuracy, moving up the scale of similitude to its source reality. It proceeded from attempts to render an accurate visual resemblance in its early nineteenth-century beginnings to producing an ever-closer simulacrum, arriving at the present, where it transcodes volume at the sub-micron level, geotagged and timestamped in the point-cloud optical scan. The paradox, however, lies in the fact that while the photographic apparatus has become increasingly situated within time and space, linked to other systems and situations around it by means of live computation and algorithmic responses, the place of the photographer

and that of the (human and non-human) subjects in the image have gradually undergone a process of displacement.

The photographic age we are entering contains the input of space at increasing levels of accuracy and detail, rebuilding it for the body and the gaze, while simultaneously causing the disappearance of the point of origin. Wandering within virtual space, the process of navigation within and around the virtual environment diminishes or possibly even neutralises the weight of the originary viewpoint; it produces a place that turns the photographer into a diasporic figure within the space he or she has created.[3] In order to address this paradox of the self-absconding photographer, one of the tasks at hand is to find a way to push the limits of computational and algorithmic spatial photographic production without losing sight of its human-technological lineage: in other words, to fully reinstate and ethically resituate the photographer deep within the virtual space from which they are exiled.

This thesis therefore presents an investigation into what I term the 'spatial photograph': that is, an emergent form of three-dimensional photographic processes and assemblages that constitutes not an image but a navigable, architectural environment. I propose that this form should be considered as a new ontological condition within photography as its materiality has shifted from grain to pixel to the point cloud, inaugurating a transformation at both the material and conceptual level that has fundamentally changed most of the aspects of the medium as we have grown to know them since its emergence in 1839.

On Different Assemblages Of Visuality

Following in the footsteps of many of my photographic teachers, Sharon Yaari, Yossi Breger, as well as more distant yet important influences such as Lewis Baltz and Bernd and Hilla Becher, I have become increasingly interested in the growing tension between what has been described as the 'seeable' and the 'knowable'. This research aims to continue and add to the debate by examining the different ways in which this tension has been translated and transformed by the new ecology of spatial imaging. More importantly, I argue not only for a new way of seeing and knowing, but also investigate what we can do through this new outlook, and how. Throughout my own practice as a photographer and artist, over the course of almost twenty years, the transitions from analogue to digital and then to computational photographic imaging have repeatedly elicited challenges to what photography is and to what it does. Debates continue to rage over the threshold at which a photograph becomes something other: a 3D model, a digital painting, a data set or a

3 Michel Foucault, 'Of Other Spaces: Utopias and Heterotopias', Architecture /Mouvement/ Continuité, (1967), 4: http://web.mit.edu/allanmc/www/foucault1.pdf.

fluid, networked entity.[4] And yet, as Daniel Rubinstein, Johnny Golding and Andy Fisher write in the introduction to their work, On the Verge of Photography, it seems increasingly evident that:

> *The digital-born image has become a hinge between these physical and digital modes of existence, combining as it does elements of familiar ocular-centric culture – with its trust and reliance on the true-to-life photograph – and algorithmic processes that problematise the presumption of an ontological connection between images and objects. (Rubinstein et al. 2017)*[5]

On 27 February 2005, University College Cork (UCC) in Ireland hosted a debate on the subject. The participants included some of the leading photo theorists of the day, who had gathered to discuss and potentially formulate and consolidate current notions of the photographic image. Yet, among all the detailed and erudite theoretical discussion, which also resulted in a transcript that formed a chapter in James Elkins' Photography Theory (2007),[6] only one mention was made of the point cloud. It appears as if the conversation reached a point of crisis, and after being unable to construct any alternative understanding to the configurations provided by the already familiar bibliographies of academic, scientific, technical or vernacular conceptualisations of photography, Elkins was forced to divert attention towards an exhibit of laser scans of ancient Irish stone inscriptions, imaged for preservation purposes. The users of this technology, he pronounces poetically, call these scans 'point clouds', not pictures or sculptures, and concludes, 'Now there is a way of talking about photography without any of the terms we have been exploring. But we should move on…'.[7] There has been a reticence to include scan and photogrammetry technologies in the theoretical thinking or imagination of photography despite these processes being photographic.

Digital photography is shaping different 'assemblages of visuality' from those of its photo-chemical predecessor,[8] becoming instead assemblages of 'surface-marking technologies', moving beyond the semiotic/indexical understanding of images and more towards what filmmaker and author Harun Farocki would come to call the 'operative'.[9] However, despite searching for a direct theorisation of point-cloud imaging, photogrammetry and the

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4 Daniel Rubinstein, Johnny Golding and Andy Fisher (eds.) On the Verge of Photography: Imaging beyond Representation, Birmingham, UK: ARTicle Press, 2013, p. 10

5 ibid p. 8

6 James Elkins, (ed.), Photography Theory (The Art Seminar 2), New York: Routledge, 2007.

7 Elkins, Photography Theory, p. 128.

8 Edgar Gómez Cruz, and Asko Lehmuskallio, (eds.), Digital Photography and Everyday Life: Empirical Studies on Material Visual Practices (Routledge Studies in European Communication Research and Education), London; New York: Routledge, 2016. pp. 2, 228.

9 "In my first work on this subject, Eye/Machine(2001), I called such pictures, made neither to entertain nor to inform, 'operative images.' These are images that do not represent an object, but rather are part of an operation." (Farocki, Harun. "Phantom Images." Public 0, no. 29 (January 1, 2004). Pg 17. https://public.journals.yorku.ca/index.php/public/article/view/30354.)

spatialised condition of photography, both before and during the writing of this thesis, it seems that these continue to be mentioned only as an afterthought, an epilogue, a flagging of something to note and develop later. I have yet to encounter a scholarly work that has attempted such a theory. From Jonathan Crary (2007)[10] to Joanna Zylinska (2017), many anthologies, books and papers have identified this connection between digital optical imaging and remote sensing in photography, yet none have tackled this condition head-on. For example, Zylinska, in her book, Nonhuman Photography, only mentions it in the concluding chapter. Examining visual data from lidar and photogrammetry, she writes:

> *[I]n addition to involving the capture of light reflected from various surfaces, this technology entails 3D modelling on the basis of the data acquired from the laser and the camera. Transcending the analog–digital binary in its mode of operation, the lidar survey at the same time raises an important question: are we still dealing with photography here, or have we perhaps arrived at something that could be termed post-photography? (Zylinska 2017)*[11]

The fusion of the optical and the computational into one increasingly intelligent semantic mechanism, capable not only of representation but also of automated analysis, as well as some predictive decision-making, has raised this combination of human and nonhuman to new levels of complexity. Although Zylinska does not develop her mention of this complex entanglement, she is right to repeat a concern first raised by Vilem Flusser (2013)[12] in his discussion on the technical image: that this is just a further instance where nonhuman visuality needs to become a human-centric responsibility.[13]

Fourteen years after the UCC debate, we have yet to see a serious attempt at conceptually defining the ontological distinction of the point cloud in the context of photographic theory and practice. I say this not out of a sentimental affinity to the medium, nor from any essentialist 'loyalty' to it; neither do I have a particular tendency towards the teleological when it comes to the demand for an ontological definition. The main reason for insisting that the articulation of the condition of the point cloud should also be made

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10 Crary positions the writing of his research into the historic construction of vision within a moment of radical change: 'The rapid development in little more than a decade of a vast array of computer graphics techniques is part of a sweeping reconfiguration of relations between an observing subject and modes of representation that effectively nullifies most of the culturally established meanings of the terms observer and representation […] Increasingly, these emergent technologies of image production are becoming the dominant models of visualization according to which primary social processes and institutions function. And, of course, they are intertwined with the needs of global information industries and with the expanding requirements of medical, military, and police hierarchies.' (Jonathan Crary, Techniques of the Observer: On Vision and Modernity in the Nineteenth Century. Repr. October Books. Cambridge, MA: MIT Press, 2007, pp. 1-2.)

11 Joanna Zylinska, Nonhuman Photography, Cambridge, Massachusetts: The MIT Press, 2017, p. 198.

12 'This lack of criticism of technical images is potentially dangerous at a time when technical images are in the process of displacing texts – dangerous for the reason that the "objectivity" of technical images is an illusion. For they are – like all images – not only symbolic but represent even more abstract complexes of symbols than traditional images. They are metacodes of texts which, as is yet to be shown, signify texts, not the world out there. The imagination that produces them involves the ability to transcode concepts from texts into images; when we observe them, we see concepts – encoded in a new way – of the world out there.' (Vilém Flusser, Towards a Philosophy of Photography, Reaktion Books, 2013, p. 15.)

13 Zylinska, Nonhuman Photography, p.195

in relation to photography stems from its shared deductive and indexical nature, and from the implications this has for its political mobilisation (a point I aim to demonstrate throughout this research).

However, while both photographic theory and the photo/art world have been slow to admit this photographic form, on the ground almost every other discipline that has previously had contact with photo-imaging has either incorporated 3D photographic practice or been completely transformed by it. As a method-based assemblage of practice and research, optical media has fused with multiple other tools and disciplines, be they surveying, geography, archaeology, forensics or medicine, forming new fields of engagement in which photo-imaging and 3D photo-imaging are deeply embedded. An overview of research papers and the homepages of software websites immediately reveals the ways in which computational volume imaging is transforming these various fields. Geospatial industries have enlisted the combined imaging and survey properties of Lidar[14] and photogrammetry, completely integrating scans into all stages of the workflow from preparatory site investigation, through progress assessment and use of 3D scanned terrain in future planning and simulation on the virtual site. Archaeology and cultural heritage projects worldwide have been replacing traditional 2D imaging with photogrammetry and scan data within their methodology, recording multiple stages and layers of the work on site. This methodology enables a highly accurate volumetric record of the material condition on-site, allowing for off-site examination and comparison between different stages of excavation and research. In Archaeology this method of record allows researchers to visually isolate specific strata across an entire site, making visible chronological relations between space and inhabitation across time. 3D scans of objects and artefacts are used in order to produce accurate profiles and section drawings much more nuanced then the manual drawing previously practiced. As I was shown in the computational archaeology labs at the Hebrew university these scanned objects (scanned through structured light methods) are then fed into a growing database of profiles which then, by means of Clustering using big data computational processes produce a Computerized Typology.[15]

A Practice Led Methodology of Research

As my research addresses the conflict in my homeland, Israel/Palestine, the reciprocal loop that exists there between the photographic construction of space and the changed spatial understanding of photographs has demanded a mixed methodology. I therefore

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14 Two main companies providing terrestrial Lidar scanners are Faro (Faro. "FARO Focus 3D Laser Scanner - FARO Technologies UK Ltd." Accessed March 28, 2019. https://www.faro.com/en-gb/products/construction-bim-cim/faro-focus/.) and Leica Geosystems (Leica. "Leica Geosystems | Laser Distance Measurer & Levels." Accessed March 28, 2019. https://lasers.leica-geosystems.com/).

15 Grosman, Leore, Avshalom Karasik, Ortal Harush, and Uzy Smilanksy. "ARCHAEOLOGY IN THREE DIMENSIONS: Computer-Based Methods in Archaeological Research." Journal of Eastern Mediterranean Archaeology and Heritage Studies 2, no. 1 (2014).

have chosen to undertake historical and conceptual research, looking at the place of photography in these particular spaces, while at the same time forming methods of photographic practice that would test these ideas in the real world. This practice-based research has meant exploring a new way of working with and through imaging, alongside the written thesis, testing its arguments to see what relations, alliances, interactions and reactions this practice creates, and how the methodology can insert itself into the system in which it aims to intervene.

When considering in what ways and in which locations photographic practice and theoretical research could be beneficial to each other, it became clear from early on that the research needed to operate in several spatial and temporal spheres, and incorporate multiple levels of authorship. The objective of articulating the constituents of a state of imaging meant that the theoretical arguments had to be tested on a range of different scales, from that of a single image to an entire expandable geography: for example, it was necessary to examine single archival images and various individual works as well as open, communal practices. In this way, the photographic projects developed during the research allowed the medium itself to reveal its properties.

The Western imaginary has continued to produce and be shaped by the co-constitutive relations between place and image. Photography has played a consistent role in the production of the political and ideological cognition of space.[16] With the advent of the spatial photographic technologies (such as aerial and terrestrial lidar scanners) that have become integral to engineering, architecture and military planning, the interconnection between terraforming and imaging has grown ever closer. We need to remain within the photographic if we wish to understand these political/ideological processes of terraforming and control.

The Jewish belief in the return to Palestine and the land of Israel has always existed somewhere between the paradigms of the city and the desert. It is not surprising therefore that opposing ideas of wandering and settlement, law and lawlessness, sovereignty and extraterritoriality, which underlie the whole matrix of Jewish belief, are also factored into its renewed understanding of space. Photography,[17] as a tool of representation as well as an instrument of record and survey, has been fundamental in this production of both image-space and physical space. Israel/Palestine could be viewed as a laboratory for the techno-political-ideological relationship between imaging and imagination, and as such, offers an ideal setting in which to test an emergent mode of the photographic.

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16 W. J. T. Mitchell (ed.), Landscape and Power, Chicago: University of Chicago Press, 2000.

17 This is especially the case with the new topographers such as Lewis Baltz and Bernd and Hilla Becher, along with the emergence of a whole field within Israeli contemporary art photography, which emerged in the late 1990s, as represented by Sharon Ya'ari, Yossi Breger and Yigal Shemtov, with whom I align much of my understanding of the way photography and photographers partake in the world.

For the purposes of the research, I have developed two separate projects (which are still ongoing) in two distinct locations: in one, Jerusalem, a city undergoing a form of spatial apartheid, I specifically look at the 'City of David' archaeological site at the heart of the Palestinian village of Silwan; in the other, I concentrate on a series of officially unrecognised and de-legitimised Bedouin villages in the Negev Desert (known as the Naqab Desert in Arabic), in the south of Israel. The first is a site of extreme vertical complexity, where surface is entangled with sanctity, while the second is a large expanse of flat desert where earth and photography create a form of palimpsest and in which surveying and remote imaging are used by the state authorities to undermine indigenous land rights.

By carefully developing each project in relation to its own current and historic political and ideological environment, it became clear that the structure of the research should reflect its methodology. Conceptually, I wanted to work between the city and the desert; methodologically, I looked for a way to test the current photo-political relations, to enter into and investigate the very photographic space I had created. Entering these photographic spaces meant engaging with other parties and, increasingly, working with many different collaborators – residents, activists and artists on the ground in each of the sites: Hagit Keysar,[18] a fellow artist, researcher and coordinator of PublicLab in Israel, who introduced me to 'kite photography'; Emek Shave,[19] an NGO comprising Israeli and Palestinian archaeologists who are resisting the nationalist appropriation of archaeology in the West Bank and Jerusalem; Zochrot,[20] an NGO dedicated to documenting and furthering the remembrance of the Nakba of 1948; the villagers of al-Araqib and Wadi al-Naam in the Negev; the Negev Coexistence Forum;[21] and the Council of the Unrecognised Bedouin Villages.

There is little point in describing photographic space if we cannot set foot in it; this thesis therefore is concerned with entering anew into specific current political and photographic spaces through the introduction of a new photographic space and its practice.

My first project looks at the site of the 'City of David' archaeological compound, south of old Jerusalem's city walls, the place of origin of the ancient city. Throughout its several millennia of existence and – more significantly for my research – since the 1867 British survey of the site, its geographic volume, steep geography, striated geology, underground tunnelling and networks of waterways have played an intrinsic role in the already charged, dense and increasingly violent and entangled conflict over ownership and sovereignty. Since early 1986, ELAD,[22] a Jewish nationalist NGO, has been operating, then managing

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18 Keysar, Hagit. "Hagit Keysar." Accessed March 28, 2019. https://cargocollective.com/hagitkeysar.

19 Emek Shave. "Emek Shaveh | Archeology in the Shadow of the Conflict." Accessed March 28, 2019. http://alt-arch.org/en/.

20 Zochrot. "Ground Truth: Records of Displacement, Return and Environmental Destruction in the Negev/Naqab Displacement, Return and Environmental Destruction in the Negev/Naqeb." Accessed March 28, 2019. https://zochrot.org/en/event/56254.

21 Dukium. "Dukium.Org - Negev Coexistence Forum for Civil Equality." Dukium.org. Accessed March 28, 2019. https://www.dukium.org/.

22 ELAD is an acronym for the Hebrew phrase 'El Ir David', meaning 'To the City of David.

the excavation and development of the site, directly linking the archaeological research, its imaging and its imagination to a messianic project for the Judaification of the Palestinian village of Silwan and the eastern part of Jerusalem.

Over the course of the past year, I have created a collated point cloud of the entire site, making use of original and aggregated materials – spanning the period from the 1890s to the present – generated by the various 'actors' operating in this location. Using this as a starting point, I argue that a (formerly impossible) optics of the multileveled entanglement of architecture and archaeology,[23] underground excavations and inhabitance, development and destruction can now be rendered visible. What is at stake here is not only the question of what can be seen and by whom, in a place where volume, mechanical objectivity and religious ideology are being used as a means of enforcing an oppressive opacity, but more importantly, the question of how to challenge the deepening connection between imaging, imagining and terraforming in the context of messianic colonisation.

An altogether different case, divorced from the urban context, is the illegalised Bedouin village of Al-Araqib (one of thirty-four other similarly illegalised Bedouin settlements) on the edge of the Negev Desert. Here, the DIY participatory production of aerial imagery and photo-based 3D mapping has become a mode of activism that reframes our understanding of aerial photography and surveying. Although sedentary in the area for over 200 years, the indigenous Bedouins of the Negev are considered 'squatters' by the Israeli state, which ever since its establishment has actively worked to dismantle their culture and heritage through (among other means) spatial displacement and the undermining of both their historic and current connection to the land. This project's aim has been to explore the questions surrounding the place of imaging and surveying in the long process of rendering opaque the loss of essential material data and the ongoing transformation of land that is the Bedouin's heritage.

In this project, which I undertook as a project coordinator at Forensic Architecture,[24] I aimed to explore the ways by which a new method of use for point cloud and Structure from Motion (SfM)[25], when networked into the currently separate field of GIS[26] and created through a long-term participatory process, can redefine the possibilities for visual-spatial activism. Forensic Architecture's collaboration with Public-Lab, Zochrot and local families in this large-scale, long-term project has created a method whereby

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23 One project which served as a reference point and inspiration for this perspective of a multileveled imaging of archaeology was that of Mary-Ann Ray. See Mary-Ann Ray, Seven Partly Underground Rooms and Buildings for Water, Ice and Midgets, New York: Princeton Architectural Press, 1997.

24 Forensic Architecture is an interdisciplinary, independent research agency based at Goldsmiths, University of London. I have been a member and project coordinator in the agency since mid 2016. See http://www.forensic-architecture.org

25 Structure from Motion (SFM) is a field within photogrammetry in which the process of spatial 3D reconstruction uses multiple planar images taken from varying positions in space. 3D form is gained through the motion of the camera through space by which it records different angles of a single scene.

26 GIS or 'geographic information system' is a framework for gathering, managing and analysing data as part of a system of cartography.

photogrammetry is used to assemble the aerial and ground views captured across multiple periods of time by 'civic satellites' (kites and balloons equipped with simple cameras) into spatial point-cloud constellations. A custom-built, online, 3D geographic information platform, Naqab.org, enables the interconnection of these geo-located environments with archival data and media sources. It also serves as a base layer for situated testimony, aggregated geotagged data, measurement and architectural planning in collaboration with and on behalf of the local Bedouin population with whom the project at large is being developed. This expandable, photo-based, participatory 3D geographic system serves as host for and derivative of historical and contemporary material remains, and offers the possibility to enhance the understanding of the overarching, ongoing story of the historical presence of the Bedouins in and their attempted displacement from the area.

Thesis Structure

The thesis is organised as follows: Chapter One opens with an introduction to the concept of the spatial photographic image, articulating the ways in which it differs from existing forms of imaging and why I argue that it constitutes a new ontological condition in photography. It then traces a brief genealogy of this volume image with the aim of bringing together the histories of photography and photographic surveying, pointing to an inherent propensity – and aspiration – in optical imaging towards becoming a volume entity. Lastly, the chapter aims to elucidate the relations and the distinctions between image spaces and the spatial image. In order to investigate the characteristics of the spatial image, the last section unpacks four studies, each conducted as a stereoscopic pair and converted through a process of photogrammetric reconstruction into a three-dimensional point cloud. The examination of each of these studies reveals some of the characteristics of this material transformation, as well as its affective and pictorial propensities.

Once a basic conception of the spatial image has been established, I then use the two subsequent chapters (Chapters Two and Three) to suggest new methodologies for a 'counter-practice' of spatial photographic imaging. Each chapter centres on a specific entanglement of image-topography-politics, and follows the development of a distinct project which forms a response or counter-spatial photographic practice. Chapter Two centres on the spatial image's ability to contend with volume. In the context of a project developed around the archaeological excavations in the village of Silwan, in east Jerusalem, where conflict is directly connected to vertical levels of archaeological strata as well as to land ownership that is occluded by disconnected lines of sight, I argue that spatial volume imaging can be used to make visible the hitherto opaque optics of the site. Meanwhile, Chapter Three, pertaining to the 'Ground Truth' project in the Negev Desert, centres on a project I coordinated and took part in developing as part of the Forensic Architecture

agency. Expanding on the methods of spatial photographic assembling that I learnt while developing the projects and building on the participatory, civic-led methods of photographic surveying I was exposed to while working with Hagit Keysar and PublicLab, this chapter will aim to develope the notion of a communal spatial photographic practice.

An apendix for each chapter, located after the conclusion, details the specific project's materials, media and artwork, as well as crediting its contributors.

My concluding chapter to the thesis, gives an account into the way these projects, through their understanding of volume, surveying and communality, have constructed a methodology that could be understood (in the pedagogical context) as a step towards defining a different mode of politically engaged photographic practice. As an artist, practice is not only the object of my research but also the vehicle for its conceptualisation. Simultaneously and inseparably, the projects serve as both a point of entry and a prism through which to engage directly in the political sphere.

Chapter 2

THE SPATIAL PHOTOGRAPH

Photography As Architectural Space

Emerging forms of computational photography, utilizing depth registering and extracting capabilities, are forging a distinct ontological condition within photography. It is a condition by which the photographic apparatus constitutes itself and functions as an environment. The 'spatial photograph', as I term it, does not flatten reality onto a chemical grain emulsion surface or a plane of discrete pixels, nor does it renege on its visual coherence in favour of its own constitution as data, cloud set or networked image; rather, in this highly computational environment, physical surface is transcoded onto a mirrored digital terrain of spatially distributed, discrete coordinates. A photographic point-cloud[1] creates a photographic topography, photography as architectural space.

This understanding of photography as an omni-directional, manoeuvrable environment is most clearly distilled in its current point-cloud form. While it maintains its photographic 'essence' – that is, the inscription of visual information through the registration of returning light from the physical world[2] – I would argue that nearly all the fundamental attributes of the apparatus have undergone a conceptual, technological and ideological transformation, calling for a redefinition of key terms and processes, and a realignment of their relations. Furthermore, the existing ways in which spatial photography operates in other fields have also been transformed, raising the question for civil society of what

1 A point cloud is a set of data points distributed in virtual 3D space. Point clouds are generally produced by 3D scanners or photogrammetric processes which measure a large number of points on the external surfaces of objects or environments around them. As the output of 3D scanning processes increasingly termed 'Reality Capturing', point clouds are used for many purposes, including to create 3D CAD models for manufactured, construction, survey and for a multitude of visualization, animation, rendering and mass customization applications.

2 This is my definition of what constitutes photographic media.

these new imaging capabilities might deliver in terms of new modes of practice and engagement.

There is a combined sense of dry data and other worldliness, a translucency and hyper reality in this granular realism. When we examine its thin surface layer (the thickness of a computational point), the solid coherence and continuity that we are accustomed to in the planar photograph[3] cannot be sustained, nor can the false perception of substance lying below the representational image. The point cloud follows the combined logic of the database and the narrative:[4] Its underlying structure may be that of the dataset, yet in its mode of acquisition and its need for navigation it is just as much a purveyor of narrative. Through its laser and Lidar origins, the point cloud is a record of its point-by-point process of haptic creation[5]: the first pulse of light leaves the emitter, hits the physical surface in front of it and returns to register a single, suspended x, y, z coordinate and its light intensity; millions of beams follow, systematically mapping all that is within range of the scanner – for every beam there is a digital point that is autonomous yet connected, time-stamped and geotagged. Due to its photogrammetric 'structure-from-motion' origins, the point cloud is a frozen record of the camera's sequential movement through space. The final cloud, though, exceeds the finite number of source images. Distributed in three-dimensional space, the resulting point cloud forms a continuous terrain, observable from endless points of view. The original position of the photographer (with their distinct point of view) and the boundaries of the photographic frame – both contested issues throughout the long history of photographic critical discourse – cease to exist at the fundamental level of photographic materiality. In this environment of space with no fixed horizon, which begins and ends abruptly at its adjustable minimum and maximum distance thresholds, with no above or below, no inside or outside, the viewer-turned-navigator finds themselves in what Hito Steyerl (2011) describes as 'free fall'.[6]

If we pause, so to speak, at this atomised, suspended stage, before each point is wired, meshed and moulded into a representation of the surface and allocated its hierarchical role in the structure of the three-dimensional model,[7] it is clear that the difference between the point-structure-image and the environment is a matter of viewing distance and perception. The user is forced to manoeuvre across, to and through the surface, propelled into motion, thus revealing a dynamic relationship that is constantly in flux. Depth of field, sharpness and image resolution are replaced by the density of the points and the relation between the elements of the cloud, which is constantly changing according to the

3 The term Planar Photography is a term coined by Jens Schröter in his book '3D' referring to the flat photographic image as opposed to the holographic and stereoscopic photo-imaging processes that do not operate through direct single viewpoint perspective. See Schröter, Jens. 3D: History, Theory, and Aesthetics of the Transplane Image. International Texts in Critical Media Aesthetics. New York: Bloomsbury, 2014. p. 38

4 Lev Manovich, Roger F. Malina and Sean Cubitt, The Language of New Media, Cambridge, MA: MIT Press, 2002.

5 haptic in the sense that light pulses travel to and reflect off surfaces, one by one accumulating spatial information through this process of aggregated contact.

6 Hito Steyerl, 'In Free Fall: A Thought Experiment on Vertical Perspective', The Wretched of the Screen (e-flux journal) (2011), 12-29.

7 In the 3D model, the point becomes part of the three building blocks of the object: vertices, edges and surface/polygon.

movement of the user and the shifting borders and orientation of the cloud itself.

The photogrammetric spatial reconstruction regains some of the volume of the original physical surface that was rendered as flat on the planar photographic material, and the image is stripped from some of its iconographic, pictorial and sentimental trappings, making way for a different type of aesthetics, that of the mechanics of capture. The spatial image becomes a digital embodiment of the transcoding of an existing terrain onto a three-dimensional grid. As such, the photographic archive, repurposed, can be grasped not only as embalmed time[8] but as encapsulated space.

Constellation And Navigation

Two paradigms that have emerged out of this volumetric shift in photography and permeated the fields in which I intervene in this research are 'constellation' and 'navigation'.[9] Constellation comprises the grouping of discrete nodal points into a recognisable pattern that is then named after its apparent form and inscribed with an identifying mythology.[10] Navigation – charting the way space unfolds as a body moves through it – includes the need for time and movement in order to gain orientation. Both are pivotal concepts and actions that articulate the spatial condition. Hence, it is important, particularly in the context of manufactured physical environments, to think of this current moment in photography and its trajectory as moving away from the grid, the parcel, the pixel or the index towards a nodal, relational system of constellation and navigation.

As 'analogue' photography has given way to digital, the functions of data storage, unpacking and analysis have developed increasingly intelligent pattern-recognition attributes,[11] aiding image analysis and manipulation, feature recognition, feature completion and different modes of search and reply. On the surface plane of an image sensor or image file, the pixel grid index has been superseded by multiple nodal connections sketching identified forms or form signatures. These nodal points, which combine into constella-

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8 Andre Bazin, 'The Ontology of the Photographic Image' (trs. by Hugh Gary), *Film Quarterly* 13:4 (1960), 4.

9 Set in opposition to scanning, Navigation in this dissertation refers to the method by which a viewers location (be it in physical or virtual space) must be in motion through the image space on all three axis in order to see its different parts. Navigation therefor, is an active mode of spectatorship which cannot be only ocular. It necessitates an involved, intentional participation by the viewer. Furthermore it much more so then the large flat print or plate, the unfolding of the three dimensional image space involves (shifting scales of) time and forms narratives and shifting hierarchical relations between the different objects in the scene.

10 The definition of constellation: "an assemblage, collection, or group of usually related persons, qualities, or things" in Merriam Webster dictionary. also see; "A group of stars forming a recognizable pattern that is traditionally named after its apparent form or identified with a mythological figure." in Oxford Dictionary.

11 "Computational photography refers broadly to sensing strategies and algorithmic techniques that enhance or extend the capabilities of digital photography. The output of these techniques is an ordinary photograph, but one that could not have been taken by a traditional camera. Representative techniques include high dynamic range imaging, flash / no-flash imaging, coded aperture and coded exposure imaging, photography under structured illumination, multi-perspective and panoramic stitching, digital photomontage, all-focus imaging, and light field imaging". from http://graphics.stanford.edu/courses/cs448a-10/

tions overlaying the primary pixel grid, are the flexible strata within the digital files.

The transition from flatness to volume has highlighted the need for a changed understanding, not only of the image space itself (which I will discuss later in this chapter) but also of our methods of reading and interacting with it, shifting the focus from scanning to navigation. The surface of a flat image needs to be scanned, whereas a three-dimensional image has to be navigated. For an image to be legible, its topography and territory must be reducible to flatness. In the parallel acts of reading a photograph and reading a terrain from the air, the conceptual and physical distance between viewer and viewed is now problematised through a disengagement from perspectival imaging mechanisms and the emergence of a partial conceptual and physical marriage of surveying with immersion. The spatial photograph now physically demands the application of actions that were once attributed, conceptually, to planar photography:[12] the dissolution of the frame to enable us to delve into the image. To read an image, we scan it with our eyes, whereas we physically walk through a landscape in order to get to know it. However, we are now at the point (in time and technology) where we need to 'walk the image'. Images are no longer a navigational aid; instead, navigation has become an imperative prerequisite of the image.

This process, however, should be distinguished from the discourse of the 'networked image' and other modes of navigation within image complexes[13] and archives in which navigation occurs in virtual 3D space but between sets of 2D images and fabricated three dimensional models.[14] These forms of movement reposition the observer, physically and conceptually, in relation to the image, and especially make clear the co-dependant relationship between the images themselves and their space/time position, yet there is still a clear separation between the space itself and the images: they may emerge from or inhabit the space but do not (collectively) form it. Navigation in these cases is a method of sifting, whereas in the spatial photograph, image navigation is the only means by which we can come into contact with the subject itself.

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12 The terms 'trans-planar' and 'planar photography' have a central place in Jens Schröter's book, 3D, which discusses the genealogy of three-dimensional forms of analogue photography, mainly the stereoscope and holography (Jens Schröter, 3D History, Theory, and Aesthetics of the Transplane Image, New York: Bloomsbury, 2014).

13 The concept of the "Architectural Image Complex" was developed by Eyal Weizman and Forensic Architecture as part of the work around the Hannibal Directive unleashed on the Rafah during Black Friday, August 1st 2014. A three-dimensional model providing us with the means of composing the relations between multiple images and clips and an optical device to navigate between them. See: Weizman, Eyal. Forensic Architecture: Violence at the Threshold of Detectability. 1 edition. Brooklyn, NY: MIT Press, 2017. p.204

14 One of the first to articulate these thoughts on the movement from cinema to new media environments was Lev Manovich who described Man with a Movie Camera as 'also a database of new interface operations that together aim to go beyond simple human navigation through physical space' (Manovich et al., The Language of New Media, p. 14).

Encapsulated Space: The Stereoscopic View Through Digital Photogrammetry

In the search to find ways to wilfully break with the existing image regimes and better understand this spatial condition of photography, I began this part of my research by examining collections of late-nineteenth and early-twentieth-century stereoscopic images, specifically those of Jerusalem and Palestine produced not only by pilgrims but also by early Zionist settlers and colonial officials, which are now stored in archives in the UK and US.[15] I not only looked at their content, context and form but also, more specifically, at how the camera mechanisms themselves left their imprint on the final image in the way they directed, almost choreographed the photographer's movement in the scene, and distorted their subject. These potential spatial registrations comprise a sort of encapsulated land archive. If photography is a process of deduction[16] and compression, how could these image spaces possibly unfold when read.

The mechanism of depth through parallax in the stereoscope[17] necessitated the stereo-pair images to conform to a strict compositional regime.[18] When setting up the camera to photograph a subject, the space in the scene had to include three clearly defined vertical planes,[19] receding from the foreground to a background located at the infinity-focus plane of the lens, so that the subsequent viewer would have a perception of depth. Physical space was broken down, organised and assembled (as much as possible) into two or three distinct vertical planes, receding on the z axis before being flattened and compressed onto the stereo plates for it to later unfold in the viewer's mind, creating what today is referred to as near-3D or 2.5D.

As will be discussed later in this chapter, stereoscopy from early on was manifest as a complex set of reciprocal relations between optics and spectatorship. Depth-through-parallax enabled the experience of volume and reproduction. A profound understanding emerged of the internalisation of the process of vision and the inherent potential of the image to use the ability of the human mind to construct a life-like scenario out of visual clues, as well as the power this type of vision has to elicit an emotional response. Equally, the medium was seen to have potential value for scientific, objective and sculptural reproduction.

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15 These archives are listed in Appendix Chapter 3 Item 2

16 'Photography is the only deductive art. It starts from the world around it and deducts from it what it deems interesting' (Lewis Baltz, 'Tate Shots': https://www.youtube.com/watch?time_continue=269&v=dqsk9c-XVRg. (Accessed 4 March 2019).

17 In 1838 Charles Wheatstone patented his invention of the stereoscope, a mechanism for 3D drawing and viewing using binocular vision to form a volume image in the viewer's mind. See Charles Wheatstone, 'Contributions to the Physiology of Vision. Part the First. On Some Remarkable, and Hitherto Unobserved, Phenomena of Binocular Vision', Philosophical Transactions, Royal Society of London 128 (1838): 371-394. See also Oliver Wendell Holmes, 'On the Stereoscope and Stereograph', 1859, cited in Alan Trachtenberg (ed.), Classic Essays on Photography, New Haven, CT: Leete's Island Books, 1980.

18 See also Wheatstone 1838; Crary 1992; Nickel 2004; Schroeter 2014.

19 Frederick James Cox, The Photographic Tourist, London: Frederick J. Cox, 1857.

In order to demonstrate some of the characteristics of spatial imaging, I chose four stereo-pair images that best demonstrated some of the aspects that resulted from the flattening of a scene onto a photographic plane. Each one highlights a specific attribute relating to the spatial condition of the resultant point-cloud image and its unfolding of volume, and to the ways in which the inscribed light information is decoded or discarded. These stereo pairs were recorded by photographers from the American Colony,[20] and were downloaded from the Matson Collection housed in the US Library of Congress.[21]

Study 1 / Data Loss: Inhabiting The Image

***Figure 1**. 'Brochov Girls' Farm: Polish immigrant girl, Israel 1920', photograph. Library of Congress, retrieved 2 June 2017.*

The above photograph (fig. 1) shows a stereoscopic view of a young woman named Davora Rushkin. She stands at the forefront of the frame, lit obliquely from behind by sunlight, a partially white figure thrown into relief by a background of dark shrubs covering what looks like the edge of a structure or wall. A shallow depth of field brings her figure into sharper focus. Viewing this full-body portrait through a stereoscope, the image

20 'The American Colony was a non-denominational utopian Christian community founded by a small group of American expatriates in Ottoman Palestine in 1881. The collection focuses on the personal and business life of the colony from the waning years of the Ottoman Empire, through World War I and the British Mandate, and into the formation of the state of Israel. It includes draft manuscripts, letters, postcards, telegrams, diaries or journals, scrapbooks, printed materials, photographs, hand-drawn maps and ephemera' ('About This Collection | American Colony in Jerusalem, 1870-2006 | Digital Collections | Library of Congress', Digital Collection, Library of Congress, Washington, D.C.: https://www.loc.gov/collections/american-colony-in-jerusalem/about-this-collection/. (Accessed 19 February 2019).

21 'About This Collection - Matson (G. Eric and Edith) Photograph Collection - Digital Collections.' Digital Collection, Library of Congress: https://www.loc.gov/collections/g-eric-and-edith-matson-photographs/about-this-collection/. (Accessed 1 June 2017.)

pairs' shallow depth of field and the contrasting tones of the girl's white apron help separate her figure from the backdrop. There are only two vertical planes in this image: the girl in the foreground and a blurry background.

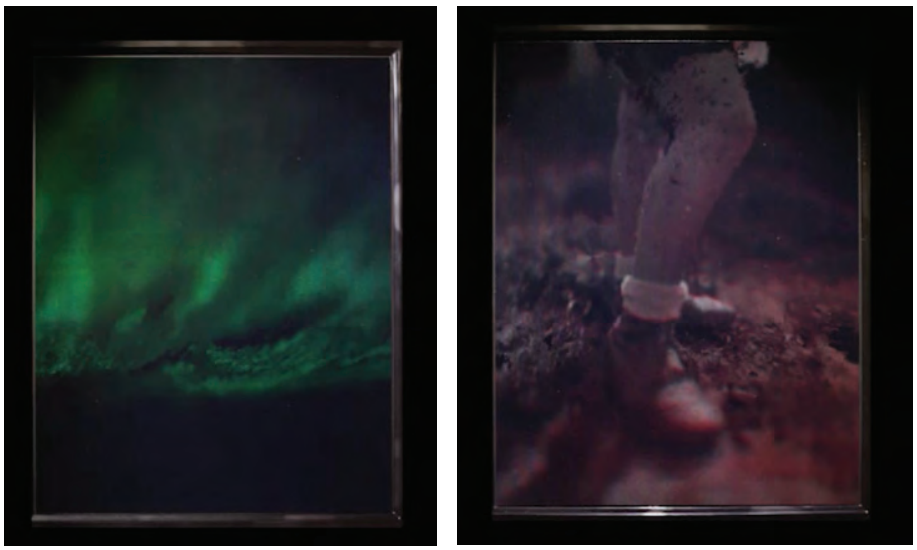

***Figure 2**. Halutza: digital holographic print of dense point cloud, screen-capture from video documentation. (Ariel Caine 2015).*[22]

The images were then processed through photogrammetry software, in this case Agisoft Photoscan Professional,[23] a software that allows for manual control over all the camera parameters within the 3D reconstruction. The surfaces of both images were scoured for recognisable, shared features in order to form a series of triangulations that would enable each resolved point to be spatially positioned in a three-dimensional matrix. As the computer finished its calculations, the spatialised image that emerged was radically different from, and yet was clearly a direct derivative of, the flat originals: what appeared on screen was a partly revived, partly distorted but strikingly accurate image-transcoding of the physical subject at the moment of capture. In the lower half of the original stereo pair, the girl's feet were reproduced clearly but her entire upper body and head, along with the background, disappeared completely or rather did not register in the spatial analysis. The shallow depth of field in the image rendered the upper half resistant to calculation. The area of contact between the feet and the receding ground, where vertical and horizontal information in the original scene provided sufficient difference in the stereo pair, is where the most precise volume detail could be reconstructed or decompressed. In an attempt to further analyse this recreation of the light that enters the viewer's eyes from a three-dimensional object/world, I printed the spatial point-cloud image, through a pro-

22 See video documentation of hologram at: https://vimeo.com/110939252
23 'Agisoft Metashape': https://www.agisoft.com/. (Accessed 19 February 2019). The product was previously called Photoscan and not Metashape.

cess of laser-directed exposure, as a digital A5-sized hologram.[24] (fig. 2)

The question is, what does this kind of view enable? Do the infinite possibilities of movement and viewpoints augment or disrupt the viewer's vision? Is the moment when the solid viewpoint disappears a moment of crisis? In his account of the postmodern symbolic system, Frederick Jameson (1983)[25] uses the Lacanian definition of schizophrenia as a breakdown in the chain of signifiers causing a disruption of the logical sequence of the system of signifiers, as a metaphorical description.

> *Schizophrenic experience is an experience of isolated, disconnected, discontinuous material signifiers which fail to link up into a coherent sequence. The schizophrenic thus does not know personal identity in our sense, since our feeling of identity depends on our sense of the persistence of the "I" and the "me" over time".*[26]

The harmonious appearance of signs as a cohesive, thematic sequence of meaning is disrupted and they appear asynchronous; contrary to 'regular' vision where we are constantly "threading our paths through it"[27], the schizophrenic vision is irregular, arbitrary, fragmented. This is the cause of the panic and confusion that, in Jameson's eyes, characterises the postmodern world.

In contrast to Jameson's analysis, which identifies the disruption in the logical sequence of the system of signifiers as a moment of loss and crisis, others see this destabilization of ground and subject/subjectivity as a cause for optimism, a liberating opportunity for development. It is argued that the dissolution of the hierarchical chain of vision and the fall into an uncertain space of volume can act as a vector that directs us back towards a refiguring of an embodied presence. The cancellation of vision in its traditional sense offers a potential release from the dominance of the indexing aspects of vision that feminist scholar Luce Irigaray described in a 1978 interview in which she speaks of a canonical, gendered vision that negates material or bodily expression, objectifying the body and driving it towards becoming an image: The fortification within vision is less the privilege of women as much as it is of men. More than in the case of other senses, the eye objectifies and controls. It forms out of distance and preserves distance. The moment in which the gaze dominates is the moment in which the body loses its corporeality, it becomes an image.[28] In opposition to this type of vision, composer John Cage, offers a concept of attention (couched naturally in musical terms) that is not mono-directional, centralised

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24 Holography is a process of photographic recording that, in essence, captures and encodes both clean and noisy signals of light as it scatters around a three-dimensional scene. By recording these patterns of light and then re-projecting them back towards the viewer's eyes it is, optically, as if the viewer is seeing the actual light reflecting back from the original scene. In a non-haptic way, the 3D world is actually there.

25 Frederick Jameson, 'Postmodernism and Consumer Society', published in; Hal Foster, '*Postmodern Culture*'. London: Pluto, 1983

26 Ibid. p. 119

27 Ibid. p. 119

28 Luce Irigaray, '*This Sex Which Is Not One*'. Ithaca, N.Y: Cornell University Press, 1985. p. 187

or predominant but rather what he defined as 'new listening'. In his 'Experimental Music' lecture in 1957, Cage called for a way of listening that roams freely between all the existing sounds and does not focus solely on a sound that has received a performative preference.[29] Cage's innovative approach to sound and composition – one that drew its inspiration in part from Buddhist philosophy – has transformed the world of music and of art in general. In this respect, it is possible to talk about the concept of the 'void' (in the Buddhist sense) as meaning a space that is very real but does not claim for itself exclusivity, ownership, centrality or superiority. Buddhism considers such a place as one of upeksha (equanimity). This sort of open contemplation experiences the mutual creation and interdependency of all phenomena in the world without the interruption of received or personal interpretation.

Returning to the question of vision, volume and the spatial photograph, it should be clear that when inhabiting this optical volume we must also acknowledge the new forms of violence in operation in the act of a coerced restitution of volume to a space or a body image. Navigating among the points of recovered data, as well as in the void of 'white shadows', I would argue that the granular condition of the point cloud points towards a 'new vision', not only in László Moholy-Nagy's terms but more in those outlined by Cage – an equanimity of vision from which we must then return to the political.

Study 2 / Superposition

In a further experiment with spatial reconstruction, I used a nineteenth-century photograph, 'Woman of Nazareth' (fig 3), in which the unnamed subject was looking directly into the camera's dual lens at the moment the image was taken. In the reconstructed point cloud (fig. 4), it is possible to leave the original viewpoints and navigate around her figure. Once a new viewpoint is adopted, both subject and photographer, positioned opposite each other at the moment of capture, are clearly present, as is the distance between them and the height of the camera. It transpires that, in the process of photography's transition from the granular to the holographic, the singular body's viewpoint vanishes. Photographic space detaches itself from the single perspective and erases the looking body. In its place, the looking eyes and the camera become free-roaming, perspectival subjects within a multi-point constellation that forms the three-dimensional space. As a result of the disappearance of the 'I', the viewpoint becomes free and all-embracing with a multiplicity of perspectives and a multi-dimensional infinity of possibilities, simultaneously a continuous and granular, similar to the concept of the 'superposition' in the field of physics.

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29 John Cage, '*Silence: Lectures and Writings*'. Repr. London: Marion Boyars, 1999. p.10

Figure 3. *'Woman of Nazareth', photograph, circa. 1898. (Library of Congress: https://www.loc.gov/item/mpc2004006402/PP/ (accessed 4 June 2017))*

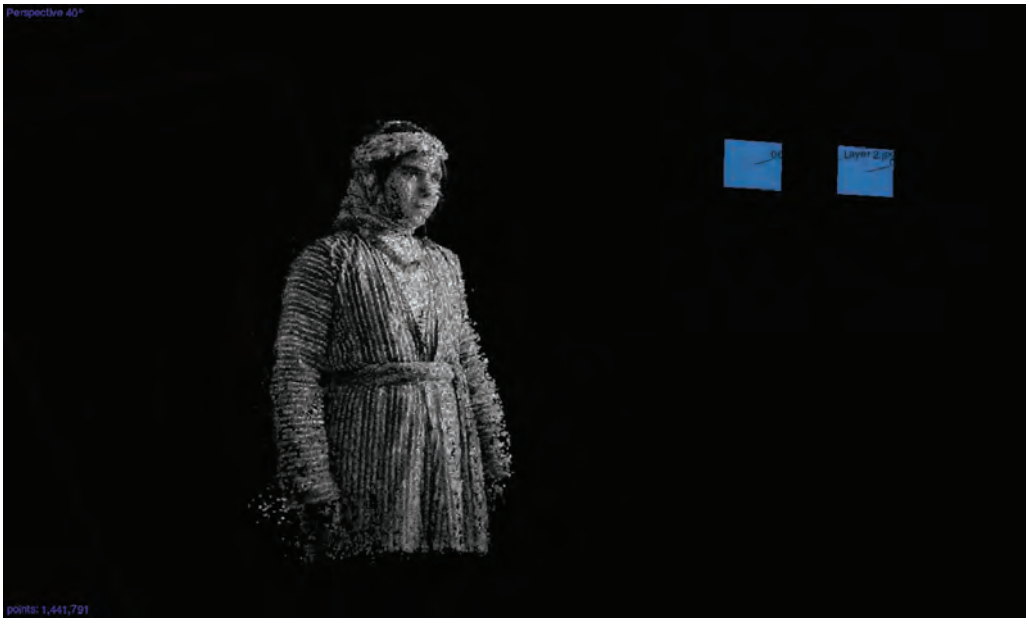

Figure 4. *'Woman of Nazareth', point cloud spatial reconstruction with stereo camera positions.*

Historically, physicists had held the belief that there was a clear distinction between material consisting of particles (characterised by quantity and speed) and light waves (characterised by wavelength, ebb and flow). At the beginning of the twentieth century, however, it was demonstrated that material particles and even light waves could in fact manifest as both particle and wave, alternately. For example, it was observed that when measuring light waves, the light is perceived in discrete, measurable units and not as a continuous stream of energy. Similarly, when measuring the behaviour of the smallest material units (electrons), they were found to move – and could be measured – as waves. Therefore, at any theoretical time outside that of the specific moment of measurement, the electron potentially exists in both modes simultaneously. This condition is called 'superposition'. I offer here a reading of the new spatial photograph as just such a state of superposition. We can view the constellation from an individual perspective, yet we are aware at the same time that this is only one possibility out of an infinity of perspectives, all simultaneously present in an open-ended and infinite space.

Study 3 / Depth-Plane Compression

The spatial reconstructions below (fig. 6 - 7) demonstrate not only the horizontal latch to the ground but clearly shows the mechanics of capture, the vertical condensation of space through the stereoscope's optics. As we move around the point cloud to the side view, we see the gradual flattening of space as we near infinity in the focus range. In the space between the minimum and maximum focal range, physical space is broken down through the lens mechanism into three makett-like layers. The Ophel Hill slopes up before us when we view the scene from the original lens locations, yet the old city walls further off in the distance remain completely flat. Moving into the extracted space, 'white shadows' appear, cast by the objects in the image, the cut-out holes where the camera did not see and therefore the computer could not reconstruct.

We can see that photographic space itself has become calculable. The materiality of the photograph changes, constructing one which, by definition, registers only that which can be clearly calculated – anything that cannot be calculated is left as a void. Calculation and its limits gain visible form in a very clear and immediate way in the point cloud. It is perhaps one of the ethically important attributes of this specific form of image data that, as mentioned previously, it constantly manifests its points of weakness and limitations while retaining its mesmerising affective and indexical qualities.

Figure 5. *'Jerusalem', photograph, 1898. (Library of Congress: https://www.loc.gov/item/mpc2004006050/PP/ (accessed 4 June 2017)*

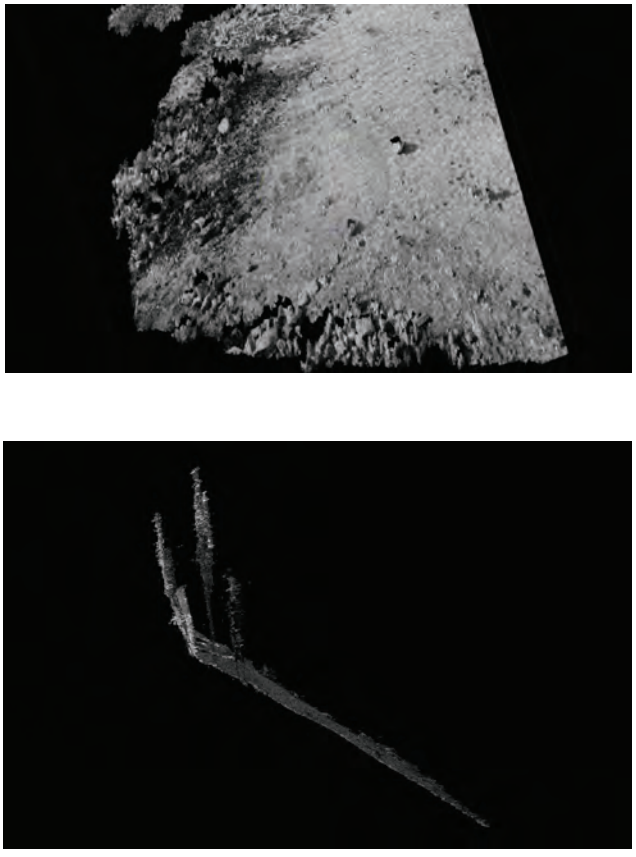

Figure 6. *Top and side views of the resulting photogrammetry point cloud.*

Figure 7. *'Temple area, Mosque of Omar [i.e. Dome of the Rock], etc. Olivet and Mosque el-Aksa [i.e. al-Aqsa] from Zion.*

Study 4 / Noise ; Data Ratio

The last example of a stereoscopic view (fig. 8, below) is an image from 1915 of a locust on a thistle in the Negev. In this, we can clearly see a transformation of soft image information to digital 'material' noise. The soft-focus pixels of the form in the image become, in the photogrammetric model, a noise cloud engulfing the individual locust and the thistle. The edges of the frame form a hard-edged, encapsulating, containing box in which the dense cloud of locust and noise are entangled.[30]

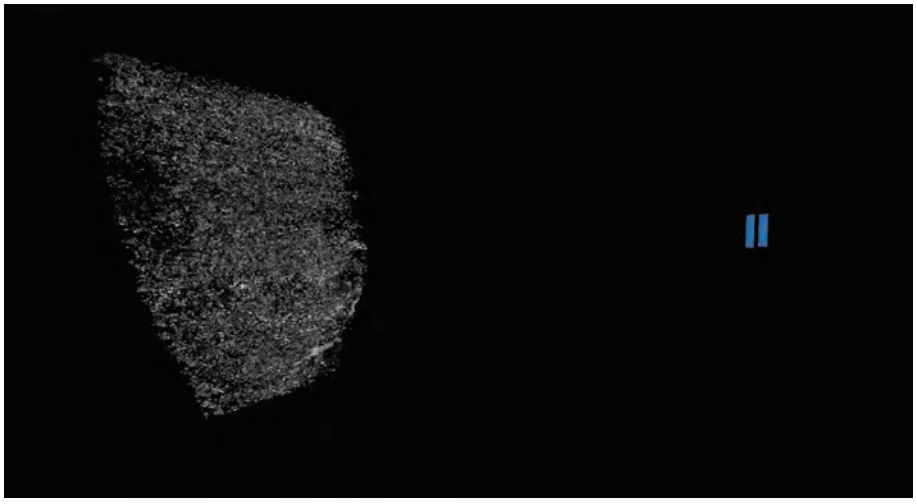

Figure 8. *Screen shot of photogrammetry analysis of a stereo-pair image (Ariel Caine 2016) of 'The terrible plague of locusts in Palestine, March-June 1915: Locusts devouring a thistle (Scolymus Hispanicus)', photograph, 1915. (Library of Congress: https://www.loc.gov/item/mpc2004004236/PP/ (accessed 4 June 2017)*

30 The 3D point cloud. See: https://skfb.ly/6JEy7 (Accessed 26.4.2019).

Figure 9. *Screen shot of photogrammetry analysis of a stereo-pair image (Ariel Caine 2016) of 'The terrible plague of locusts in Palestine, March-June 1915: Locusts devouring a thistle (Scolymus Hispanicus)', photograph, 1915. (Library of Congress: https://www.loc.gov/item/mpc2004004236/PP/ (accessed 4 June 2017)*

The Genealogy Of The Spatial Image

The year 1867 saw the publication of a new map of the city of Freyburg. The novelty of this map lay in the fact that the cartographer did not leave his desk in Berlin to visit the site; rather, he drew the map using a series of photographic images – twenty-one of the terrain and a further nine of the city's church, taken with a newly developed *messbildkamera* (measuring camera), which employed a process of analysis and data extraction called *photometrographie*[31] or photogrammetry.[32] The *messbildkamera* combined the photo-theodolite with a regular, technical-plate camera system, using the theodolite's ability to accurately measure and record the distance and height of points in space and marking them on the projection on the photographic plate. The creator of this photo-imaging apparatus, Albrecht Meydenbauer, had managed to create not only a non-haptic method for volumetric recording through the merging of trigonometric triangulation and a single-viewpoint optical perspective, but more significantly for the future of imaging, produced the first example of an image as a form of dataset.

Inverting Perspective

The photogrammetry of the mid-nineteenth century presented an inversion of linear perspective, working from the flattened image back to volume by way of projection:

Photo - gram - metry
Light - drawing - measurement

This process comprises the estimation of the geometric and semantic properties of objects in the physical world based on images. Optics, trigonometry and (later) digital computation are used as a non-haptic method for recording space and volume. Exemplified in the camera obscura, pinhole linear perspective gave rise, from the early Renaissance on, to numerous experiments in spatial recording and analysis through the reduction of volume

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31 Sebastian Finsterwalder, a German mathematician and glaciologist, pioneered the use of the photo-theodolite, a plane-table to track shifts and movement in glaciers. Finsterwalder developed some of the first studies and documentations of climate change in the North Pole. Albrecht Meydenbauer, a German civil engineer and architect, first published an article titled 'Photometrographie' in 1867. Aimé Laussedat, a French officer and scientist and professor of geodesy at the École polytechnique in Paris, developed technical cameras such as the photo-theodolite and applications for surveying through photogrammetry. See: https://www.cca.qc.ca/en/search?page=5&query=Albrecht+Meydenbauer&filters=%7B%22forms_collection_library_bookstore%22%3A%5B%22photographs%22%5D%7D&_=1543508631735. (Accessed 26.04.2019); https://geoforum.pl/strona/46816,46856,46948/teledetekcja-historia-laussedat-pulfrich-i-autografy. (Accessed 26.04.2019). In 1849, Laussedat became the first person to use terrestrial photographs for topographic map compilation. He is referred to as the 'Father of Photogrammetry'. The process Laussedat used was called 'iconometry' (from icon, the Greek word for image, and –metry, the Greek for the art, process or science of measuring). In 1858, he experimented with aerial photography, supported by a string of kites, but abandoned it a couple of years later. Laussedat's use of photography for mapping was officially accepted by the Science Academy in Madrid in 1862.

32 Meydenbauer called photogrammetry 'the use of photographic imaging for geometrical measurement'. His first attempt to use the photographic image for geometric measurements was a derivation of the geometric plan using elevations from a photographic perspective of a building, which he exhibited at the Berlin Photographic Exhibition in 1865.



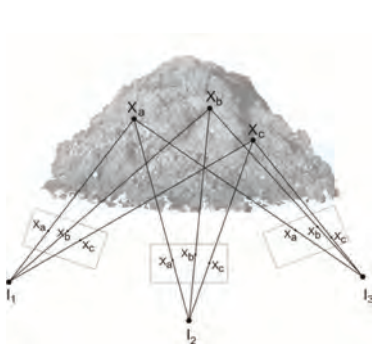

Figure 10. *Johan Zahn, 1685 (left),* ***Figure 11.*** *Albrecht Dürer: 'Draftsman drawing a lute', monogram, 1525,* ***Figure 12.*** *SfM diagram*

to an image or map. Architects and mathematicians, as well as astronomers and cartographers, experimented with this mode of scientific spatial reduction, carefully recording the correlations and distance between physical features and their representation (and perception) by an image. An early conception of the process of transcoding not from volume to image but from volume to (virtual) volume can be seen in Johan Zahn's *Oculus Artificialis Teledioptricus Sive Telescopium* (*The Long-Distance Artificial Eye or Telescope*), published in 1685 (fig. 10),[33] but it was only with the experiments in early photogrammetry that this inversion started to become a viable reality. It is easy to understand this idea of inverted perspective if we view Albrecht Dürer's 'A Man Drawing a Lute' (1525) (fig. 11) beside a diagram of the process of 3D-point estimation through multi-viewpoint triangulation (fig. 12).

Image And Sculpture

In his two treatises, 'On Painting' and 'On Sculpture', Renaissance architect and philosopher Leon Battista Alberti points to a fundamental distinction (that prevailed until the advent of computational spatial imaging) between planar perspectival compression for imaging and the extraction of measurement for physical volume (re)construction for objects. He pointed out that two movements existed, through either single or multiple vanishing-point perspective mechanisms (planar or spherical): the flatness of the image and the volume of the object. In his 1452 text on sculpture, Alberti wrote:

33 In 1685, the Würzburg cleric, Johann Zahn, published his *Oculus Artificialis Teledioptricus Sive Telescopium* (*The Long-Distance Artificial Eye, or Telescope*). In this work, he provides an early comprehensive account of the function and use of a number of optical instruments, including the camera obscura and magic lantern (whose invention he credits to Athanasius Kircher), and various other lanterns, slides, peepshow boxes, telescopes, microscopes, lenses and reflectors. He also envisages, for the first time, a portable hand-held version of the camera obscura. At the heart of the imagined device is a mirror-reflex mechanism, a technology that would not be realised until 150 years later with the birth of the photographic camera. Zahn's ideas and explanations are furnished by a plethora of innovative, and at times, wonderfully surreal engravings.

> *The relevance of optical perspective for sculptors begins with the division of the phenomenon of perspective into two separate actions on the part of the artist: perception and rendering. It is only the rendering of perspective that solely concerns painters and not sculptors. Perception of perspective, however, is absolutely vital to sculptors who wish to represent anything in nature through sculpture. Perception of perspective, after all, is the visual perception of three-dimensional form.*[34]

The aspiration to escape this dichotomy, which lies at the heart of the drive for the illusion of perspective, has time and time again been achieved through the interaction with human perception; that is, through tricking the eye – for example, with trompe-l'œil, dioramas and panoramas, phantasmagorias and stereoscopic-vision machines. An inseparable component of imaging and mathematics, as Kim Veltman[35] and Oliver Grau[36] demonstrate, has historically been the attempt to extend beyond the understanding of the perspectival frame as a window,[37] using linear perspective and anamorphosis to introduce new possibilities of playing with forms, not only in the natural world but equally in the mind.[38] Embedded in the "DNA" of image making is the attempt to escape beyond the flatness of the image and its given frame, using either material spatialisation of the image or by means of both its effect and affect on the viewer's body. Dating back to early examples such as the 'Room of the Mysteries' in Pompei,[39] whose panoramic bacchanalias depicting lines of sight crossing the room engaged and engulfed the (probably) intoxicated visitor, or the Palaeolithic drawings on the walls of the Lascaux Cave, which incorporated the movement of flickering torch light in order to animate the animal figures.

Far from basing itself solely on the immobile 'cyclopean viewpoint', pre-Baroque and to some extent even pre-Renaissance imaging and drawing experimented with the interplay of viewpoint and the perception of real-world objects, manipulating representation, morphing and transforming internal relations within the static image through the viewer's movement in space. This psycho-sculptural understanding of the drawn surface translated back into a much later adaptation of stereoscopic vision in catalogues for the correct reproduction of sculpture. Varying the relations between the focal lengths of the lens, the distance of the camera from the object and the distance between the stereo lenses and the stereo-pair images can render the relations between the objects in the scene, as well as between foreground and background, totally different. The position and scale of the view itself changes dramatically depending on the stereo pair's distance from one another and their left and right positioning.[40]

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34 Leon Battista Alberti, On Sculpture, Lulu Com, 2013. p. 71.
35 Kim H. Veltman, 'Perspective, Anamorphosis and Vision', Marburger Jahrbuch Für Kunstwissenschaft 21 (1986): 93.
36 Oliver Grau, 'Into the Belly of the Image: Historical Aspects of Virtual Reality', Leonardo 32:5 (1999), 365-71.
37 Erwin Panofsky, Perspective as Symbolic Form. New York: Zone Books, 1997.
38 Kim H. Veltman, 'Perspective, Anamorphosis and Vision,' Marburger Jahrbuch Für Kunstwissenschaft 21 (1986), 21.
39 Oliver Grau, 'Into the Belly of the Image: Historical Aspects of Virtual Reality.' Leonardo 32, no. 5 (1999): 365–71.
40 Kurt Lothar Tank. 'Deutsche Plastik Unserer Zeit'. Published by O. Schönstein, München 1942. //www.loc.gov/pictures/item/46030408/. (Accessed 20.04.2019)

Interpretation of stereoscopic imagery and its ability to exaggerate spatial relations were used, on the one hand, in aerial reconnaissance to accentuate and amplify relief so as to better identify features in the landscape as well as to overcome early attempts to use anti-aerial camouflage tactics.[41] Photographer and artist Thomas Ruff (1996),[42] on the other hand, produced his stereoscopes of miniaturised post-war German landscapes with the aim of inverting the former fascist landscapes and translating them into contained photo-sculptures haunted by their political past. (fig. 15)

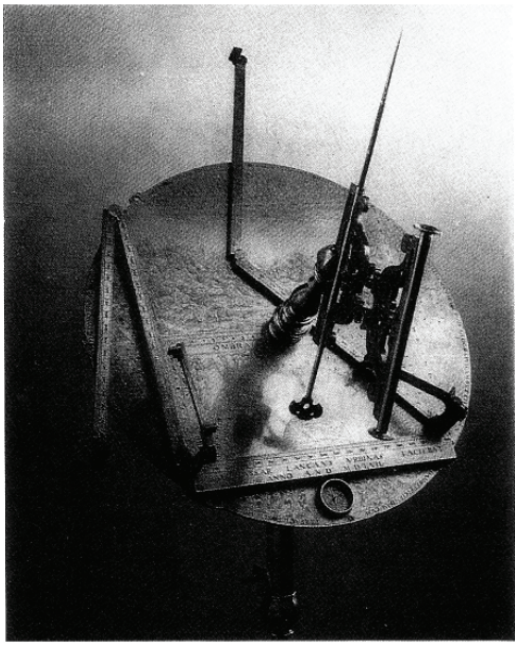

Figure 13. *Baldassare Lanci: 'Instrument for Surveying and Curvilinear Perspective', 1567. (Museo di Storia della Scienza)*

From Plot And Parcel To Node And Triangulation

In the modern era, measurement and calculation have come to signify the conscious mind's power to directly intervene in the perception of material objects. In the wake of the Industrial Revolution and with the birth of the era of the Anthropocene, landscape itself – or rather the environment and the weather – have increasingly been 'reworked' in the shape of a desired image of the future injected into the present. As such, non-haptic tools of measurement and calculation have increasingly been combined over the past years to include imaging tools. Furthermore, if until recently the aim of survey imaging was to compress geographical volume into surface features, the past decade has seen a rapid drive towards the introduction of calculable volume into the mechanisms of image making.

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41 Herbert E. Ives, Airplane Photography. London: Philadelphia Lippincott, 1920: https://archive.org/details/airplanephotogra00ivesuoft/page/274. (Accessed 20.04.2019) Thomas Baldwin, Airopaidia; Containing the Narrative of a Balloon Excursion from Chester ... Hints on the Improvement of Balloons, Means to Prevent Their Descent over Water ... with Various Philosophical Observations, to Which Is Subjoined, Mensuration of Heights by the Barometer, with Extensive Tables, Chester: Thomas Baldwin, 1786.

42 Thomas Ruff, Rhurgebiet 1 (1996), in Batzner, Nekes and Schmidt (2008: 142)

Figure 14. *Cover and double spread from the photographic album "Deutsche Plastik Unserer Zeit,." by Kurt Lothar Tank.*

It was the fear of entering the 'unknown' terrain of the Scottish Highlands, the territory of the Jacobean rebels, that propelled the leaders of the eighteenth-century British army to commission the creation of an accurate 'to-scale' map (although as yet without the use of triangulation) of the area's geography.[43] The British Ordnance Survey thus began in 1747 as a tool of military reconnaissance, mapping the borderlands of the country, mainly those in the north such as the Scottish Highlands but soon after expanded to include the entire island. The expansion of the British Empire into North America and the Near East accelerated the development of tools and methodologies for surface and volume registration. Once the survey was tied to engineering – to the establishment of zones for the operation and construction of structures for resource development, transport and commerce – the need arose for a three-dimensional record of space. Thus, in the mid-nineteenth century, the system of plotting and parcelling land with outlined borders and impressionistic hachuring in order to give a perception of relief shifted to a process of mapping through triangulation. The use of the chain and the theodolite enabled the formation of a triangulation grid: by employing one known baseline measurement, it was possible to calculate a series of further nodes and measurement-line segments across the topography. At certain intervals, another validating physical measurement of an additional baseline would be used. Territories throughout the empire were accurately mapped using this method and, for the first time, height measurement and therefore volume were also accurately recorded. In the mid-twentieth century, light and laser beams were first deployed in an attempt to map two particular spaces that could not (at the time) be accessed physically – the clouds[44] and the surface of the moon. Surveying and scanning today, augmented by new forms of triangulation and measurement systems, is predominantly conducted through digital

43 Caren Kaplan, Aerial Aftermaths: Wartime from Above. Durham: Duke University Press, 2018.
44 Kovalev, Vladimir A., and William E. Eichinger. Elastic Lidar: Theory, Practice, and Analysis Methods. Hoboken, N.J: John Wiley, 2004.

***Figure 15**. Thomas Ruff, Rhurgebiet 1 (1996), in Batzner, Nekes and Schmidt (2008: 142)*

theodolites, remote-sensing satellites and airborne Lidar. The advent of computation and computer vision in the late 1970s accelerated the development of the capabilities and speed of multiple-view 3D point estimation and scene reconstruction.[45]

The grid and the triangulation, the parcel and the height map, the pixel and the point: there is a similarity in the morphology of the digital photographic material and that of the logic of the survey. First the grid and then the dot and triangulation follow the morphology and logic of the site of survey and excavation. A section of photography has moved away from the grid architecture into a cloud-like constellation, a topological 3D form, and it is here that the 'use of science and technology begins to reconfigure imaginaries to such an extent that they can decontextualize the ground from the earth'.[46]

As we move from a ground-level view to the gaze of the reconnaissance satellite, we move between varying increments of the oblique,[47] simultaneously 'dialling' between different politics. Military observation and surveillance photography strives to flatten territory and reduce it to its surface features. The vertical, aerial view has predominantly been associated with the 'eye' of the ruler: the vertical not as a spatial dimension but rather as a dimension of power:[48] 'Recognizing the vertical dimension of territory shows that territory is a volume rather than an area, and noting that lines on maps have only a limited height when translated into lines on the ground showcases a new level of vulnerability: a vulnerability to imagined senses of a protected territory, the body of the state.'[49] It is necessary to re-examine this premise in light of concepts such as Eyal Weizman's (2002)

45 3D reconstruction is problematic in computer vision where the goal is to reconstruct scenic structures and camera positions from images of the scene. In photogrammetry, although we shift to a spatial state of an image, one that is omni-directional and multiple, we nevertheless have a paradoxical condition by which, in the process of transition from the multiple camera frames and types, they are all stripped of their individual characteristics and are assigned the pinhole status through a process of un-distortion.

46 Ryan Bishop, 'Project "Transparent Earth" and the Autoscopy of Aerial Targeting', Theory, Culture & Society 28, (December 2011), 271.

47 This is a conceptual and architectural term coined by Paul Virilio and Claude Parent to introduce the concept of movement through volume in opposition to the dichotomy between horizontal (movement) and vertical (stasis) lines in modern architecture.

48 Michel Foucault's quote is taken from 'Force of Flight', originally published in 1973 to accompany a series of paintings by Paul Rebeyrolle (1926-2005), cited in Stuart Elden, Space, Knowledge and Power: Foucault and Geography, Abingdon: Routledge, 2016. p. 7.

49 Stuart Elden, Terror and Territory: The Spatial Extent of Sovereignty, Minneapolis, MN: University of Minnesota Press, 2009. p. xxii.

'politics of verticality'[50] This describes the re-visioning of existing cartographic techniques, entailing "an Escher-like representation of space, a territorial hologram in which political acts of manipulation and multiplication of the territory transform a two-dimensional surface into a three-dimensional volume".[51]

There has been an extensive amount of research into the verticality of warfare and territory;[52] however, this has usually been more about looking up and less about also looking down. But, as Stuart Elden (2013) asks, 'what happens below the surface, and how does this impact on questions of security? How should we think depth as well as height?'[53] The unknown terrain of the underground is still relatively unseen by the optics of terrestrial and aerial surveillance. What lies beneath our feet has become the 'final frontier' for the geospatial and security industries.[54] The 'view from above' has begun to extend underground: 'The use of combinatory senses to render a visible image of that which could not be seen (the underground) provides yet another attempt to remove the ground of error for military observation and control, re-inscribing the desire of mastery operative in the view from above'.[55]

Landscape itself has increasingly been 'reworked' to further security agendas. Peter Nyers (2012) shows how the remaking of the landscape in border regions takes place by means of 'earthworks, both construction and destruction, filling and ramping […] for security reasons. This is reshaping a three-dimensional landscape as part of a securitized terrain.'[56] In the context of Israel / Palestine which will be discussed in the next chapter, this three-dimensional terraforming is not only – and not even primarily – a form of security and control but rather a much more diffused conflation of the two, with an underlying layer of prescient messianic immanence emanating from the excavated depths of the tunnelled cavities and pathways.

With the advent of digital imaging, scanning and computerised image analysis in the late 1980s and its entry into operation in the mid-1990s, a series of rapid transformations began to change the way in which imaging, imagining, planning and construction (or preservation) were enacted. Increasingly, tools and methodologies from different fields have been brought together, sometimes fusing at the level of the technology itself, to form new assemblages.[57]

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50 Weizman, Eyal. "Politics of Verticality: 1. Introduction to The Politics of Verticality." openDemocracy. Accessed April 9, 2019. https://www.opendemocracy.net/en/article_801jsp/.

51 Weizman, Eyal. "Politics of Verticality: 2. Maps of Israeli Settlements." openDemocracy, 2002. (Accessed 10 April 2019) https://www.opendemocracy.net/en/article_631jsp/.

52 See, for example, Derek Gregory (1998; 2011), Trevor Paglin (DATE), Stephen Graham (2016), Peter Adey (2013), Hito Steyerl (2012), Grégoire Chamayou (2015),

53 Stuart Elden, 'Secure the Volume: Vertical Geopolitics and the Depth of Power', *Political Geography* 34 (May 2013), 6.

54 Homeland Security News, 'Geospatial Corporation Maps the World under the Earth's Crust': http://www.homelandsecuritynewswire.com/geospatial-corporation-maps-world-under-earths-crust. (Accessed 4 June 2017).

55 Ibid.

56 Elden, 'Secure the Volume', 7.

57 Gottfried Konecny, Geoinformation: Remote Sensing, Photogrammetry and Geographic Information Systems, Boca Raton, FL: CRC Press, 2014. p. 1.

Beyond The Paralysed Cyclops: Bildraum And The Spatial Image

In his unfinished *Arcades Project* (1927-1940), Walter Benjamin proposed a conception of the dialectic of the image as both a mode of writing and a model of reality grounded in the 'recognisability'[58] of the 'now' – a 'now' that has been detached and briefly suspended from the historic continuity.[59] For Benjamin, withouth the revolutionary, artistic or messianic moment of rupture, history will continue to accumulate as we aimlessly drift towards a catastrophic future. It is however within the points of fracture that bring into the realm of the sensible alignments of the deeper layers of political formations,where the work of art or moment of messianic revalation manifests and projects us into a new trajectory. Reading these passages by Benjamin and applying them to the process of imaging has informed our understanding of photography, emphasising photography's position as neither a purely aesthetic representation nor a scientific, objective, self-registering[60] truth but as irrevocably political. Benjamin writes:

> *[T]he claim that political tendencies are implicit in every artwork of every epoch – since these are, after all, historical creations of consciousness – is a platitude. But just as deeper layers of rock come to light only at points of fracture, the deeper formation of a political position becomes visible only at fracture points in the history of art. The technical revolutions – these are fracture points in artistic development where political positions, exposed bit by bit, come to the surface. With every new technical revolution, the political position is transformed – from a deeply hidden element of art into a manifest one.*[61]

In this understanding of the political nature of photography and its transformations, the notion of the way in which it occupies space is conceived as the interaction between what has been included in the frame and what has been excluded. Images operate within the mind, within society and across time; however, Benjamin did not envisage the potential of photography to occupy space.

Arguably, a new condition of imaging is emerging through what is known as 'bildraum' or image-space, although it is important here to make a basic distinction between the bildraum/image-space and the spatial image. When considering the different, historically changing spaces of photography, Jens Schröter describes four main modes of optics: geometric, physiological, wave and virtual.[62] These different forms of optical registration

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58 Walter Benjamin, *The Arcades Project*. Cambridge, MA: Belknap Press, 1999, p. 462.
59 In his 14th Thesis on the Philosophy of History Benjamin writes of his concept of the *Jetztzeit*
60 See William Henry Fox Talbot, *The Pencil of Nature*, London: Longman, Brown, Green and Longmans, 1844: http://www.gutenberg.org/files/33447/33447-h/33447-h.html. (Accessed 4 June 2018).
61 Walter Benjamin, et al., The Work of Art in the Age of Its Technological Reproducibility, and Other Writings on Media, Cambridge, MA: Belknap Press, 2008. p. 317.
62 Jens Schroeter. *3D: History, Theory, and Aesthetics of the Transplane Image*. International Texts in Critical Media Aesthetics. New York: Bloomsbury, 2014.

have developed over time but they also co-exist, all inhabiting different spheres of what we currently consider optical media:

> **Geometric**: An understanding of the geometric behaviour of light beams has enabled the construction of physical or virtual systems of representation (photography or ray-tracing through 3D software).
>
> **Physiological**: The study of the ways in which the human eye and cognition work has led to the construction of optical technologies that specifically target, activate and manipulate these senses.
>
> **Wave**: Knowledge of the different wavelengths that constitute the optical

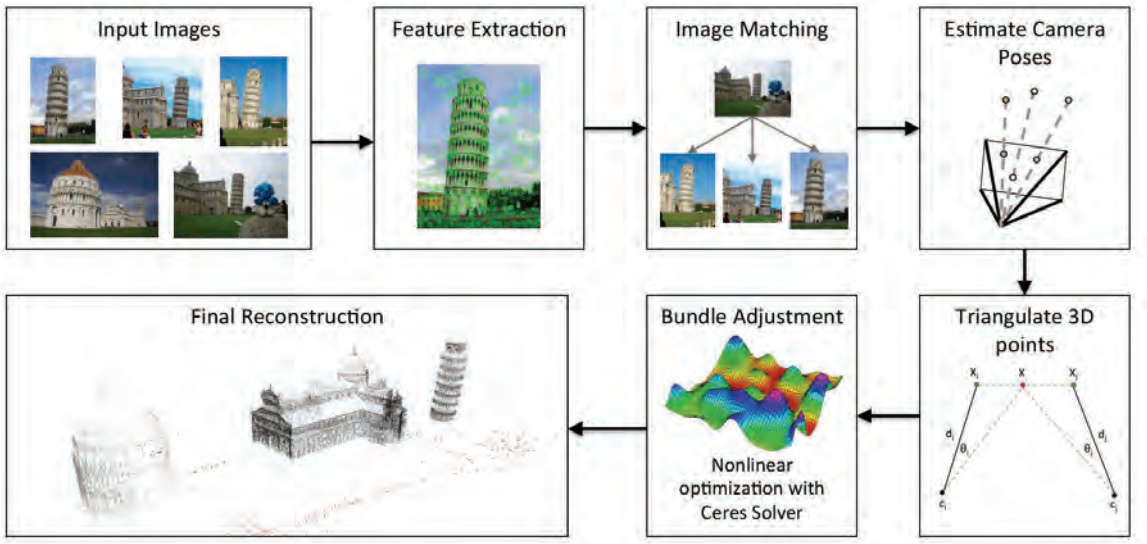

Figure 16. *Structure-from-motion' global pipeline.*

> spectrum of colour has enabled not only the development of colour photography but also holography.
>
> **Virtual**: The use of computational and algorithmic methods to create the source phenomena for an optical projection means that it is possible to create an image using all of the first three optical knowledges without the need for a physical world and light source to catalyse the initial optical process.

Within this configuration, the spatial image is located between the geometric, the physiological and the wave. Now, however, it is also increasingly fused with the virtual: its computational, algorithmic and semantic capabilities are becoming instrumentalised, not to build virtual environments but to aid in the reconstruction of the physical one. Artist David Hockney famously said in 1982 that 'photography is all right if you don't mind

looking at the world from the point of view of a paralyzed cyclops',[63] a description that was echoed in Erwin Panofsky's[64] description of the 'one-eyed and immobile spectator'. Yet the spatial image is an image in movement: although it emerges from perspectival machines and lenses, it transgresses them, not only embedding the moment of creation but also movement and time in its experience and use. Gilles Deleuze (2005) introduced this new concept of the image in movement in his argument that the image is above all not a representation of something, a linguistic sign (a definition that relies upon the age-old Platonic distinction between form and matter translated into its modern Saussurean equivalent of signifier-signified); rather, he collapses these two orders into one, and the image thus becomes expressive and affective: not an image of a body but the body as image.[65] Developing the Bergsonian notion of movement and time, in which object and movement are literally inseparable, Deleuze argues that any type of representational aspiration is false or partial as it assumes that the frozen element of the image is self-sufficient; an image, he argues, is only represented within movement.

Horizontal, Vertical And Spatial Images

During my first year as a student of photography, we were introduced to two main modes of photographic relationship with the physical world. The first is what could be called 'vertical photography', the prevalent perspectival position of the camera that is perpendicular to the world it records. The second was 'horizontal' or 'rhizomatic photography', developed by Aim Deuelle Luski (our course tutor). Luski's[66] horizontal cameras incorporate the Deleuzian 'rhizome' into a new photographic mechanism that has been at the heart of his philosophical and artistic practice since the late 1970s. He describes it thus:

> *[The horizontal photograph] resembles the Deleuzian rhizome that operates like a net of timeless assemblages on a plain, but unlike the rhizome, it emphasizes its particular point of emergence, the photographic as an event of material burn, as a place of disaster. In horizontal photography, I photograph not only the thing in the image but also the act of photography itself, and this act turns from a singular event in time into an array of articulations which describe the relations of the signs in the photograph with the environment from which they were taken. These relations are the traumatic differences created from the place where the past entered the camera's dark chamber. If vertical photography aspires to replicate the thing as an image and distance it from the world, horizontal photography aims to turn the thing different from itself and become an image as part of the world.*[67]

63 David Hockney, *David Hockney Photographs*, London; New York: Petersburg Press, 1982, p. 26.
64 Erwin Panofsky, *Perspective as Symbolic Form*, New York: Zone Books, 1997, p. 29.
65 Gilles Deleuze, *Cinema 1 The Movement Image*, London: Bloomsbury Publishing, 2005. p. 58.
66 Ariella Azoulay, *Aim Deuelle Luski and Horizontal Photography*. Leuven (Belgium): Leuven University Press, 2013.
67 Aim Duelle Luski, 'Horizontal Photography', *Mafte'akh* 7 (2014): 145-164 (my translation).

Luski's theory and practice have always remained in the realm of the analogue, in the chemical modes of photographic production. However, if we think of the horizontal photograph in its digital manifestation, its closest correlation would be the light-field image;[68] in the context of 3D-photorealistic modelling, the correlation would be with ray-tracing simulations.[69] The light-field camera and image sensor records the multiplicity of light entering the camera from multiple positions in space. In contrast to the traditional lens or pinhole camera, whose aim is a one-to-one correlation of each point in physical space with a point on the sensor, in the light-field camera each point on the sensor records multiple angles and light sources, taking into account the way light is scattered and reflected before it enters the lens. Although the light-field image is taken from a single point of view with one lens, by reconstructing the movement and refraction of light in the space under scrutiny, it can reproduce depth as well as the multiple points along the focal plane.

However, we are now in a moment that is not only vertical and horizontal but also spatial. Computational processes, which incorporate both modes of record and representation, are dismantling and reassembling the photographic surface and its time of capture. If up until now, the assemblages described here have been reactive. Some of their capabilities involve real-time systems providing live streams of scanned data or live data calculations, yet they all passively process and display an output according to predefined parameters. However, it is increasingly the case that passive image processing is beginning to include semantic interpretation and generative algorithmic properties that seep into all the photographic stages, from sensor through to output and dissemination. The medium has moved from the (silver halide) grain to pixel to computational point, and therefore from a homogenous surface to a discrete parcel to an architectural environment.

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68 Marc Levoy, et al., 'Light Field Photography with a Hand-Held Plenoptic Camera', Computer Science Tech Report, Stanford University, 2005: http://graphics.stanford.edu/papers/lfcamera/. (Accessed 10 April 2019).

69 Turner Whitted and Bell Laboratories, 'An Improved Illumination Model for Shaded Display', 23:6, 1980, 7. See also: NVIDIA, 'Introducing the NVIDIA RTX Ray Tracing Platform', NVIDIA Developer, March 6, 2018: https://developer.nvidia.com/rtx/raytracing. (Accessed 10 April 2019)

Chapter 3:

VOLUME / SILWAN AND 'THE CITY OF DAVID'

Introduction

With the heavy rains of the winter of 2018, the landslides and sinkholes returned to East Jerusalem.[1] One such sinkhole opened up just behind the Ein Silwan Mosque in Wadi Hilweh, a neighbourhood in the village of Silwan. Within a short time of its opening, a truck with concrete arrived to fill the hole with cement. The amount of concrete needed seemed surprisingly large: the relatively liquid cement kept on pouring through the crack into the opening in the ground, a testament to the size of the underground cavity. Until recently, sinkholes and land collapses have been infrequent natural phenomena in Jerusalem, a city built on solid rock, and yet for the last decade the earth under Wadi Hilweh has been shifting, causing widespread structural and infrastructural damage. The first time such a hole opened up beside the Silwan mosque was over a decade ago, and since then cracks have gradually started to appear in family homes,[2] roads, public stairways and walkways. That morning in December 2018, outside the Ein Silwan Mosque, the opening of the road's surface revealed for a brief moment the (officially unacknowledged) connection between the damage to Palestinian property and the underground tunnelling of the Israeli Jewish settler organisation, Elad.

1 https://www.maannews.com/Content.aspx?id=782015. (Accessed 10 April 2019).
2 https://www.maannews.com/Content.aspx?id=776360. (Accessed 10 April 2019).

The weaving of biblical-era archaeology into the infrastructure of modern-day Jerusalem has long been at the very core of the Israeli colonial and national imagination.[3] Optics and engineering in this city have been steeped in the religious and nationalist aspirations that have guided operations and policy in Palestine since the late nineteenth century,[4] and more significantly since Israel took over control in 1967. It is perhaps inevitable that contested locations are charged with a certain amount of bias, especially a site such as Jerusalem, entangled in and burdened by millennia of conflict and overlapping jurisdictions that are hard to disentangle or erase – even if there were the political will to do so. While the 'Judaification' of Palestinian East Jerusalem has been an official aim since Israel assumed control of the city from the Hashemite (Jordanian) kingdom in the 1967 war, the state – split between democracy and ethnocracy to the point of schizophrenia – has pursued multiple, often contradictory policies. Some of these policies aim to bring the Palestinian residents of East Jerusalem[5] into the fold of a unified capital, while others are clearly aimed at discriminating against[6] or expelling them.[7] It is within this grey[8] zone of policy that ideologically motivated factions within the Israeli polity have been able to rapidly progress towards reinstating a Jewish presence in the Palestinian city, transforming the field of cultural heritage into an ideological tool for the promotion of the idea of Jewish indigeneity and messianic revivalism.

Already in 2009, as the archaeological excavations continued to expand and the damage they were causing on the surface was becoming increasingly evident, Palestinian residents and supporting NGOs filed a legal petition to stop the works. The Supreme Court's response was twofold. First, it claimed that there was no clear proof of a correlation between the tunnelling (or 'earth-clearing works' as they were described) and damage to the infrastructure above-ground. Secondly, it deemed that any damage that did exist was 'acceptable' in light of the significance of the archaeological discoveries[9] to Israel's cultural heritage. Under the auspices of the Supreme Court, the Israel Antiquities Authority (IAA) and the municipality's engineers, archaeology and settlement have been mobilised

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3 Nadia Abu El-Haj, 'Translating Truths: Nationalism, the Practice of Archaeology, and the Remaking of Past and Present in Contemporary Jerusalem', American Ethnologist 25:2 (1998): 168: https://doi.org/10.1525/ae.1998.25.2.166. (Accessed 10 April 2019).

4 The researchers on the first PEF expedition were urged not to allow their religious sentiment to cloud their objective scientific vision. The relative objectivity and diplomatic sensitivity of the first Wilson expedition, however, held for only a few years before the religiously charged second expedition led by Charles Warren.

5 Palestinian East Jerusalem has never officially been annexed and so all Palestinian inhabitants are considered residents and not citizens.

6 East Jerusalem has been historically underdeveloped and starved of investment in by the municipal authorities in all sectors, from utilities and infrastructure, through schooling and healthcare, to cultural heritage programmes.

7 The most blatant of these acts is perhaps the construction of the Separation Wall physically casting entire Palestinian neighbourhoods officially within the municipal boundaries outside of its territory.

8 Here, I the term 'grey' in the sense coined by Oren Yiftachel (Oren Yiftachel, 'Critical Theory and "Gray Space": Mobilization of the Colonized, City 13: 2-3 (June 2009): 246–63): https://doi.org/10.1080/13604810902982227. (Accessed 4 April 2019)

9 Supreme Court judge Edna Arbel in her 2009 ruling in case no. 1308/08 stated: 'Against the claimed damages, there is a significant public interest in continuation of the works. Indeed, the revelation of hidden secrets of the past which have been buried for hundreds and thousands of years in the bowels of the earth is a central component of the archaeological study. Carrying out this research is in the public interest from many aspects, if for the contribution it has to our understanding the history of the country and the history of the Jewish people, if because of the contribution that it has to our understanding historical events that have the importance of not being reduced but to the Jewish people and its history.' (Supreme Court, בג"ץ 1308/08 מחמד עטאללה סיאם נ. רשות העתיקות 21-09-2009 - פסקי דין, החלטות ופרוטוקולים: https://www.ruling.co.il/_eba87e41-d9b1-dc5c-1ed5-19bde6ee025c. (Accessed 18 January 2019).

in tandem to dispossess the Palestinian residents and obscure the non-Jewish heritage of the site. Some modes of violence do not meet 'the norms of recognizability because they are hidden from view through being openly visible, perhaps even hyper-visible'.[10] This discontinuity of vision has been instrumentalised by means of architecture and optical media and put to use to further Israel's extensive development of Palestinian East Jerusalem and the 'Holy Basin'[11] heritage site. The underground work itself, coupled with the idea of a 'natural' separation between above and below, has been instrumental in creating a vertical separation between two competing realities: the Palestinian and non-Jewish lived environment on the surface and a predominantly Jewish ancient underground layer. Within a smaller section of the Holy Basin area – the City of David site – the problematics of verticality, control and vision meet the violation of civic rights, ethno-nationalism, messianic ideological bias and cultural heritage in a dense interplay of forces.

In this part of the thesis, I focus my practice-led efforts on the area of Wadi Hilwe and the route of the Herodian road that leads from the Pool of Siloam up to the Givati parking-lot excavation and into the Old City of Jerusalem. In this section of the larger site, the thin crust of the surface forms an optic divide that enables a separation of narratives, hiding the connection between the Israeli encroachment on Palestinian land, the damage to Palestinian properties and infrastructure (through the work that is taking place on a huge scale underneath the residents' feet) and the narrative of Jewish indigeneity, exile and return according to the dictates of divine providence. This connection begins in the depths of the earth and has culminated in the emergence of the tunnels at the foot of the Western Wall and the Temple Mount. Below ground, the route is linked directly to the story of the second temple and its destruction. All along this route, which runs under the main road of Wadi Hilwe, hundreds of Palestinian properties, both public and private, have suffered structural damage or have even collapsed.

Despite the fact that Elad's activities above ground, directed towards expanding the Jewish presence in the village of Silwan is highly contested and its ideological extremism recognised, its massive archaeological project on the same geographical location is widely embraced. Throughout the ongoing development both above and below the earth's surface, spatial imaging has been used to bridge the gap, to the point of conflation, between the messianic narrative and the scientific data, between the existing and the planned, using Lidar scans of the walls of both the city and the site to search for structural deficiencies, sonar imaging to discover cavities in the strata beneath car parks and open spaces, and model reconstructions based on the scanned surface. This technical spatial transcoding – an imaging of sorts – with its scientific accuracy appears ideologically neutral. Elad's

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10 Yves Winter, 'Violence and Visibility', New Political Science 34: 2 (June 2012): 195-202: https://doi.org/10.1080/07393148.2012.676397. (Accessed 9 April 2019).

11 The 'Holy Basin' is a modern Israeli term for the geographical area in Jerusalem that includes the Old City and its adjacent territories.

Figure 1. *An aerial view of Silwan and Jerusalem's Old City through its newly launched 3D GIS system interface, created by Simplex, 2019.*

success is inextricably linked to its strategy of forming partnerships with civic, scientific and commercial entities, enabling it to present its operations using a professional, technical and practical discourse and not solely in ideological, religious terms.

The Project

Three-dimensional imaging is used throughout the Holy Basin: by the Israeli state as part of its apparatus of security and control; by the municipal authorities in their planning and monitoring mechanisms; by archaeologists in their inspection and recording of the City of David site and its artefacts; and by Elad in its advocacy and promotional campaigns. All employ the topography and its volume to control sight, jurisdiction, movement and the creation of knowledge. The question is: how can a different, counter-spatial image be formed? In what ways could the tactics of discrete photomapping, the aggregation and appropriation of found footage, and the use of 'open-source' coding and GIS (geographic information system) and photogrammetry software allow for a spatial imaging practice that renders this entanglement of volume, sanctity and politics visible?

The aim of this project has been to create an expanding point-cloud image that will encompass the multiple spaces of the site, revealing the relationship between surface and underground. I would argue that navigating within and around this image will not only bring to light the intersecting surfaces of the Palestinian village of Silwan and the City of David site but also clearly show the correlation between the violence and damage inflicted above ground and the excavation. When used as a digitally transcoded, georeferenced, architectural volume, the point cloud becomes an environment in which we can deploy and display information points, spatial links and annotations, giving voice to the politi-

cally suppressed narratives of the Palestinian residents and bringing to light the violence wreaked on their cultural heritage. Practically speaking, I wish to examine the following questions:

- Where does the tunneling pass, and at what depth, underground?
- What is the exact spatial relationship between the tunneling and the damage above ground to Palestinian private properties and public infrastructure?
- What layers of archaeology are ignored and passed over in sections of the excavation?

On the level of the photographic theory behind this spatial condition, I aim to explore:

- In what ways are volume, time and movement redefined within the spatial photograph?
- Which levels of data does this digital transcoding of space retain and which discard, and what are the implications for the imagination and for mobilization?

I started with an attempt to use existing imaging technologies – analogue and digital photography, found video and still footage of the site posted by various sources involved in or affected by the excavations, such as Elad, the Palestinian residents of Silwan, Christian evangelists, the municipal authorities and the Ministry of Tourism. I searched through the Palestine Exploration Fund (PEF)[12] archives and the US Library of Congress for nineteenth-century records of the early excavations at the site, as well as images describing land use in the area before its urbanisation. All the sources were used in order to provide an image of the sites transformation over time. A selection of collated materials were used to photomap the underground routes and connect them to the visible layer of daily existence and conflict above ground. My intention was to use the inherent propensities of the spatial image to contend with volume, and its ability to work with multiple sources and chronologies, to enable all the different strata of the site to co-inhabit the same space. The characteristics of the spatial image allowed me to treat the surface not as a flat plane but as a thin, continuous layer of visibility folded over a volume through multiple points in times, from the late nineteenth century to the present day – a surface that flows continuously from street level to underground and back. I set out to follow the undulations of this surface.

I combined existing found footage with walks I took through publicly accessible tunnels

12 The PEF, founded by the British in 1865, is the oldest organisation dedicated to the study of Palestine; its remit at the time fell somewhere between an expeditionary survey and military intelligence gathering however since the end of British rule in 1948 the organisation has focused on archaeological and cultural heritage research. See https://www.pef.org.uk/ (Accessed 10 April 2019).

and over parts of the site that lay above ground. This formed a collated, spatial amalgam of the site that called for its navigation and a renewed interrogation. An aerial overview of Wadi Hilwe was achieved through collaboration with PublicLab[13] organiser and activist Hagit Keysar, whom I first met in the summer of 2015. Keysar granted me access to images of Silwan taken from the air by a camera attached to a kite that she flew with Shai Efrati, Jeffrey Warren from PublicLab and a group of youths from the village.[14] These images helped form the base layer for the ground-level spatial point cloud, to which I added all the multiple interconnected point clouds. This early encounter with KAP (kite aerial photography) in its civic and activist form[15] introduced me to a world of civic science and collaborative practice of which, as a photographer and moving-image practitioner, I had been little aware.

Background

What is popularly known as the 'City of David' is in fact a 150-year-old amalgamation of archaeological excavations[16] on the site of ancient Jerusalem, dating back to around 5,000 BCE. It is located outside the walls of the current Old City of Jerusalem, between the River Kidron and the Tyropoeon Valley, and encompasses multiple periods of occupancy and rule from the early Canaanites through the Judeans to the Byzantines and Mamluks. Until the late nineteenth century, the village of Silwan mainly occupied the eastern slopes of the Kidron Valley; in some areas, houses were built atop ancient burial caves, as Charles Warren described in his reports to the Palestine Exploration Fund (PEF) in 1867, following its 1866-67 second expedition.[17] Throughout the first half of the twentieth century, Silwan expanded to include the western slopes where the ancient site exists. A 1944 RAF aerial image[18] (fig. 2) shows several houses and evidence of terraced agriculture in the area that today comprises the neighbourhood of Wadi Hilwe. Since 1967, Silwan has experienced rapid expansion and the village now occupies both slopes of the valley, blending with the adjacent neighbourhoods of East Jerusalem – Abu Tor in the south and Ras al-Amud in the north east.

Excavations on the site of ancient Jerusalem began with Charles Warren's PEF expedition, during which he began documenting the ancient waterways and underground paths beneath the visible city, which was under the control of the Ottoman Empire at the time. Since then, the site has been excavated on an almost continuous basis by both interna-

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13 PublicLab is a collaborative project comprising DIY aerial mapping by local communities across the globe. See Public Lab, contributors. "About Public Lab." Public Lab. Accessed February 11, 2019. publiclab.org/n/4.

14 PublicLab, 'Silwan': https://publiclab.org/wiki/jerusalem#Silwan. (Accessed 14 March 2019).

15 KAP is (still) a relatively widely used form of low-altitude aerial photography employed by archaeologists, geologists and other types of researchers to carry out imaging in locations where drones are not able to operate.

16 See the list of excavation expeditions in Appendix for chapter 3

17 The textual description and mapping of the houses in the village by the Wilson and Warren expeditions took place between 1865 and 1867.

18 See the image in Appendix for Chapter 3

Figure 2. *British RAF aerial photograph of Silwan, 1944 (left) aerial photograph by Israeli air force, 1967 (right)*

tional and Israeli archaeological teams. Kathleen M. Kenyon led the first modern scientific-grade excavations, conducted according to current archaeological standards, between 1961 and 1964 on several northern sections of the site, just below Warren's, and since 1995, archaeologists from Jerusalem, Tel-Aviv and Haifa universities have been carrying out research in several sections of the site, under the auspices and scientific jurisdiction of the IAA. Throughout this time, their work has been largely commissioned and funded by the City of David Foundation and Elad.[19] Officially registered as an NGO on the 8 September 1986 by David Be'eri, a former Israeli commando officer, Elad stated that its founding aim was to strengthen historical Jewish ties to modern-day Jerusalem by means of guided tours, 'repopulation' of the area and advocacy.[20] The Ir David Foundation, the arm of Elad operating the City of David site,[21] describes its aims more bluntly when it proclaims that the Foundation is 'committed to continuing King David's legacy as well as revealing and connecting people to Ancient Jerusalem's glorious past through four key initiatives: archaeological excavation, tourism development, educational programming and residential revitalization'.[22] Elad directly contracted the IAA archaeologists to carry out their operations on the site, as well as supporting the publication of their scientific

19 IAA, 'City of David Archaeological Site', 1995: http://www.antiquities.org.il/images/archinfo/061-090/081.pdf. (Accessed 10 April 2019).

20 Ministry of Justice, 'א.ל.ע.ה - אל עיר דוד | גיידסטאר - אתר העמותות של ישראל': https://www.guidestar.org.il/organization/580108660. Accessed 16 February 2019).

21 Elad have several operating branches or sub-companies, each dealing with a different aspect of its operations. See Ministry of Justice. 'א.ל.ע.ה - אל עיר דוד | גיידסטאר - אתר העמותות של ישראל'..

22 Ir David Foundation, 'City Of David': http://www.cityofdavid.org.il/en/The-Ir-David-Foundation. (Accessed 26 February 2019).

analyses of the discoveries, as a means of 'strengthening Jewish ties to Jerusalem' through the promotion of the (Jewish) history of the area. Direct involvement in the presentation and ideological mobilisation of the archaeological finds has enabled the organisation to leverage the immense importance of the site in its attempt to legitimise its ethno-messianic agenda.

By contrast, since the 1950s, the city of Jerusalem and its historical basin area (the 'Holy Basin') has been developing apace without a unified, comprehensive plan. Neither have the Israeli authorities, to date, provided a comprehensive plan for the excavation, preservation and development of archaeological sites in the Holy Basin, most of which are of religious significance to the many faiths in the city. Despite the exponential expansion of the city boundaries following the 1967 war,[23] the overall design for its development has not been updated since Municipal Plan No. 62 was passed in 1959.[24] This anomalous situation has meant that it has been easier for the municipal authorities to prevent development, including the building of much-needed infrastructure, in the Palestinian neighbourhoods of East Jerusalem. Contrary to the Palestinian situation, however, Jewish development in the same parts of the city has been readily approved, thus gradually establishing the seemingly contiguous nature of these new sites of Jewish settlement and Jewish West Jerusalem. This has been achieved by strategic, ideologically motivated development that has actively driven out many of the Palestinian inhabitants of Silwan and rendered those who remain invisible through a combination of infrastructure legislation, landscaping and imagery.

As the density of the non-Jewish neighbourhoods in the Old City prevented direct intervention, Israel has directed its efforts, ever since the city's annexation in 1967, towards its underground layers, conducting massive tunnelling and underground excavation projects in a bid to reach and expose the surface layers of the ancient Judean kingdoms. These tunnelling projects, serving as a grey space of sovereignty,[25] whether they take place in full view or outside the public gaze, have in many cases in the Old City but most extensively in Silwan meant destabilisation (both structural and psychological) for its non-Jewish residents. Tunnels now run for hundreds of meters beneath Silwan; some follow ancient pathways, some are newly excavated and still others are unknown to the public or even to the official monitoring agencies. The extent of the project conducted by Elad (with the approval if not the total oversight of the municipal authorities) was exposed, for a short while, when (as mentioned earlier) a number of buildings collapsed and cracks began to appear at street level, forcing the spotlight onto this massive archaeological but primarily engineering project. The tunnel running under the Herodian road and Wadi Hilwe, which

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23 Jerusalem's area has grown from 37 sq km to 123 sq km . See Appendix Item no 6 for the map of Jerusalem's city boundaries.

24 Jerusalem Municipality, 'עיריית ירושלים - תכנית המתאר לירושלים': https://www1.jerusalem.muni.il/jer_sys/publish/showPublish.asp?pub_id=10835. (Accessed 27 March 2019).

25 Oren Yiftachel. "Critical Theory and 'Gray Space': Mobilization of the Colonized." City 13, no. 2–3 (June 2009): 246–63. https://doi.org/10.1080/13604810902982227.

was first excavated and partially cleared in 2007 in work conducted by Roni Reich of Haifa University in collaboration with Elad, has since expanded all the way under the existing city walls up to the western wall of the Temple Mount.[26] In recent weeks, the opposite end of the tunnel, which collapsed earlier in the year (this tunnel is not open to the public), has made the headlines as the IAA and Elad have requested permission to make a new underground opening in the wall of the Old City, potentially causing irrevocable damage to the seventh-century structure, in order to expand the tunnel to allow tourists to reach the plaza at the Western Wall.[27]

Elads' educational programme, promoting a narrative of Jewish revival and historical sovereignty, is targeted at Israeli and foreign tourists alike, while it is pursuing a process of 'residential revitalisation', which essentially involves buying up Palestinian properties, driving out their owners and settling Jewish families in their place. The ownership and real-estate claims behind the current Jewish-Israeli encroachment into the Wadi Hilweh and Batan al-Hawa neighbourhoods of Silwan rest in part not only on the narrative of an unbroken continuity between the ancient past and the present day but also on a presumed connection with a late-nineteenth-century Jewish Yemenite neighbourhood called Kfar Hashiloach (Siloh village). In 1886, at the behest of Israel Dov Frumkin, editor and publisher of the first Hebrew newspaper, Havazelet, several Jewish Yemenite families were settled in rows of purpose-built houses on the south-eastern edge of Silwan. (fig.3) At the height of its existence, Kfar Hashiloach consisted of 160 families; however, during the 1938 Arab Revolt, when Muslim inhabitants in Silwan rose up and massacred some members of these families, the British Mandate forces removed all the remaining Jews from the area, and their properties were passed to the hold of caretakers from Silwan. In recent decades, both Elad and Ateret Cohanim (a right-wing Jewish organisation dedicated to the jewsih resettlement of east Jerusalem and the Muslim quarter)[28] have started legal proceedings to facilitate the retrieval of these properties and have begun resettling Jews there, first in the old properties and then on newly acquired plots. The creation of a link between the historical Yemenite presence and the encroaching Jewish ownership of real estate in Silwan serves a dual purpose: on the one hand, it is used to promote the overall ideological narrative of the connection between ancient Jewish settlements and present-day settlers, and on the other, it serves as a legal foothold for current land-ownership claims, paving the way for the violent takeover of, and expansion of the Jewish presence in, the Palestinian village.

Local Palestinian residents, however, have begun to resist official Israeli policy, coordi-

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26 IAA, 'Drainage Tunnel Excavations', 2007: http://www.antiquities.org.il/article_heb.aspx?sec_id=25&subj_id=240&id=1275. Accessed April 10, 2019

27 Nir Hasson, 'פריצת פתח מתחת לחומות ירושלים תפגע במבנה מוסלמי מהמאה השביעית', הארץ, https://www.haaretz.co.il/science/archeology/.premium-1.7041722. (Accessed 21 March 2019).

28 Ateret Cohanim. "American Friends of Ateret Cohanim: Home." Accessed April 10, 2019. http://www.jerusalemchai.org/.

***Figure 3**. 'Jerusalem (El-Kouds). Village of Siloam', ca. 1898. The row of houses of 'Kfar Hashilo'ach' can be seen on the right of the image. On the left are the houses of Silwan. (American Colony (Jerusalem) Photo Dept.)*

nating their actions through the Wadi Hilwe Information Centre and Silwanic.net civic, which have been monitoring the damage caused by the archaeological and settlement projects. They are supported by several Jewish NGOs, such as Peace Now, Ir-Amim and Bimkom.[29] The archaeological project itself has also been under consistent fire from Emek Shave, an NGO that has called into question the IAA's mode of operation and the inbuilt bias of its scientific findings from a professional standpoint. Above all, Emek Shave has challenged the way that Elad has mobilised selective archaeological finds to promote Jewish heritage with the aim of controlling the site at the expense of its Palestinian inhabitants and its non-Jewish heritage.

Surveys Of Jerusalem And Its Environs

In the early nineteenth century, notions of science and truth were still predominantly aligned with religious belief. Nevertheless, the emergence of critical thinking,[30] the increasing influence of positivist philosophy, the publication of Charles Darwin's seminal Origin of the Species and the birth of geology as a discipline[31] represented a challenge

29 See appendix chapter 3 item 2 for details on these organisations.

30 Critical thinking meant that the Bible began to be treated outside the scope of religion and divine origin.

31 Geological research raised questions regarding the age of the earth, problematising the biblical narrative and requiring a new hermeneutics.

(each in its own way) to the seemingly unassailable ideas at the core of British society. Confronted with these four, simultaneously seismic shifts in belief, the Anglican Church sought ways to reaffirm society's religious foundations. It seized on the idea of researching the actual landscapes described in the Bible as a way of reasserting the scriptural message. From the end of the eighteenth century on, Palestine was re-imagined as the source of a renewed religious vigour, and science and education were enlisted in the drive towards popularising and disseminating a Western, Christian image of the country. The newly invented technology of photography, with its apparently objective descriptive qualities, was enlisted in the fight to prove the validity of the scriptures. Thus, the medium's scientific, descriptive capabilities did little to dispel preconceived ideas of a symbolic, religiously charged topography; rather, they strengthened them: photography's very objectivity was used to affirm the truthfulness of prophecy.

John Kitto, an English biblical scholar, was among several to produce works about the 'land of the scriptures', illustrated with photographs of Palestine, including his Pictorial Bible[32] (1838) and Daily Bible Illustrations[33] (1849-53). Francis Galton[34] produced his Statistical Inquiries into the Efficacy of Prayer in 1872, while in 1837 Rev. Alexander Keith published Evidence of the Truth of the Christian Religion – Derived from the Lateral Fulfilment of Prophecy Particularly as Illustrated by the History of the Jews, and by the Discoveries of Recent Travelers (later republished in 1844, accompanied by daguerreotypes by his son, George Keith). Keith wrote:

> *Religion deserves a candid examination, and it demands nothing more. The fulfilment of prophecy forms part of the evidence of Christianity. And are the prophecies false, or are they true? Is their fallacy exposed or their truth ratified by the event? And whether are they thus proved to be the delusions of imposters or the dictates of inspiration? To the solution of these questions a patient and impartial inquiry alone is requisite. Reason alone is appealed to, and no other faith is here necessary but that which arises as the natural and spontaneous fruit of rational conviction.*[35]

The fact that Western travellers discovered a land that was partially desolate, poor and disease-stricken, very far from the fabled 'land of milk and honey', was simply seen as validation of the sense of abandonment that had befallen it as it awaited redemption.

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32 John Kitto. The Pictorial History of Palestine and the Holy Land, Including a Complete History of the Jews. The Pictorial History of Palestine and the Holy Land, Including a Complete History of the Jews, v. 1. C. Knight, 1844.

33 John Kitto. Daily Bible Illustrations: Being Original Readings for a Year on Subjects from Sacred History, Biography, Geography, Antiquities and Theology. 1850.

34 Francis Galton, Statistical Inquiries into the Efficacy of Prayer, Melbourne: H. Thomas, 1872.

35 Alexander Keith, and Arthur Penrhyn Stanley. Evidence of the Truth of the Christian Religion Derived from the Literal Fulfilment of Prophecy; Particularly as Illustrated by the History of the Jews, and by the Discoveries of Recent Travellers. With a Refutation of the Rev. A.P. Stanley's Poetical Interpretations. London T. Nelson, 1859. p. 13.

'Palestine's […] aspect in the present day is the precise likeness delineated by the pencil of prophecy, when every feature that could admit of change was the reverse of what it now is.'[36]

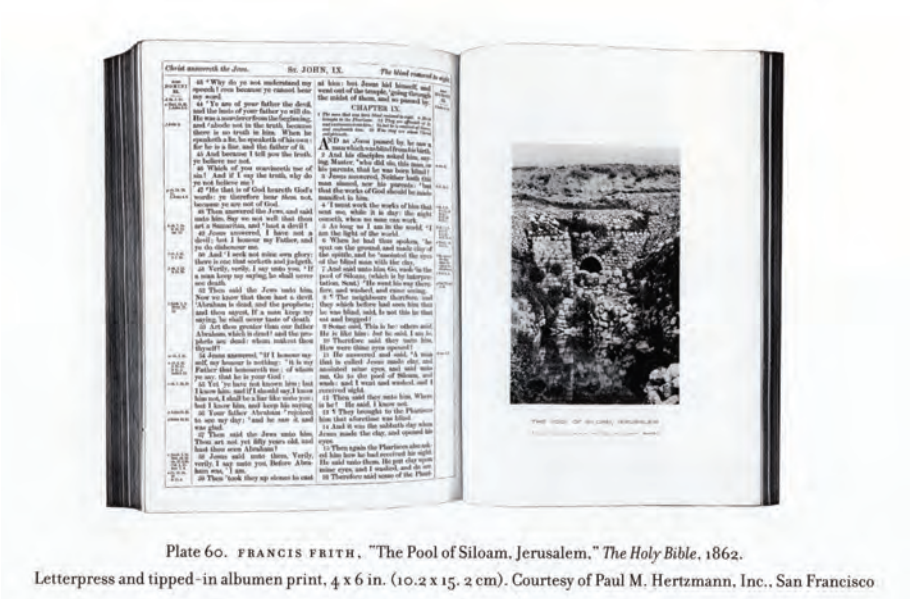

Plate 60. FRANCIS FRITH, "The Pool of Siloam, Jerusalem," *The Holy Bible*, 1862.
Letterpress and tipped-in albumen print, 4 x 6 in. (10.2 x 15. 2 cm). Courtesy of Paul M. Hertzmann, Inc., San Francisco

Figure 4. *'The Pool of Siloam, Jerusalem' in an 1862 edition of the bible. (Francis Frith)*

However, there were also geopolitical reasons beyond the theological cause for the specific Anglican focus on the Palestinian landscape. At the beginning of the nineteenth century, aside from the Muslim presence in Jerusalem, political representation was divided between the Jews and four Christian churches: Catholic, Greek Orthodox, Armenian and Coptic. Protestants were not recognised as a legitimate religious presence in the city and it took the brief period of Egyptian rule over the city, between 1831 and 1840, to allow them to establish themselves there. When Ottoman rule returned, it relied heavily on the support of external powers, predominantly the French and British, to overcome the Russian forces at Krims (1854-56). Foreign assistance on the battlefield was reciprocated by granting the Western Christian churches expanded jurisdiction and the freedom to operate in Palestine in general and in Jerusalem in particular. However, while other churches were already deeply embedded in the Old City, the Anglican Church was relegated to the geographical sidelines, forcing it to divert its attention away from relics and church buildings and concentrate instead on portraying the landscape itself, its daily life and terrain, as

36 Alexander Keith, and Arthur Penrhyn Stanley. Evidence of the Truth of the Christian Religion Derived from the Literal Fulfilment of Prophecy; Particularly as Illustrated by the History of the Jews, and by the Discoveries of Recent Travellers. With a Refutation of the Rev. A.P. Stanley's Poetical Interpretations. London T. Nelson, 1859. p. 98

a manifestation of the sacred.[37]

The travellers and biblical researchers who made their way to Palestine in increasing numbers during the first half of the nineteenth century recorded their exploits – so much so that in 1852 a critic wrote in an Edinburgh magazine: 'Let us suppose we read, say for instance, only a few of these all but daily Oriental productions, Alas! we read them all! Yes; there they are; the same Arabs, camels, deserts, tombs and jackals that we journeyed with, rode on, traversed, dived into and cursed respectively, only a week ago, with some other traveller.'[38]

During the first twenty-five years of photography's existence, between 1839[39] and 1864, twelve British photographers were operating in Palestine. Some were religiously motivated clergymen with photographic interests, while others such as Francis Frith and Francis Bedford were leading figures of British photography. Photographic societies, publications, panoramas and stereoscopes, as well as religious societies and expeditions, gradually established the photographic medium as an integral and essential medium through which to argue for a religious and (British) national affinity to the Palestinian land. However, a new stage in the relationship between science, imaging and imperial control began with the establishment of the PEF and the work of the British army's Royal Engineers in Jerusalem in particular.

On the 3 October 1864, the first British surveying expedition to Palestine started work on finding a level plane from which to draw their triangulation map of the environs of Jerusalem. With the use of chain and theodolite, the surveyors were able to create a spatial transcoding of the physical terrain for the very first time. Their original aim was to establish accurate measurements of the ground level from the Mediterranean to the Dead Sea that would facilitate the construction of a new water system for the Old City, in order to improve its sanitation. This new mode of cartographic abstraction stripped out all but the bare topography of the surface, any man-made structures or vegetation were erased from the image, creating a clean slate – an analogue version of the later Digital Terrain Model (DTM). This ability to treat the spatial amalgam of physical things as separable elements within an accurate image represented the first application of nineteenth-century scientific rationality to the idea of the 'Holy Land' (a process that was in its infancy worldwide). The different levels of terrain and sub-terrain, vegetation, water, land use, structures, names and technical data all appeared as layers in this visual mapping system based on the new

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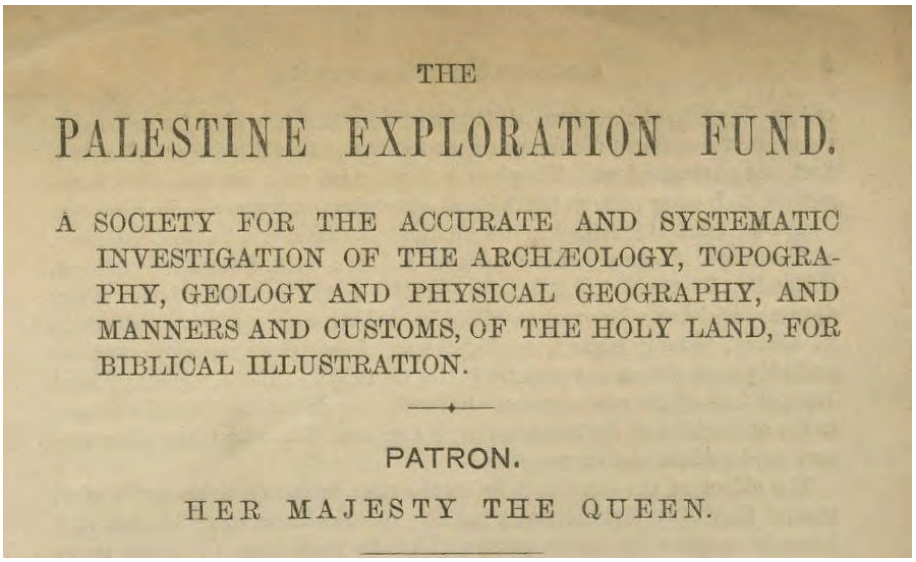
37 'The Churches of the Holy Sepulchre or of the Holy House may be closed against us, but we have still the Mount of Olives and the Sea of Galilee, the sky, the flowers, the trees, the fields, which suggested the Parables, the 46 holy hills, which cannot be removed, but stand fast for ever' (Arthur Penrhyn Stanley, Sinai and Palestine: In Connection with Their History. London: John Murray, 1856), p. 473

38 Cited in Eitan Bar-Yosef, The Holy Land in English Culture 1799-1917: Palestine and the Question of Orientalism, Oxford English Monographs, Oxford: OUP, 2005, p. 67.

39 The first photographic image of Jerusalem was a daguerreotype from 1839 made by Horace Verne a mere few months after Arago's announcement in Paris.


THE

PALESTINE EXPLORATION FUND.

A SOCIETY FOR THE ACCURATE AND SYSTEMATIC INVESTIGATION OF THE ARCHÆOLOGY, TOPOGRAPHY, GEOLOGY AND PHYSICAL GEOGRAPHY, AND MANNERS AND CUSTOMS, OF THE HOLY LAND, FOR BIBLICAL ILLUSTRATION.

PATRON.

HER MAJESTY THE QUEEN.

Figure 5. *Detail from an early PEF publication (PEF/1865/1/84/1). (Copyright: Palestine Exploration Fund)*

Figure 6. *A detail from Charles Wilson's 'Survey of Jerusalem 1864–1865' showing the Old City and its surroundings. The water cisterns are shown in blue.*

three-dimensional method of surveying employed by the Royal Engineers.

The Survey of Jerusalem, published by the newly formed PEF in 1865, comprises three volumes of notes, maps and photographs. Led by Charles Wilson, the expedition included photographer James MacDonald and Francis Ferris, John McKeith, John Davison and Thomas Wishart, all members of the Royal Engineers. They arrived at the port of Jaffa and

from there began to set their west-east triangulation grid.[40]

The official aims of the survey were to carry out:

- levelling from the Mediterranean to the Dead Sea;
- a geological structure of the country;
- a topography of the city and its environs;
- a detailed plan of the city;
- a detailed analysis of its water supply (in ancient and modern times); and
- a detailed survey of the holy sites around Jerusalem and its environs.

Archaeological excavations were not an official part of the survey but were conducted at Wilson's request, with the aid of the British consulate, local officials and landowners. In principle, it was clearly stated that the surveyors should refrain from introducing their religious aspirations and thoughts into their work, even (and perhaps particularly) in and around the Christian 'holy sites'. At the same time, however, it is clear from the protocols of the PEF's first meetings and its list of directors that the implementation of science married to biblical textual exegesis was encouraged. Thus, Wilson's expedition began a certain amount of archaeological exploration and excavation, specifically beneath Jerusalem, both inside and outside the city walls. As Wilson recounts:

> *Last week I made an expedition with Dr Chaplin through a passage cut in the solid rock to conduct the water from the Kedron Valley into the Pool of Siloam. At first we were able to stand up, but were soon brought down to our hands and knees, and for some distance had to lie down on our sides and wriggle along like eels: not a comfortable sort of locomotion at any time, but when it has to be done in six inches of water and mud, dreadfully unpleasant. There was just room between the water and the top of the passage to carry our heads along and breathe. I was leading, and managed to carry my candle through in safety, but Dr Chaplin lost his, and got several mouthfuls of dirty water in forcing his way through […] I find much less difficulty than I expected in getting about to different places, and, from working quietly at first, have established a sort of right to go wherever I like, and the inhabitants are now quite accustomed to see my head suddenly appearing out of wells and cisterns. The greatest difficulty I have is in getting into the interior of private houses, especially amongst the Jews, and they live just in the place where I want to work, in what is called by Josephus the Lower City.*[41]

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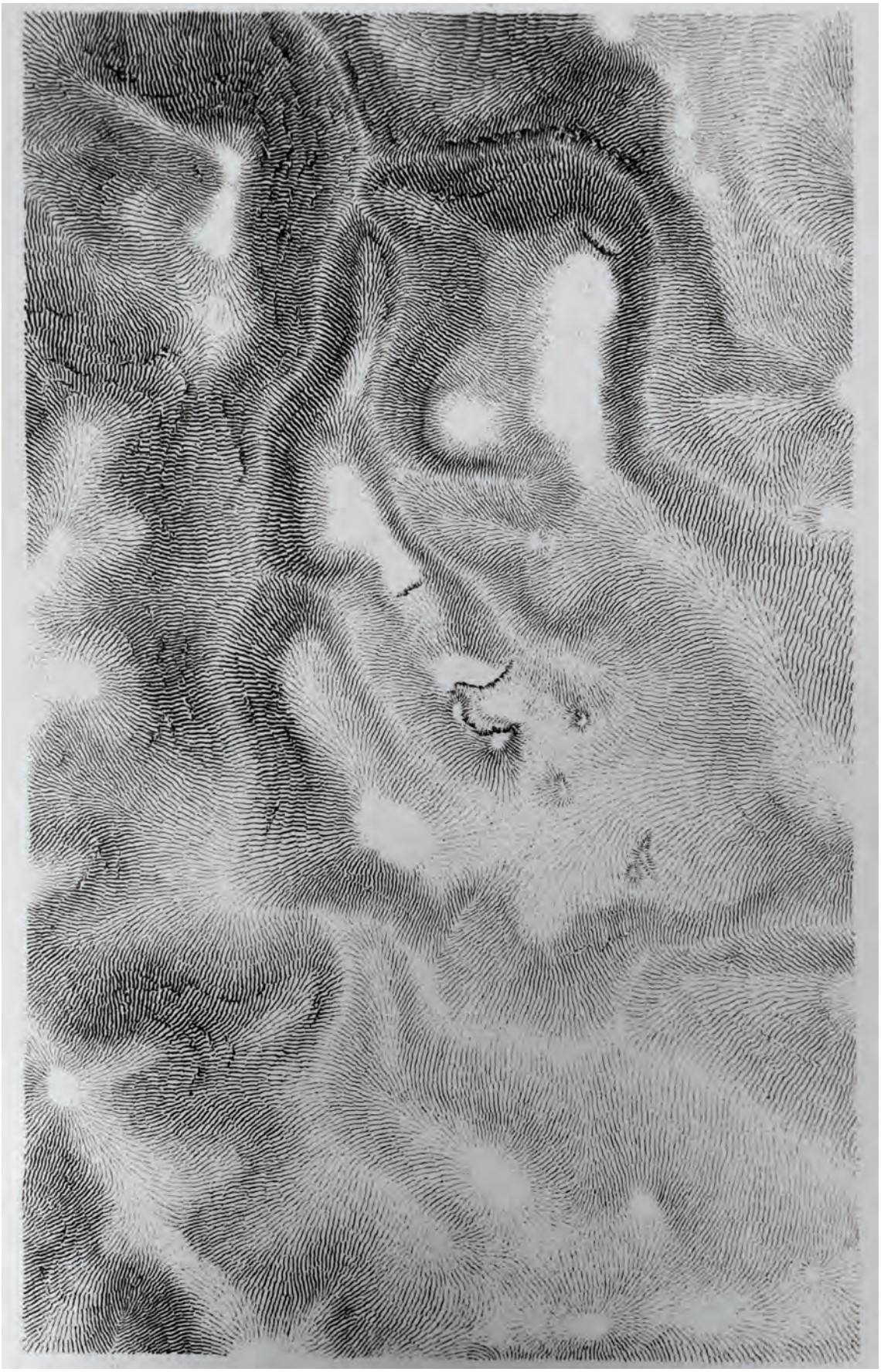
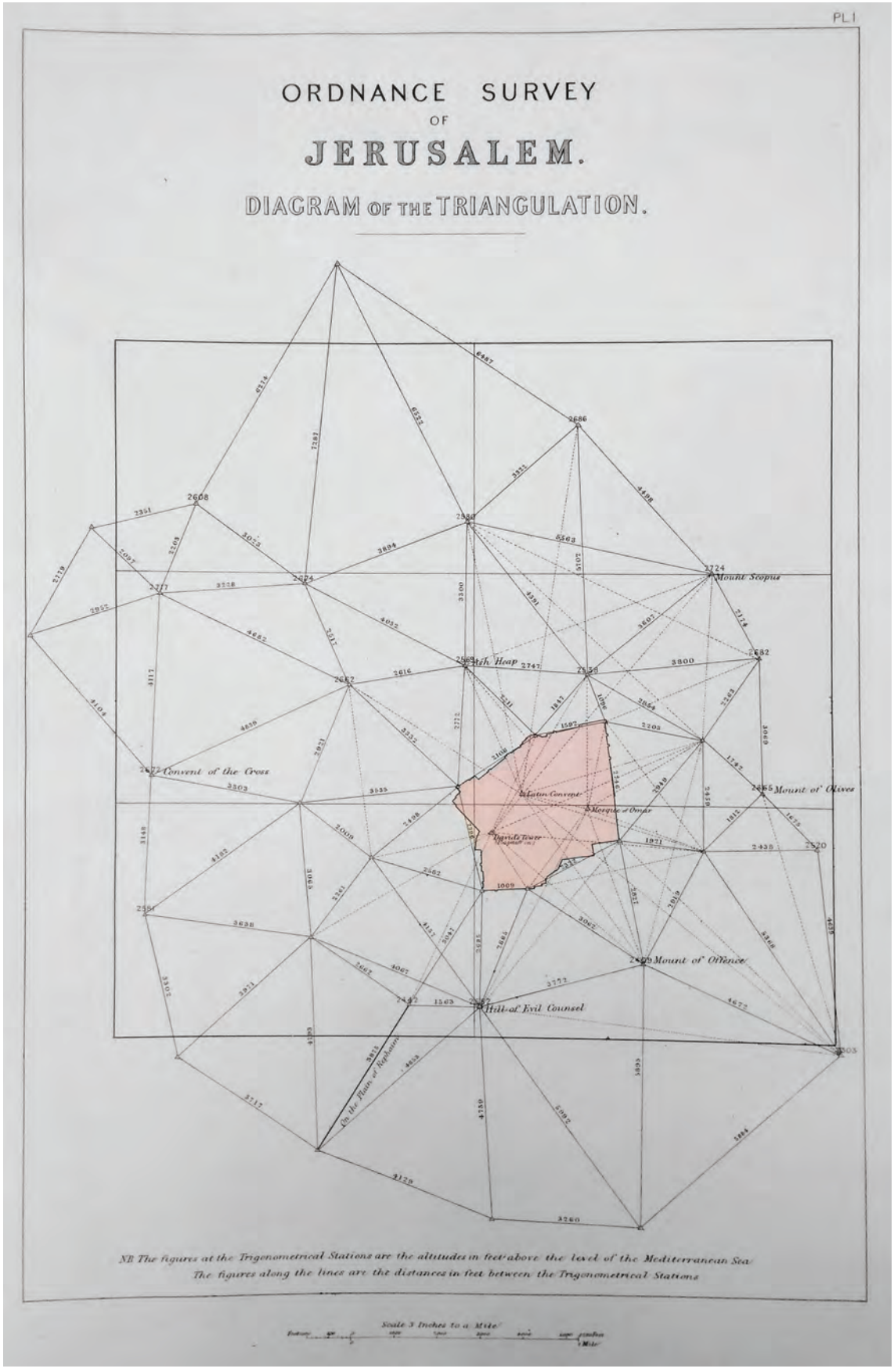
40 "The survey of Jerusalem originated in Miss Burdett Coutts' wish to provide the city with a better water supply. She was told it was first necessary to make an accurate survey of the city […] I happened to be in the room of one of the officers when he received the letter offering him the appointment; he said he would not go, and I then asked him, in writing his report, to say that I would go. I had only once seen Sir H. James before, and was therefore a little surprised when he accepted my offer. I was generally considered to be going on a fool's errand; many believed I would come to grief in money matters; and men who had had previous experience in Palestine and Jerusalem told me they did not believe the Turkish officials would allow me to survey the city. The only man who gave me any encouragement and said he thought I had done right, was the late General H. D. Scott, R.E. I went out and surveyed not only the city, but the mosques and sacred area, and only exceeded the estimate by a few pounds, the excess being due to our being jammed in Egypt during the cholera epidemic of 1865" In Charles Moore Watson, Life of Major-General Sir Charles William-Wilson, Royal Engineers, London: John Murray, 1909, p. 42.

41 Watson, Life of Major-General Sir Charles William-Wilson, pp. 47-48.



Figures 7. *Ordnance survey of Jerusalem, made under the direction of Col. Sir Henry James. Illustration of the topography.*



Figures 8. *Ordnance survey of Jerusalem, made under the direction of Col. Sir Henry James. Diagram of the Triangulation.*

Beside the notes published as part of the survey, a volume of photographic views was paired with each site, along with several survey views from each of the four directions overlooking the Old City.[42] Photography was mainly confined to outdoors or to very specific interiors with sufficient light and ventilation. Glass plate had a low sensitivity and powder-burning flash 'units' were impossible to use underground or in constricted quarters as the smoke would obscure the picture and render breathing problematic; the only effective means of record underground were drawings.

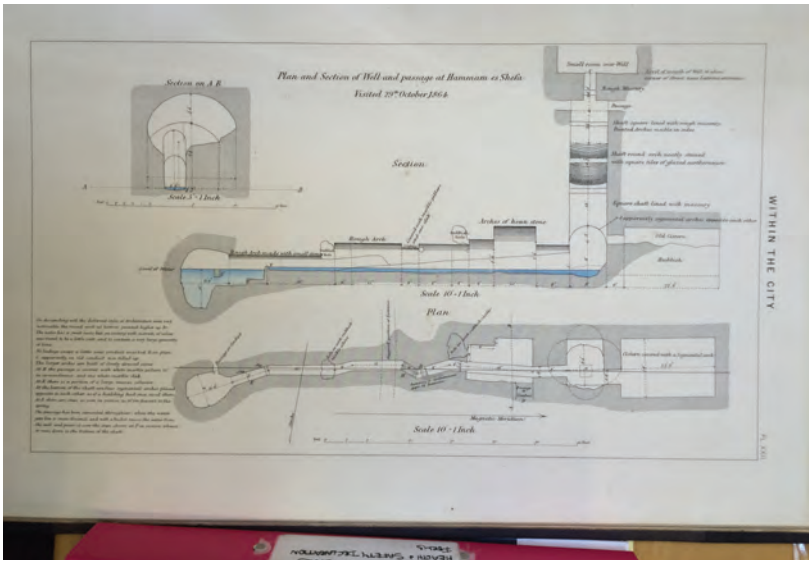


Figure 9. *A plan of a section of the wall and passage at Hammam es Shefa, Warren Expedition 1864.*

The second exploration of Jerusalem's terrain in February 1867 was concerned less with the infrastructural and more with the mythical as Warren and his excavation/survey team descended underground, evading the Ottoman Pasha's gaze, in search of the ancient remains of the Temple of Solomon:[43]

> *Accordingly, I picked out a spot along the south wall, about eighty feet from the south-west angle, concealed behind some prickly pears, where we worked down along the wall in security; at the same time I also commenced another shaft at the south, about forty feet from the wall in the open, for at that distance it was not supposed I could get near the wall itself. We mined in this case down to the rock, and then run along its surface until we reached the great wall, and there we commenced our work, examining the masonry.*[44]

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42 The PEF houses collections of photographs from a wide range of researchers including photographs taken by independent travellers such as Arthur Langley and Robert Pitt; Derek Riley's research collection of aerial photographs of archaeological features in Israel; Robert Bewley and David Kennedy's aerial photographs of archaeological sites in Jordan; and Iain Browning's photographs of Petra, Jerash and Palmyra.

43 A more comprehensive description of this first underground excavation is given in the first section of Chapter Three, where the ways in which this 1867 expedition set the ground for the strand of biblical archaeology adopted by the Elad in Silwan roughly 120 years later.

44 Charles Warren, Underground Jerusalem, London: Richard Bentley, 1876, p. 148: https://archive.org/details/undergroundjerus00warruoft/page/322. (Accessed 10 March 2019)

The photographs produced by Warren's expedition (1866-67), taken by Henry Philipps, covered a much wider area than MacDonald's had during the previous survey; however, Philipps' series of images lack the cohesive clarity of the latter. The two areas where he managed to expand on MacDonald's images were portraiture and close-ups of objects. In this second expedition, the role of the photograph seems to have been much more varied, shifting from providing an objective record of the survey to interacting with the reportage, enhancing the feeling of the 'event'.

Biblical archaeology, therefore, became a field in itself primarily due to the actions of the PEF, taking on the mixture of scientific professionalism and religious spirit that imbued all the PEF's material finds and written documents. The research produced throughout its years of surveying, cartography and archaeological, geological and botanical research became the basis for all subsequent exploration in these respective fields in Israel/Palestine. The first decades of the twentieth century, however, saw the PEF's position as the main organising entity in the area recede as the British Mandate assumed sovereignty and its governmental, university and military departments were commissioned to carry out much of the PEF's tasks. French,[45] British, US and increasingly Zionist teams conducted research, mapping and infrastructural development throughout Jerusalem. The first extensive mapping of the Ophel was conducted in 1923, preceding renewed archaeological excavations in the area, and in 1936 a survey of Jerusalem at the scale of 1:2500, commissioned by the British Mandate, updated the 1865 Wilson survey. The establishment of British rule in Palestine meant that the focus shifted to the daily management of the city and to secular as opposed to religious concerns.

A further consequence of Palestine's incorporation into the British Empire was the rise of national movements, both Zionist and Palestinian. Zionism, which came into being at the close of the nineteenth century, although secular in fact represented the nationalisation of religious messianic conceptions, not their replacement. God was excluded from the discourse, yet the idea of the 'divine promise' continued to direct political activity and to serve as a source of legitimacy. In the main streams of secular Zionism at the time, this legitimacy was not connected to the material properties of the land. However, as messianic conceptions began to influence political, military and municipal decisions, the question of legitimacy gradually became inseparable from the material. Messianism was no longer viewed as the antithesis of concrete reality, a critique of what is and addressed only to the future; rather, messianic redemption was seen to spring from events taking place in the present and was embodied and realised in these events. Thus, everyday physical reality was infused with the symbolic. Religious, redemptive beliefs assumed concrete realisation in the Zionist foundation of the state of Israel and its policy of a Jewish return to the land

45 'Plan de la ville de Jérusalem dressé en 1888 par l'abbé Henri Nicol', Gallica, 1888: https://gallica.bnf.fr/ark:/12148/btv1b84436309. (Accessed 5 April 2019).

and its settlement. From this perspective, with every unearthing of a wall, a shard of pottery, coin or stone, a new layer of obstruction was stripped away, bringing the Jewish people a little closer to their ancient past and to their future redemption. Elad's excavations in the City of David, therefore, follow the ideological model that dates back to Warren: a return to the biblical archaeological practice, metaphorically holding a shovel in one hand and a bible in the other.

Cultural heritage: surveying and excavating the Old City of Jerusalem

When analysing the impact of an archaeological site in a cultural-heritage context, we have to consider the wide range of values that attach to it depending on the identity of the stakeholders and those who are de-facto marginalised by it, as well as its socio-economic and cultural value for both the present and the future, the traces of its colonial structure, and the relations between the current structures of power and archaeological knowledge. All these factors find articulation in the site. The Universal Declaration of Human Rights (UDHR) in 1948,[46] and later the 2005 FARO Convention,[47] established international guidelines concerning rights of ownership in cultural heritage sites. Yet those managing, developing and promoting the Israeli/Palestinian sites in many cases have quite different aims and outlooks from those of the communities that inhabit the areas where the sites exist. In some cases, the excavations continue under a different guise but with the same colonial or messianic purpose that motivated their origin and subsequent trajectory.

Since 1993, the care of archaeological sites in Israel and the Palestinian or Occupied Territories has been divided between the two national archaeological authorities, the IAA and the Palestinian Archaeological Authority (PAA). On the Temple Mount, all jurisdiction, including archaeological jurisdiction, rests with the Jerusalem Islamic Waqf, a trust that manages Muslim religious edifices, supported and backed by Jordan. Under international law, in certain areas of the West Bank, Israel as an occupying power can only carry out salvage excavations.[48] Many therefore regard the removal of artefacts from their original location, let alone transferring them to Israel, as a further breach of international law. The responsibility for Israel's archaeological activity in the Occupied Territories rests with the staff officer for archaeology (SOA), a member of the Israeli civil administration. At first, the SOA carried out excavations in cooperation with the IAA but increasing archaeological surveyors from abroad have reduced the work of the SOA to that of doc-

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46 UDHR 1948, Article 22; see also ICESC 1966, Part 1, Article 1(1); Part 3, Article 15(1)).

47 'The Council of Europe Framework Convention on the Value of Cultural Heritage for Society' (Council of Europe 2005, Section 1, Article 4(a); see also Preamble; Section 1, Articles 3(b) and 6(a)).

48 "A systematic investigations, often partial, precipitated by development pressure or the need to rescue remains prior to their destruction. Based on the premiss that some work is better than none, salvage archaeology is the main source of archaeological information in areas where remains are constantly under threat. Because salvage archaeology is threat-led, it is only rarely possible to be selective about what is examined, and time constraints often mean that many of the more refined techniques of data recovery cannot be deployed. Known as rescue archaeology in Britain." In Oxford Reference. "Salvage Archaeology - Oxford Reference." Accessed April 10, 2019. https://doi.org/10.1093/oi/authority.20110803100438850.

umentation and oversight. Due to the extreme political and diplomatic sensitivity of any activity in the Holy Basin area, Israeli jurisdiction was transferred from the SOA to the prime minister's office.

Over the past few decades, archaeological excavations in and around the Old City have been carried out solely by the IAA. However, in most cases, the IAA acts as merely a service provider, contracted and funded by private entities and NGOs to carry out the digs. Jurisdiction itself has been parcelled out to several organisations and interest groups, the four main ones being the Western Wall Heritage Foundation (previously under the auspices of the Ministry of Religion, it has been directly connected to the prime minister's office since 1988), Elad (Silwan and the City of David), Ateret Cohanim, the Nature and Parks Authority (the green belt around the city walls and, previously, the City of David compound) and the Jewish National Fund (the JNF holds some private property and land in Silwan). Underground excavation sites stretch from the north of the Old City to the Pool of Siloam in the south, including sites such as Zidkiyahu's Cave, the Ohel-Yitzhak Synagogue ('Isaac's tent synagogue'), and the City of David and Western Wall tunnels. Within the Waqf's Temple Mount areas of jurisdiction, the areas of excavation include Solomon's Stables and the controversial Bab al-Rahma prayer site.

Remapping The Holy

In a fascinating paper, Alona N. Shiftan and Oryan Shahar[49] dissect further Zionism's relationship to the Jewish historical presence on the land using the perspective of the division between secular hegemony and the 'folklorish' religious beliefs of the population: that is, between the biblical archaeology of the former, with its belief in a continuous Jewish presence, and the Talmudic diasporic narrative of the latter, leaping over the time between exile and redemption. These two main approaches could be described, respectively, as 'the continuum' and 'the leap'. The 'leap' views the Zionist revival as one that follows the 2,000-year 'hibernation' of the Jewish people after their exile from the land in Roman times. The 'continuum' does not negate either the existence of life in exile or the continuous existence of Jews in the land of Israel; it embraces both exile and local existence and seeks to connect with both.

One way in which a gradual link between a Jewish presence throughout the history of Palestine and the newly formed Israeli state was (and still is) achieved is through the mapping, rejuvenation and promotion of numerous 'holy sites' across the country. Former head

49 Alona Nitzan Shiftan and Oryan Shahar, 'עולם מעגלי, עולם ישר זוויות: בין תל חצור לקבר חוני המעגל', Zehuyot 5 (2014).

of the ministry of religion Shmuel Zanvil Kahana, for example, created a 'map of holiness'. In his capacity as head of the Holy Sites Authority during the 1950s and 1960s, Zanvil compiled a list of all Jewish sacred sites, large and small, across the country. These included tombs, antiquities, historic places of worship or simply locations in which an event of sacred significance was held to have taken place. The two main approaches outlined above co-exist within his treatment of the ancient sites. Zanvil used his position in the ministry of religion to take on the project of identifying and reviving all the possible sites of worship that was initiated by President Yitzhak Ben-Zvi, who undertook extensive research into the origins of the communities and geography of Israel/Palestine.[50] In many cases (and here the history of this movement touches more closely on the issues informing my research), the sites themselves had to be re-erected and even created anew. Often, these sites were of pagan origin or were part of the ritual of other faiths; thus a process began by which the sites were 'converted'. An architectural practice informed by a newly articulated aesthetic was put to work to bring the sites to 'life', to render them functional. Graves, caves and synagogues were to be turned into functioning tourist sites without losing their 'authenticity', even to the extent of artificially creating an 'authentic' vernacular to solidify the connection of this essential facet of Jewish religious life to the land itself. Some sites, such as Elijah's Cave in Haifa and David's Tomb in Jerusalem, underwent a forced conversion from Islamic or Christian sites to places of Jewish worship, and an invented religious folklore was attached to them.[51]

This 'map of holiness', which was aimed at anchoring the abstraction of Jewish sovereignty to the concrete geography of the land, was materialised through architecture and by setting the Israeli population in motion, creating a wave of movement in the country to and from the sites. In a reflection of the process of triangulation, the map sets the start and end points of this movement, shaping the route itself and creating an area of religious influence. In the process, the scenery en route to a holy site accrues some of its cargo of 'holiness'. By demarcating these sites on the map, Zanvil cast a net over the entire country. The fact that the development of each site (and of all the sites as a whole) lay under the jurisdiction of the ministry of religion deepened the link between construction, archaeology and development, and strengthened Zionist beliefs. Hence, each time a single artefact is unearthed the spread and potency of a site's claim to sacred status is intensified.

Zanvil's operations of amplified immanence were echoed after 1967 across the Green

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50 Yitzhak Ben-Zvi, Israel's second president (1952-63) founded the Institute for the Study of Jewish Communities in the East, affiliated with the Hebrew University of Jerusalem, in 1947. The institute was set up 'for the purpose of studying documents, manuscripts and printed material relating to the history, communal life and culture of the Jewish communities under Islam and in other countries of the Middle East and Asia; for initiating and supporting research on these subjects; and for publishing monographs and texts reflecting the history and cultural activity of these communities' (Yad Izhak Ben Zvi, 'Ben Zvi Institute': http://www.ybz.org.il/?CategoryID=278. (Accessed 3 April 2019).

51 Doron Bar, 'Holy Places or Historical Sites? Defining Sacred and Archaeological Sites in Israel, 1948-1967', Cathedra 154 (2015): 137-62.

Line by the nationalist religious Gush Emunim movement,[52] on the one hand, and by the actions which began to take place in the 'emancipated' Old City, on the other. Here too, the ministry of religion was the first to implement a combination of religion, science (archaeology and architecture) and imaging in the bid to forge a new reality out of an idealised past that is then projected onto a desired future, disentangled from the unwanted aspects of the present.

Surface And Sanctity

[W]hen possession is taken of a territory – that is, when its exploitation begins – rites are performed that symbolically repeat the act of creation: the uncultivated zone is first 'cosmicized' then inhabited.[53]

Over the course of a few hours, just days after the 1967 conquest of the Old City, Israeli bulldozers razed the entire Mughrabi Quarter adjacent to the Wailing Wall. However, this was the last time the Israeli regime was able to significantly change the built fabric of the Old City; from then on, it could only operate through more incremental, smaller-scale operations. By these means, the heavily populated and densely built environment has gradually come under control of the Israeli regime. It has achieved visual domination of the rooftops, as well as taking over key points on the ground, the most prominent being the headquarters of the border police in the Mahkame building overlooking the plaza at the Western Wall and the western entrance to the Temple Mount. A concentrated network of street-level cameras has been established to overcome the problem of finding a clear line of sight from above due to the city's dense network of sheltered alleyways. But although the surface level could be registered, it could not be effectively influenced, controlled or moulded.

Both the built environment and archaeological explorations serve as a mechanism of vision, directing the gaze and the movement of the body.[54] They equally determine the trajectory of the imagination. By way of inversion,[55] the mechanisms of vision, in the form of remote sensing, have become an integral part of architectural, engineering and archae-

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52 'Gush Emunim (translated as 'Bloc of the Faithful') was an extra-parliamentary national-religious movement advocating Israeli sovereignty in the Golan Heights, Gaza Strip, Judea and Samaria by a massive civilian presence in these territories. For this purpose, the movement not only promoted settlement, but acted to promote education, social projects, immigrant absorption, and propaganda. Gush Emunim called for coexistence with the Arab population and negated the principle of transfer as advocated by Meir Kahane. Its ideological inspiration was derived from the teachings of Rabbi Zvi Yehuda Kook, according to which the purpose of the Jewish people is to gain physical and spiritual salvation through living in and developing Eretz Yisrael (the Land of Israel); the sanctity of Eretz Yisrael obligates seizing it after it was freed from foreign rulers, and therefore it must be settled even against governmental policy' (Israeli Knesset website, 'Gush Emunim': https://www.knesset.gov.il/lexicon/eng/gush_em_eng.htm. (Accessed 3 April 2019).

53 Eliade, Mircea. Myth of the Eternal Return: Cosmos and History. Princeton, NJ: Princeton University Press, 2018.

54 Eyal Weizman, Hollow Land: Israel's Architecture of Occupation, London; New York: Verso, 2007. See also Eyal Weizman, Forensic Architecture: Violence at the Threshold of Detectability, Brooklyn, NY: Zone Books-MIT, 2017; Nadia Abu El-Haj, Facts on the Ground: Archaeological Practice and Territorial Self-Fashioning in Israeli Society. Chicago: The University of Chicago Press, 2001.

55 See the discussion on perspectival inversion in Chapter Two on the spatial photograph, which describes how the inversion of perspective turned the camera obscura and single viewpoint perspective into a multi-viewpoint projection of images as virtualised objects.

ological processes, offering the possibility of (proxy) contact. Remote sensing allows the viewer to access a location where their physical presence would be dangerous or forbidden, enabling them to control it virtually.

Although, above ground, Jewish-Israeli construction was limited to the Jewish quarter, the furthering of Jewish control could proceed relatively unhindered underground. Thus, the cooperation between the ministry of religion and the fields of architecture and archaeology which began in the 1950s was able to continue, and the first official Israeli underground excavation began underneath the houses of the Muslim quarter, close to the Western Wall. Through the efforts of several other interested organisations, such as Elad, this was extended from Silwan in the south to the northern edge of the walls of the Old City. Underground tunnelling had allowed Warren to conceal his activities from the watchful eye of the Ottoman ruler as he dug for the first time beneath the walls of the sacred Temple Mount; in a similar fashion, as Elad's excavations began during the late 1980s and early 1990s, part of their reason for operating underground was related to the illegality of their project. It is of course necessary to dig below the surface in order to reach the archaeological strata; however, scientific developments, since the very early 1900s, have also enabled the use of a top-down stratigraphic method which systematically and meticulously documents small, parcelled segments, rather than the traditional method of vertical shafts opening out into a horizontal excavation within single, narrow sections of historical strata. This horizontal process encourages selective vision, filtering out unwanted layers of archaeology that contradict the overall narrative and dislocating the site from both its above-ground and underground heterogeneity and context. Moreover, the use of tunnelling to achieve a 'simpler' field of vision is also asserted through the dramatic enhancement of larger areas of the site such as the Fountain House, which has been specifically designed to act as backdrop for a multimedia, semi-holographic light-and-sound show. Here, the mix between architectural vision and modelling still uses the relatively traditional jargon of the theatrical audio-visual multimedia show.

The rationale behind both the tunnels and the 3D reconstructions is in part scientific, as the tunnels are not strictly defined by Elad and the IAA as archaeological digs but as the restoration of an existing pathway that dates from the time of the second temple, dictating the route taken by the excavation and its horizontal nature. In the case of the 3-D reconstructions, Elad published a basic document or report (available for download),[56] written by a consultant archaeologist, which details the aesthetic decisions behind the virtual

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56 Ir David Foundation. "עיר דוד." הרקע המחקרי למיצג האור קולי של ירושלים הקדומה במרכז המבקרים עיר דוד. Accessed April 27, 2019. http://www.cityofdavid.org.il/article/%D7%94%D7%A8%D7%A7%D7%A2-%D7%94%D7%9E%D7%97%D7%A7%D7%A8%D7%99-%D7%9C%D7%9E%D7%99%D7%A6%D7%92-%D7%94%D7%90%D7%95%D7%A8-%D7%A7%D7%95%D7%9C%D7%99-%D7%A9%D7%9C-%D7%99%D7%A8%D7%95%D7%A9%D7%9C%D7%99%D7%9D-%D7%94%D7%A7%D7%93%D7%95%D7%9E%D7%94-%D7%91%D7%9E%D7%A8%D7%9B%D7%96-%D7%94%D7%9E%D7%91%D7%A7%D7%A8%D7%99%D7%9D-%D7%A2%D7%99%D7%A8-%D7%93%D7%95%D7%93.

models of the City of David in the Fountain House video – currently the NGO's main public presentation for the site. The report describes each segment of the model, from the choice of maps and the estimated measurements of the underlying ground level at the time of the temple to all the various structures' measurements and the city plans. Yet the basic premise behind the model, which aims to focus attention on the Jewish first-and-second-temple periods, is the erasure of potentially conflicting narratives and the radical simplification of a place with multiple possibilities and gaps in knowledge.[57]

The map provided at the entrance to the City of David site gives a somewhat cartoonish (simple yet dense and informative) overview of the routes, their historic and archaeological significance, and the interconnection of both the physical site and its history with the wider Jewish surroundings. In fact, apart from one word in English denoting the name of the Palestinian village where the actual site resides (in the map it is located at the very edge), there is no indication of a non-Jewish presence in either the past or the present. Providing the visitor does not look beyond the compound's diffuse boundaries, there seems to be quite a striking correlation between the map and reality. On the site itself, the visitor is immersed in a purely Jewish environment, peaceful and rich. However, if they took one step outside the compound – a threshold unmarked by anything other than a sudden change in the nature of the infrastructure – they would find themselves in the midst of a very different urban environment: dense, underdeveloped, Palestinian, and would encounter an immediate shift in the intensity of the ambient volume and light.

To visit the City of David, therefore, is to enter an embedded experience. Moving through the site is a vertical as much as a horizontal affair – as the visitor is constantly reminded by signs, texts, tour guides and by the 3D movie at the start of the tour. This is because verticality is not just a spatial orientation but (in archaeological terms) one that involves time: moving deeper underground allows us to 'go back in time'. As this is not a professional but an experiential location, this 'time travel' is not presented as an intellectual experience; rather, it is an emotional one. The directors of Elad and the administrators of the City of David project have tapped into the mixture of religious emotion, excitement and sense of scientific discovery that first drove Warren to excavate this location in 1867. What is most questionable, however, is not just the methodology but the disproportionate weight given to some of the factual data, the way it is interpreted and the connections that are drawn, creating apparently scientifically proven conclusions where none should logically and factually exist.

The Israeli authorities' scopic regime of control operates through a dual process of intense surveillance of the local Palestinian population while simultaneously diminishing

57 An example of one such moment in the film comes when the height of the temple's structure is unclear to researchers, in the reconstruction, the top half of the architecture is obscured by the simulation of gods light.

***Figure 10**. A tourist map of the trails in the City of David site. (Ariel Caine, 2017)*

their visual presence through the architectural, structural and media reconfiguration of the landscape. It might be that the division between secular Zionism and religious Zionism is in fact moving towards a division between the civil state and an ethno-theocracy. As Shlomo Sand points out, the conflation of contradictory points – Judaism as a religion and the attempt to construct a secular Judaism that constitutes a nationality – is not (easily) sustainable.[58] This type of 'imagined community' relies on highly contested secular points of connection, and religion is increasingly asserting itself in an uncompromising and messianic fashion in order to justify its presence in the national territory.

The differentiation between above and below ground emanates from a logic that is foreign to the point cloud. In the computer model, there is no in-out-up-down-front-back, and this fundamentally affects the ability of the user to manoeuvre within it. Of course, this orientation data is registered within the file, but it is manipulatable, an elastic starting point from which to begin working. I would argue that the promotion and creation of the underground site is reminiscent of this point-cloud logic. The connection and subsequent conflation of several sites, time periods and styles and the confusion of many layers of strata draw directly from the potential for expanded manoeuvrability that is encountered

58 'When we went into exile, our nation was uprooted from the soil in which the Bible had grown, and torn from the political and spiritual reality in which it had formed [...] In exile, our nation was disfigured and the image of the Bible likewise deformed. Christian Bible researchers, with their Christian and anti-Semitic aims, turned the Bible into a plinth for Christianity, and even Jewish commentators, who had been removed from the environment of the Bible, its spiritual and material climate, could no longer understand the Holy Book properly. Only now, when we are again a free nation in our country, breathing once more the air which enveloped the Bible as it took shape, has the time come, I believe, in which we can perceive the nature and truth of the Bible, historical, geographical, as well as religious and cultural' (David Ben Gurion as quoted in; Shlomo Sand, The Invention of the Jewish People, London; New York: Verso, 2010).

in the imaging world. In an area of the Elad tunnel, between the Shiloh [Siloam] Pool and Robinson's Arch, the chosen path follows a road from the second-temple era which leads from the pool to the Temple Mount. But instead of excavating the road itself (which is located below the present-day Wadi Hilwe road), a choice was made to excavate the Roman sewage tunnel running below the ancient road. This could have been due to practical reasons (the tunnel has been preserved whereas the road is not defined, making its excavation more difficult), but it also helps generate a sense of disorientation in the visitor and a dramatic amplification of their physical environment. Walking along the sewage tunnel, they can see and touch the undersides of the paving stones of the old road, giving the impression that they are directly below the surface of a first-century structure. Listening to stories of Roman destruction and Jewish resistance, it is easy for the visitor to forget that they are not under a Roman street at all but below a Palestinian living room.

Similarly, the Fountain House – which, like the terraced structure, should be an open site – is housed in a huge concrete building which gives the illusion of being part of the underground network, connecting the different tunnels physically as well as virtually (in its computer models). This promotes the further virtualisation and flattening of the temporalities between the archaeological layers, and in turn strengthens belief in the 'leap theory' described earlier in the chapter, which draws a direct line between the ancient Jewish kingdoms (underground) and a restored Jewish sovereignty in the present (at ground level).

Jerusalem was resettled in the day of the Second Temple and then it was ruined by the Romans. For 2,000 years, the city passed from hand to hand but the Jewish people never forgot its eternal capital. Towards the end of the 19th century, when the new neighbourhoods were built outside the walls of the Old City, the Meyuchas family was the first to build its home in the City of David. On the opposite slope, a neighbourhood of Yemenite Jews was established and later abandoned. However, in the early 1990s, the Ir David Foundation re-established a Jewish residential community in the City of David within the national part surrounding the walls of Jerusalem.[59]

The heterogeneity of the archaeological strata and of the different ethno-religious backgrounds of those who lived during these periods are, in most cases, registered and mentioned in the research papers published by the excavators, but the promotional presentations to the public marginalise this information in a way that renders their existence negligible.

In Judaism, exile is not only a geographical or temporal condition; rather, it is primarily a metaphysical one, reflecting the individual's status in the eyes of God. Its opposite is a

59 A transcript of the narration in the 3D promotional film displayed in the City of David archaeological site.

state of redemption, reflecting divine favour. This banishment from divine favour is also reflected in the distance of the Jewish people from a return to their land. A Jew can stand on the Temple Mount yet still be in exile. What determines the end of exile is not the 'homecoming' but a sign that their metaphysical condition has changed, that the time for redemption has arrived. Added to these orthodox interpretations of the condition of exile is an approach that corresponds more closely to the issue of ritual and practice. Exile, as a potential condition, has been translated from the grand scale of the nation to the microcosm of the individual. This is clearly seen not only in the liminal phase of the story of Abraham, the foundational mythic cornerstone of the Abrahamic traditions, but also in the acts and writings of the prophets who performed rituals of exile and distancing as part of an inward process.[60]

By contrast, Israeli religious-national rationalisation and theorisation are imbued with a connection to technological and scientific empirical proofs. Secular nationalists tied the newly formed state (and still do) to its geographic location through the promotion of biblical archaeology, linguistics, anthropology and to some extent even genetics.[61] The Israeli state sought material proof of a religious association with the geography of Palestine in order to bolster its metaphysical claim, and it found this first and foremost in the success of the secular project and the way it has been achieved. Much like Max Weber's theory of the self-validating success of Protestant entrepreneurship, the establishment of the Israeli state was seen as an affirmation of Jewish beliefs and justification for its actions. The messianic debate, which lies at the heart of the religious basis for the Jewish state, thus gravitates between a position that regards the state of Israel as a 'divine state' and one that condemns its foundation as 'a satanic act'.[62]

Zionism could be seen as either one of the last nationalist movements or one of the first messianic revivalist movements to have territorial claims within the modern nation-state constellation. It is articulated through its own constitution as an image: a terraforming, weather-transforming, time-warping and anthropomorphing movement.[63] Whereas for the early pilgrims, the ruins they encountered in Palestine verified the prophecy of a deserted Zion, for the present-day messianic right wing, construction and terraforming is a validating act of return: a reconfigured earth more than a reconfigured eye. Nevertheless, photography as an architectural practice and the spatial photograph with its calculable, parametric nature are now part of the actual production of a Jewish state. The spatial photograph – just as much as the home, the road or the archaeological site – is a form of

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60 Haviva Pedaya, Walking Through Trauma : Rituals of Movement in the Jewish Myth, Misticism and History. Tel-Aviv: Resling, 2011.

61 Nadia Abu El-Haj, The Genealogical Science: The Search for Jewish Origins and the Politics of Epistemology, Chicago, IL: University of Chicago Press, 2014.

62 Aviezer Ravitzky, Messianism, Zionism, and Jewish Religious Radicalism, Chicago Studies in the History of Judaism, Chicago IL: University of Chicago Press, 1996.

63 In its main stream Zionism aimed to transform the countries topography, make the desert bloom, bridge 2000 years of exile and recast the jewish physical body.

settlement.

Elad's primary imperative is the reclamation or 'redemption' of Jewish land from its current Palestinian inhabitants, and for this purpose it receives the backing of the Israeli authorities. Standing on the rooftop of Beit Hatzofe (the 'Watchman's House'), Doron Spielman, vice-president of the City of David Foundation, stated that the aim of Elad since its founding in 1986 has been to 'return all this land you see behind you into Jewish hands […] [W]e purchase much of this land for much more than its face value in order to return as many of these assets as possible back to the Jewish people.'[64] Elad enlists the support of civic and scientific expertise to further its expanding jurisdiction and provide it with legitimacy in secular and international forums. Its nationalist messianic ideology has been camouflaged by its use of technology and its bureaucratic operations.

Although Elad's activities above ground are contested, its massive archaeological project appears to be uncontroversial, and is widely accepted. The reason for this might lie in the fact that throughout the ongoing development above and below the earth's surface, spatial imaging has been used to bridge the gap – to the point of conflation – between the messianic narrative and the scientific data, and between the imagined, the existing and the planned. This technical spatial transcoding, with its lack of a direct viewpoint and its scientific accuracy, appears ideologically neutral and resistant to given assumptions. After speaking to close to forty foreign ambassadors who visited the site in February 2019, Spielman notes that 'here we have fact. The fact is that we have seals from the actual Bible itself which have been unearthed by actual archaeologists, in an actual archaeological excavation, and housed in an actual museum.'[65]

By couching its public communications in a professional, technical, practical discourse, and not solely in the blatant ideological language of Judaisation, Elad has been able to set itself apart from organisations such as Ateret Cohanim. In the beginning, however, Elad operated in a relatively modest way. In 2008, for example, Elad's Be'eri was filmed giving a tour of Beit Hama'ayan (the 'House of the Spring'), at the time under construction but today fully operational and open to the public. As the group he leads descends to the underground site, Be'eri can be heard explaining:

> *Until now we've been in the 'normal' section. From here on, things get really crazy. This house was built from the top down. We were up there and we started to dig. We began in this room. We bought a two-room house. The entrance was*

64 Journeyman Pictures, Digging for Trouble - Israel/Palestine (video): https://www.youtube.com/watch?v=aRNAJCHxa7w. (Accessed 20 February 2019).

65 City of David, 'Forty United Nations Ambassadors Visited the City Of David'. https://www.youtube.com/watch?time_continue=2&v=5a-ru1-hQ15o. (Accessed 6 March 2019). See also: City of David, 'Ambassador Danny Danon Brings Forty United Nations Ambassadors to Visit the City of David in Defiance of Unesco', 2019. http://www.cityofdavid.org.il/en/news/ambassador-danny-danon-brings-forty-united-nations-ambassadors-visit-city-david-defiance-unesco. (Accessed 6 March 2019).

> *from the other side. All of this space here [he points to a large, open room] was a hill full of dirt. I decided to build a visitor's centre here. What can you do with two rooms? Nothing. So, I said: 'Let's break this wall down into the hillside.' To the Antiquities Authority I said: 'We're doing renovations. Way up there was this terrace. We'll renovate up to the terrace.' So, we started excavating up to that terrace, which was over here. And at night, I would move the terrace. They would come in the morning and say: 'This didn't look like that.' But there is this terrace. (I worked on it) terrace by terrace until I reached the door up there. You usually build a building from the bottom up, right? Here we built from the top down, so what's the problem? Everything is hanging on air!*[66]

The events that Be'eri speaks of took place a few years earlier, yet they were not achieved by Be'eri and his family alone. In fact, the site he is discussing had already been dug and developed by Reich of Haifa University (who, as mentioned above, was also digging the Herodian tunnel). The Fountain House is now the largest and most technologically developed section of the City of David site, so it is clear that despite the 'guerilla' tactics Be'eri describes, his actions were always deeply embedded, acknowledged and approved by the Israeli state and aided by professional bodies.[67]

Remote sensing, scan data, photogrammetry and ground-penetrating radar have entered the field of Israeli archaeology over the past two decades, and the Holy Basin and the City of David sites have proved important testing grounds for these new modes of vision. The ability to capture a surface structure in a calculable form means that a growing archive of archeological material is now open to spatial analysis and algorithmic processing, allowing computer applications to ascertain and extract groups, resemblances and differences, alongside structural and physical properties such as the centre of a mass, structural deficiencies and profile calculations. The introduction of big-data logic into a field traditionally dominated by art history and human perception has introduced the option of statistics and 'objective' group identification, loosening the hold of the previous impressionistic regime – for example, augmenting the traditional carbon-14[68] dating method with dating through group analysis and morphological characteristics.[69] Archeological computational methods, however, are not widespread in Israel: the vast majority of archeological digs, regardless of the bodies that conduct them (whether private organisations, universities, museums or the IAA), are carried out without the aid of computational and

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66 A recording of David Beeri, Head of the Elad NGO. Full transcript of the audio can be found in the Appendix for Chapter 3. Toraora. הקלטה של דוד בארי, יו"ר עמותת אלע"ד. 2008. (Accessed March 8, 2019). https://www.youtube.com/watch?v=MiOPPPUD-Ok.

67 In 2017 David Be'eri received the Israel Prize for his contribution to Jewish cultural heritage through his founding of Elad.

68 Encyclopaedia Britannica, 'Carbon-14 Dating /Scientific Technology': https://www.britannica.com/science/carbon-14-dating. (Accessed 6 March 2019).

69 The Computerized Archaeology Laboratory of the Institute for Archaeology at the Hebrew University of Jerusalem has been conducting research as well as providing professional services to the IAA promoting the inclusion of digital methods and tools in the relatively old-fashioned archaeological Israeli field. For more on this see: Alex Bogdanovsky and Laura Grossmann, 'Computerized Archaeology Laboratory of the Institute for Archaeology', The Hebrew University of Jerusalem.

remote-sensing tools and methods. The only site that, by today's standards, makes full use of the available technologies and methodologies is the Legio site, part of the larger Jezreel Valley project.[70] Nevertheless, this situation is rapidly changing.

Scan data was first used in the City of David site above ground: a scan of the large sloping structure at the centre of the visitor site's 'Area G' was published on Scan3D's website in 2019 as a sample of its work.[71] Without doubt, underground scans were either taken on the same occasion or will soon follow. What is immediately striking (as it is with many scans that are tied to a digital vernacular and a standardised format) is the fact that the site appears to detach itself from its surroundings and move into a standard software environment. As a floating object set against the backdrop of a quasi-romantic sunset, the contested City of David is placed on a par with such sites as the Nottingham Caves in the UK[72] (see fig. 11). Placing the scans of the tunnel excavations side by side with those of adjacent Jewish sites, it becomes obvious how they will be interconnected and embedded within this large point-cloud structure: all 'less relevant' information will be discarded, allowing the visitor to glide through the expanded site. In a 'design-ready' spatial way, the scans' elimination of evidence of all 'irrelevant' existence, such as the entire village of Silwan, in order to show only the site itself embraces the logic present in Elad's and the NPA's promotional map, which is devoid of any mention of a Palestinian presence.

Furthermore, as the point-cloud scan is first and foremost an operational photographic entity, this type of view is the starting point for further imagining, planning and excavation works. Remote-sensing and scan data of these digs are at the moment still confined to the assessment of structural damage and to traditional site surveys, layer registration and visualisation. In 2003, ground-penetrating radar was used in the Givati parking lot area to identify possible hidden cavities and disturbances below ground that would indicate the presence of large underground structures or water cisterns. The scans precipitated and then directed the subsequent huge archaeological digs under the parking lot in 2006.[73] These started as a salvage operation – and are still defined as such despite turning into one of the largest excavations in the country – yet they are now on their way to transitioning from an excavation into a huge museum, conference centre and shopping mall (the Kedem Compound). The development of the City of David site is planned to follow a similar trajectory:

The plans include approval for the existing construction, and preparation of an area that will serve visitors to the City of David site, including joining the excavation areas,

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70 JVRP, 'Jezreel Valley Regional Project' //www.jezreelvalleyregionalproject.com. (Accessed 16 February 2019).

71 Scan3D,'סריקות תלת מימד': https://www.scan3d.co.il. (Accessed 25 March 2019).

72 Nottingham Caves Survey: http://nottinghamcavessurvey.org.uk/.(Accessed 3 April 2019).

73 Mnemotrix, 'Ir David, City of David, Jerusalem - GPR Story 2003-2008': http://www.mnemotrix.com/geo/irdavid/irdavid.html. (Accessed 25 March 2019).

Figure 11. *Above: Scan3D of the sloped structure in Area G in the City of David site. Below: Laser scans showing the Castle Rock and the Mortimer's Hole tunnel in the Nottingham Caves site, including the trip to the Jerusalem Pub. (Scans courtesy of the Nottingham Caves Survey)*

which are currently not connected, into a contiguous entity. The planned building area is up to 1,200 sq. m. The Spring House is a key site in the City of David excavations, even though it is located outside the area of the Jerusalem Walls National Park - City of David. Ostensibly there is no justification for establishing a tourist centre outside of the national park, but the archaeological excavations serve as a key means for rationalizing its inclusion in the City of David site.[74]

Plans are moving forward despite legislation, petitions and planning injunctions[75] brought by Palestinian residents, NGOs and sections of the general Jewish public. The lack of public transparency in the proceedings, denying the residents a voice, stands in direct contradiction to the ICOMOS (International Council on Monuments and Sites) guidelines.[76] The massive structure, which includes an underground carpark for around 250 cars, is also planned as a waypoint for a cable car that is destined to travel from west Jerusalem through Silwan and across to the top of the Mount of Olives.[77] Thus, from beneath the ground to ground level to the sky, development is being carried out in a manner that bypasses all internationally agreed principles and effectively negates the presence and participation of the Palestinian residents. It also time and again finds ways to legally bypass the proper legal and professional channels. Elad and like-minded, ideologically motivated parties in the municipality and the Knesset view relics, in and of themselves, as of far less importance than the objectification and repossession of the actual land. Using the new photographic capabilities of operational objectification, they are turning the site into an object that can be reclaimed, moulded and consumed.

A virtual space of collaboration has been formed within the apparently objective photogrammetric and Lidar point clouds of the Old City and its walls, sometimes in locations where physical action is not currently possible. The virtual here normalises the idea of and prepares the ground for the actual. Scans and point clouds, with their hybrid capacity, are able to merge directly into the planning and restoration stages of a construction operation, validating the theological programme as they accompany it. Photography, the military, state and religion are joined in these activities through rhizomatic strategies. As the medium of photography is transformed, the question of materiality re-emerges in a different way as a particular political narrative starts to inhabit the apparatus of calculation. Photographic space itself is becoming calculable, and as it does so, its materiality

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74 'Press Release: Tourist Centre at the "Spring House" Beit HaMaayan / Emek Shaveh': http//alt-arch.org/en/press-release-tourist-centre-at-the-spring-house-beit-hamaayan/. (Accessed 3 July 2016).

75 Ir Amim, 'Kedem Compound': http://www.ir-amim.org.il/he/basic/%D7%9E%D7%AA%D7%97%D7%9D-%D7%A7%D7%93%D7%9D. (Accessed 3 April 2019); Emek Shave, 'Thirty Leading International Architects Call on the Government of Israel to Withdraw from the Plan to Build a Cable Car to the Old City and Avoid Damaging Cultural Assets Precious to All of Humankind' (blog): https://alt-arch.org/en/international-architects-petition/. (Accessed 3 April 2019).

76 ICAHM, 'Charter for the Protection and Management of the Archaeological Heritage', in ICAHM Encyclopedia of Global Archaeology, Article 2, 1990: https://doi.org/10.1007/978-1-4419-0465-2_1036. (Accessed 3 April 2019).

77 Emek Shave, 'The Cable Car to Jerusalem's Old City: Who Gains and Who Loses?' (blog): https://alt-arch.org/en/jm_cable_car_en/. (Accessed 3 April 2019).

changes: by definition, it constructs an image that registers only that which can be clearly calculated, all else is left void. It is a type of photography that turns the visible terrain in front of it into a calculable object, one that is inevitably amenable to integration. In a system or apparatus such as this there is indeed no room for pictorial construction; coverage and calculation morph into strategy and tactics. In order for the Israeli state to carry out its strategies with as little friction as possible, it must first carry out a careful and thorough mapping of the territory.

The point cloud's granular realism follows, to a certain extent, the logic behind social realism in that it retains just enough of the scruffiness and rough edges of actual reality to give the projected image of the potential future that it contains a credible and verifiable context. It attempts to show this future as emergent, already there within the present. By using the term 'granular', I draw here on the practice of granular synthesis, a process predominantly used in sound design: zooming in to the fraction of a second of a sound sample, breaking it down only to reinstate it as a modulator for new sonic environments. There is an ingrained logic in this process that correlates to the technology of the spatial photograph in that it possesses a deliberate ambiguity, a conflation of chronologies, a transversal of borders through excess. This is a technology that creates a homogenous, open-ended space, devoid of viewpoint, that is endlessly replicable. Photography in its spatial form creates a model environment – a contained, floating, design-ready platform – which invites the symbolic to occupy the emptied space. As such, it enables the projection of a possible idealised future into the past as if it had always persisted within the surface of the present.

Whereas before the advent of this computational spatial photography there was still some separating buffer between documentation, surveying, imaging, imagining, engineering and construction, and it could be said (in admittedly simplistic terms) that architecture began in the imagination and the building site itself retained its independence, since the spatialisation of photography the site itself has become increasingly transcoded and virtualised, and architectural plans increasingly rely on a virtualised reality. The parcelled, frozen ground produced by the CAD program, the scan's speed and adaptability, and the knowledge that engineers have the power to execute and reshape almost anything the planner decides means that a much tighter feedback loop is emerging between image as space and space as image.

Granular Archaeology: A Spatial Photograph Of Silwan / City Of David

When I began work on this project, the production of such a large-scale, heterogenous point-cloud environment was still outside of the scope of my knowledge. Moving from the spatial reconstruction of a stereoscopic pair of images or the scanning of a contained scene to producing a georeferenced map of an entire site using various sets of materials meant that I had to further my knowledge in two fields, GIS and photogrammetric survey. Although the principles of photogrammetry were known to me, making the transition to a project that included huge scenes, multi-camera inputs, multiple point-cloud constellations, geolocation and scale meant that I would have to learn as I went along. Furthermore, at the time (2015), both consumer and general open-source photogrammetry software did not support multi-camera inputs[78] and contained limited manual control over the 'camera-solving' stage. Some high-end professional software packages offered this feature, yet their price range was far beyond my means as well as those of the project, which aimed to produce a civic-based, accessible and relatively open-source survey without the need to rely on large amounts of funding or equipment. There are already a number of projects underway that are based on open-source research into scene reconstruction using multiple camera inputs, such as the early Microsoft PhotoTourism,[79] Photosynth,[80] the university-based open-source computer science research demonstrated by BigSFM[81] or Building Rome in a Day.[82] However, although these computer-vision sets of code were freely available, they require the sort of immense computational power[83] available to university departments but not to an individual researcher. They also require knowledge of programming languages, which I did not possess.

In addition, GIS as well as the basic principles of surveying were completely new to me. Relying on a range of sources (the geographical, archaeological and cultural heritage professional literature, online webinars and software manuals), I first learnt to work with the distinctions between geographic and projected coordinates, how different datums are organised and which ones should be used in each instance of the process. As I aimed to work on a generalised, ubiquitous platform, all geoinformation had to conform to the WGS84

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78 In order to carry out the photogrammetry process, the software required that all source images be taken with the same camera and lens configuration.

79 Microsoft and the University of Washington, 'Photo Tourism' (2007). http://phototour.cs.washington.edu/. (Accessed 3 April 2019).

80 Photosynth was a Microsoft 3D-image navigational application launched in 2006 and discontinued in 2017. For further information see: Wikipedia, 'Photosynth': https://en.wikipedia.org/w/index.php?title=Photosynth&oldid=863799065. (Accessed 13 October 2018).

81 Cornell University, 'BigSFM: Reconstructing the World from Internet Photos': http://www.cs.cornell.edu/projects/bigsfm/. (Accessed 16 March 2019). See also: Noah Snavely, Ian Simon, Michael Goesele, Richard Szeliski and Steven M Seitz, 'Scene Reconstruction and Visualization From Community Photo Collections', Proceedings of the IEEE 98: 8 (August 2010): 1370–90: https://doi.org/10.1109/JPROC.2010.2049330. (Accessed 3 April 2019).

82 Sameer Agarwal, Yasutaka Furukawa, Noah Snavely, Ian Simon, Brian Curless, Steven M. Seitz and Richard Szeliski, 'Building Rome in a Day', Commun. ACM 54: 10 (October 2011): 105-112: https://doi.org/10.1145/2001269.2001293. (Accessed 3 April 2019).

83 This is usually provided by multiple multi-core machines linked together into a nodal structured constellation synchronised through scripts. Even through these massive networks, computation took days and even weeks when dealing with huge images sets (hundreds of thousands). A single computer would take over a year to compute this amount of data. In the case of the Naqab project, processing a scene built out of just several thousands of images sometimes lasted over a week.

and WGS84 Pseudo-Mercator datums which operate as GPS and online global mapping standards.[84] Up to that point in my practice and education, it had been necessary for me to deal with image and postproduction software in order to connect one photograph with another within the insular image space of the still, video or 3D frame. Tools such as the chemical darkroom and the camera film itself, with its potential for multiple overlapping exposures as well as photoshop, after-effects and many other possibilities, allowed for an ever-increasing elasticity. But these always remained enclosed within the self-referential ecosystem of the media. My excursion into an engagement with the one-to-one scale and real-world positions required an additional set of knowledge and different set of tools, primarily QGIS (surveying) and CloudCompare (point-cloud photogrammetry independent registration, scaling and conversion).

Furthermore, on a practical level, the City of David/Silwan site presented several challenges. It extended across multiple levels, above and below surface, and included both indoor and outdoor scenes. GPS is not available underground and is highly inaccurate or non-existent in most indoor situations. In order to position the route of the tunnelling, I had to find ways in which I could anchor the vertical levels through the entry and exit points.

Found footage for the project was (naturally) not filmed with photogrammetry in mind. Much of the movement in these photographs was accomplished through panning rather than shifting position, rendering very limited information about the spatial depth. Most videos and stills were found online, uploaded to Facebook or YouTube at mediocre resolution and with heavy video compression which damaged the detail in the scene that is so important for the feature identification that starts the photogrammetric process. Camera shake and rapid changes in orientation cause most software to lose track of the camera resolve, either halting the process or causing a split into a new model. Up until the very last weeks of writing this thesis, I was still testing out and searching for improvements in compatibility between the footage and the software's capabilities for better extraction, 'understanding' and manipulation of the material and data. Each piece of source material was tested on multiple software packages to discover how it could best be reconstructed. An additional set of solutions was then needed to combine the point clouds arriving from varying sources, not all of which could complete the georeferencing and scaling processes.

Ground control points (GCP) around the perimeter of each section of the site and at the entry and exits of the underground tunnels were measured, recording longitude, latitude and altitude. These GCP were added to the point cloud as markers or control points, embedding the coordinates of the locations into the points data. The coordinates

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84 See: https://www.usgs.gov/faq/data-tools-and-technology and https://www.usgs.gov/products/data-and-tools/real-time-data/remote-land-sensing-and-landsat. For coordinate conversion, see https://epsg.io/.

for each GCP were recorded in two ways: through the inbuilt camera GPS unit in the instances where that was available, in which case the geolocation was part of the metadata involved in the photogrammetric scene reconstruction and point-cloud calculation, or by manually searching Jerusalem's municipal GIS system, which aside from having an extremely detailed aerial image overlay that enabled quite detailed pinpointing of features, also provided individual roof-top-height information. These coordinates, provided in the new Israeli datum, were converted to the WGS84 Pseudo-Mercator and entered into the point-cloud software.

The accuracy in positioning and scale of the resulting elements within the total point cloud environment varies. Sections I purposely recorded myself above ground, with good scene coverage, lighting and high-quality files, produced centimetre-accurate, geolocated, dense clouds. As the footage quality, location access or lighting got worse, so did the accuracy and density of the reconstruction, at times shifting the accuracy from centimetres to several meters. The method by which the overall cloud was pieced together, therefore, consciously allowed for just-good-enough data[85] accuracy, with the understanding that it essentially aims to operate beyond the confines of regulatory comparison and compliance with state criteria. As a civic-oriented imaging methodology operating under conditions of repressed visibility, the first aim is to rise beyond the existing threshold of visibility and recognition. Once there, accuracy can be improved incrementally. The project seeks to hint towards and explore the aggregate and collative ways in which space could be reconstructed and recontextualised photographically by way of the new propensities within spatial photography, and how these very propensities could be mobilised politically.

Ground And Underground-Level Photo-Scanning

I have been travelling to Jerusalem since August 2015 to photographically scan as much as possible of the publicly available sections of the City of David site. Starting from the main entrance at ground level, I recorded my walks along the pathways, taking a photograph every one or two seconds, thus creating a dataset of the site's paths, ending at the Pool of Siloam. I took image frames while moving the camera from side to side so as to give each frame a distinct position, and photographed open-air excavation sites such as Area G and the Givati parking lot excavation with an encircling movement.

The site follows a linear route, leading from the visitor centre through Area G down to the entrance to Warren's Shaft. At this point, there is a choice between three official routes to the Siloam Pool. Overground, you can walk southwards through a residential walkway, an area that has mostly been taken over by Jewish settler families, with very few remaining

85 Jennifer Gabrys and Helen Pritchard, 'Just Good Enough Data and Environmental Sensing: Moving beyond Regulatory Benchmarks toward Citizen Action, International Journal of Spatial Data Infrastructures Research (2018), 11.

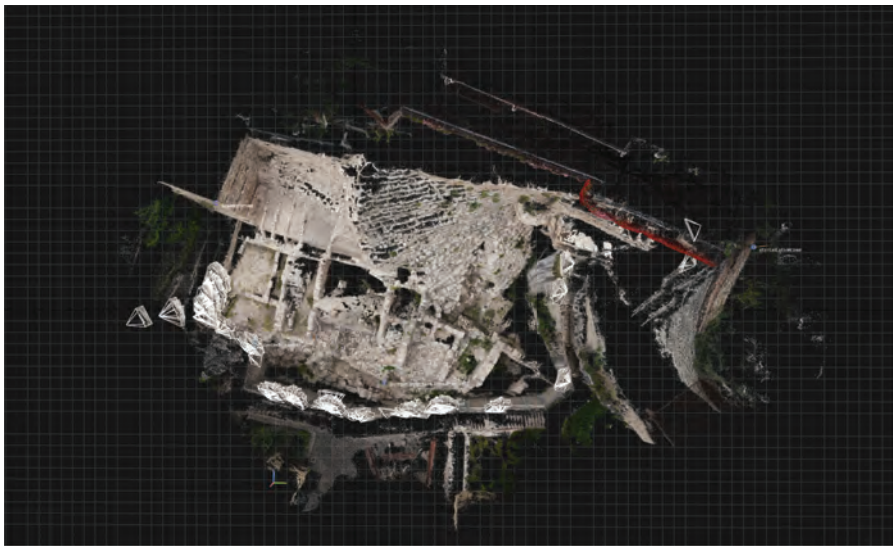

Figure 12. *Givati parking lot excavation site point cloud with camera positions.*

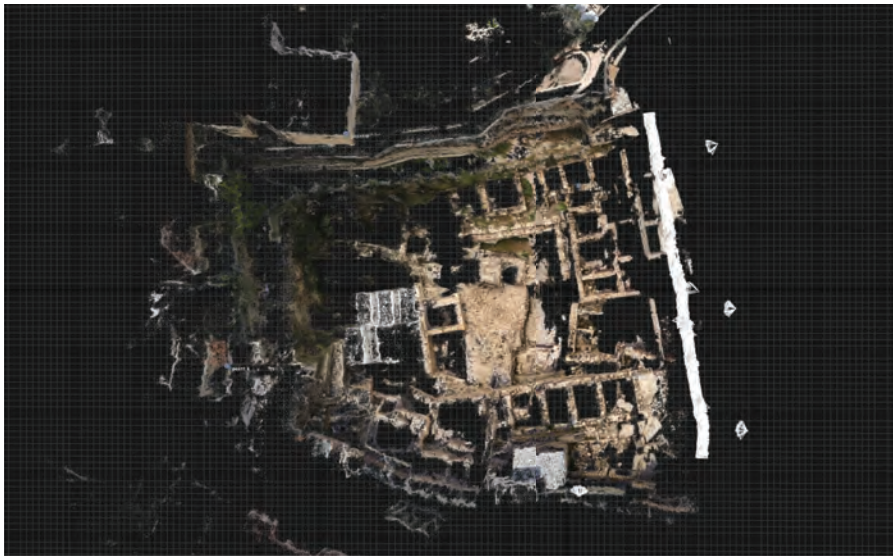

Figure 13. *Area G sloped-structure point cloud with camera positions.*

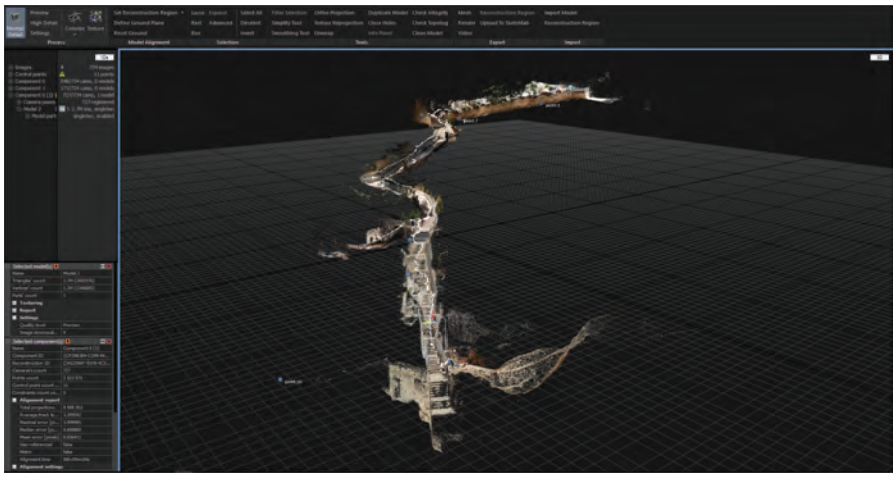

Figure 14. *The pathway leading down from Area G towards Warren's Shaft and the Fountain House. The lower section of the stairway suffered a major collapse during excavation works on the Fountain House and parts of the pathway are closed off.*

Figure 15. *An aerial image of Silwan/City of David through the Jerusalem GIS.*

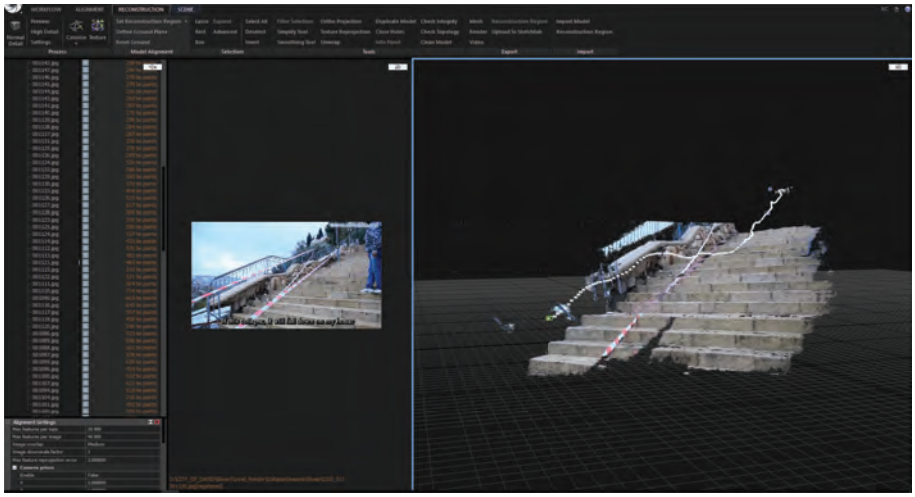

Figure 16. *A video still (left) and 3D point cloud (right) within the RealityCapture project window.*

Palestinian residents. The entire length of the walkway is covered by security cameras.

The area where the ground and tunnel levels intersected due to the collapse of the stairway were of the greatest interest as they offered a possibility to test the volume relations within the spatial image. These intersections mainly occurred on the stairway leading down to the Fountain House and close to the Ein Silwan Mosque and its adjacent parking lot. Videos filmed by the residents and activists, and uploaded by Silwanic.net, Peace Now and Emek Shave, show the sites shortly after they collapsed. The footage was uploaded in 2013, although the collapse itself took place earlier, at least once before, during 2008. Videos from the Ein Silwan Mosque area in 2010 show the damage from both outside and inside the tunnel. Each video was broken down into a stream of jpeg files which were then 'fed' into the photogrammetry software. GPS+alt points were added to the videos through GCP from the Jerusalem GIS.

The entrance to the tunnels from the Siloam Pool and the tunnel exit at the north-western corner of the Givati parking-lot site were used as anchor points through which to position the entirety of the underground tunnel that runs between them. While the horizontal positioning is accurate along the route, with an approximate deviation of around a meter, the height accuracy is most probably compromised to a greater extent as I was working from very rough estimations at the Givati exit point. The floor level at the Siloan Pool was provided by the municipality and the photogrammetry begins on that same level plain before entering into the mountain. However, in Givati, the visitor exits after climbing a set of makeshift stairs that are difficult to record, and a guard posted at their base prevents the alternative of manual measurement. The height of the climb up the staircase had to be estimated according to the average height of a single step multiplied by the number of stairs.

Archival and found footage

In the summer of 2010, an Iowa-based Christian bible scholar called Galyn Wiemers[86] uploaded a video of his journey through the newly opened section of the water tunnel running from Siloam up towards the Temple Mount (fig. 17). This tunnel is one of two parallel excavations running along the Tyropoeon Valley, under the Wadi Hilwe road. Two of the questions that arose concerning these digs and their mapping were: can a collative DIY mapping of this kind be achieved, and if so, where and under what sections of the village do they pass, and how does this route correspond to the information provided by the authorities? I broke Wiemers' video down into still frames and scanned each one for surface features using the photogrammetry software. I first used a trial version of Pix4D Mapper from which the screenshots shown here are taken (figs. 18-19). I subsequently reprocessed them through COLMAP Agisoft and RealityCapture in order to complete the entire route from the entrance to the exit at the Western Wall, comparing the adjacent frames and their features, and used computational analysis of the movement of features between the frames to resolve the question of the location of the camera in space.

In order to enable this method of practice to be repeated under DIY conditions, most of the hardware and software used was either cheap or open-source. The cameras ranged from a digital SLR (canon 5D mark2) to an iPhone camera. In most cases, I preferred to use a slightly lower resolution camera if it also provided GPS data, and so most of the final photography was done using an Olympus GT-4, a point-and-shoot hand-held camera that has a GPS unit and is water resistant, which meant that I could use it in the damp underground conditions of Hezekia's Tunnel.

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86 Galyn Wiemers, 'Generation Word Bible Teaching Ministry': http://www.generationword.com/about.htm. Wiemers video: The Tunnel Under the Street to Pool of Siloam from Jerusalem Temple Mount was used in order to 3D map parts of the tunnels under Wadi Hilwe. See https://youtu.be/1AD0ENDX95I (Accessed 18 March 2019).

Figure 17. *A still image from Galyn Wiemer's video: The Tunnel Under the Street to Pool of Siloam from Jerusalem Temple Mount.*

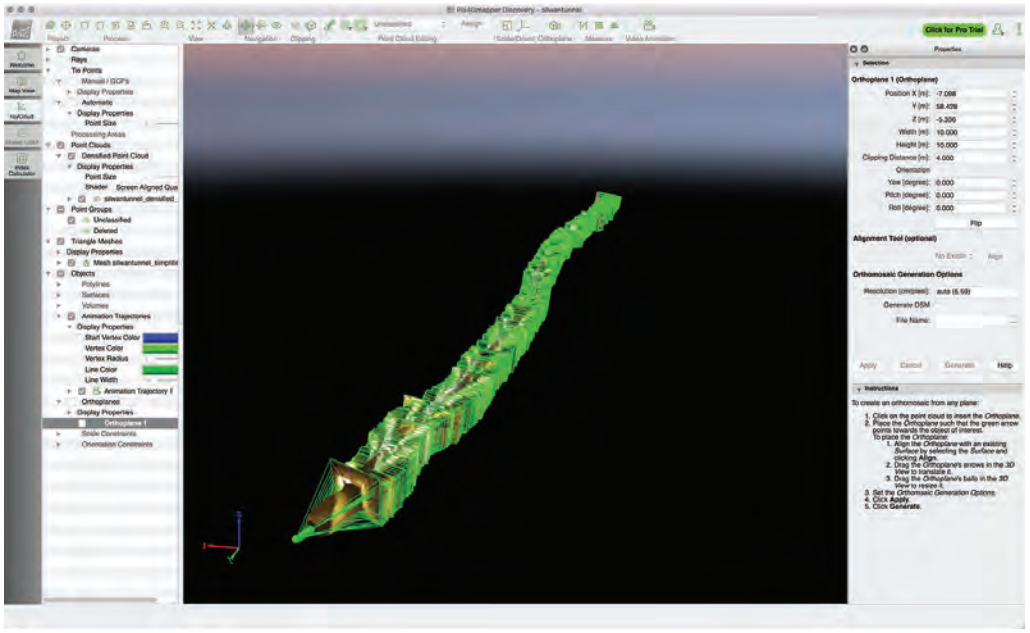

Figure 18. *Screenshot from Pix4D Mapper process, breaking Galyn Wiemer's video into still images, ordering them in sequence and extracting a basic camera path and sparse point cloud.*

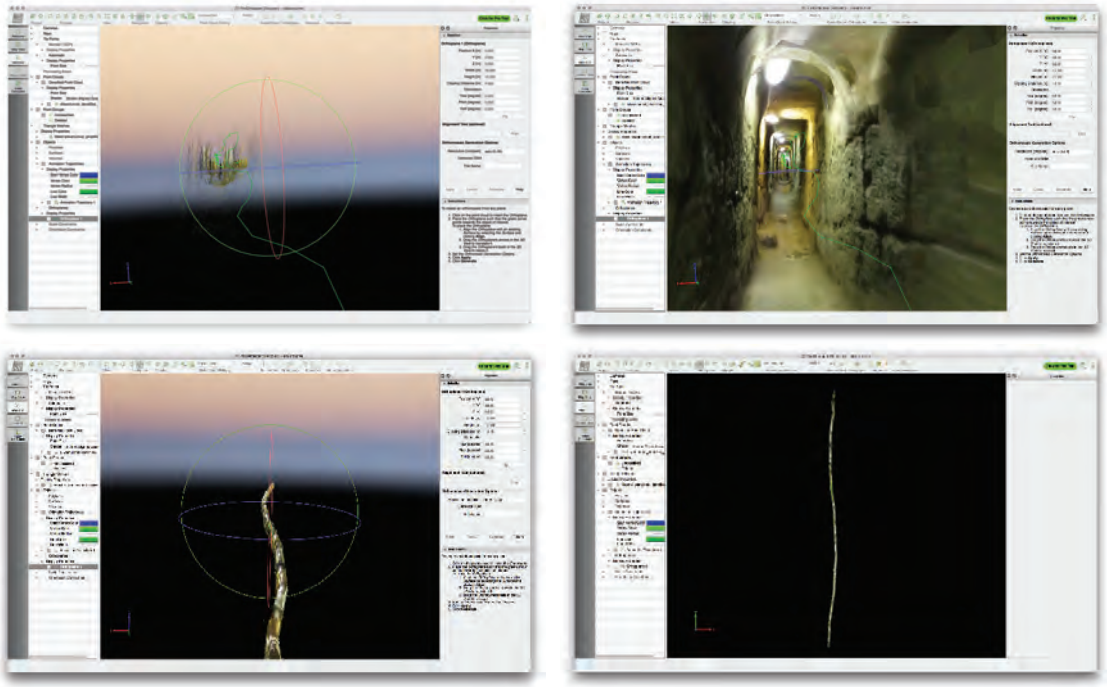

Figure 19. *Screenshots from Pix4D Mappers process, from sparse point cloud and camera path through dense cloud to meshed tunnel.*

Using open-access knowledge databases, municipal GIS data and improvements in camera hardware like inbuilt GPS and height measurements, each photograph, each of the subsequent models and each point within the hundreds of millions of points has its own geolocation and corresponding coordinate in physical space. The list below shows the three vertical levels of imaging at the site, recording the work in a counter-mapping sense, in order to link the images taken above ground to those of the excavations underground.

- Kite mapping conducted by PublicLab (Hagit Keysar, Shai Effrati and Jeffrey Warren) and the children of Silwan during the summer of 2011.
- Composite photogrammetry (video, found footage, etc.).
- Self-initiated photo scanning along the publicly available routes along the underground tunnels.

Geo-Endoscopy

Two parallel tunnels, ascending from the Pool of Siloam towards the Old City, are in the process of excavation. It is thought that both routes might be part of one wide first-century pathway leading up the mountain. Most of the western route is now open to the public while the second is still closed to tourists, although private VIP tours are carried out regularly.

Figure 20. *Peace Now screenshot: 'The Collapse in Silwan, 2/3/10'. Available at: https://www.youtube.com/watch?v=QbESX5K5sWc. (Accessed 31 March 2019)*

Combining found footage[87] and recordings of my own walks through the tunnels, I was able to scan the entire western route and position it in relation to the ground and aerial-level point clouds. The entrance and first section of the eastern underground path was scanned again using a combination of YouTube video uploads by Elad and by Palestinian residents, as well as some footage I filmed when entering the tunnel. (fig. 20)

After geographically anchoring both sections of the tunnel, it was possible to discern the correlation between collapses and damage to property in Silwan and the excavations. The hole that appeared beside the Ein Silwan Mosque (mentioned at the beginning of this chapter) is located right over the eastern tunnel, which, according to the point-cloud map, was dug at an estimated 1.5 meters below it. Similarly, the site of the recent severe collapses midway up the Wadi Hilwe road is located next to the western route of the ancient sewage tunnel. Here, the collapse has taken place 3 meters diagonaly to the subterranean path. (fig 21 & 22)

Late in 2018, the Jerusalem municipal authorities published a new map of the city on its GIS system (using the new 3D-photogrammetry model produced by Simplex). This map included for the first time the officially acknowledged path through some of the underground excavations and ancient waterways. However, the demarcation of the path of this tunnel appears to be inaccurate or in partial contradiction to the route produced by my scans. Furthermore, it does not include the second eastern pathway, the beginning of which is mapped by the point cloud in my survey.

87 For a description of opening in the ground outside the Ein Silwan Mosque in December 2018, see: https://www.facebook.com/watch/?v=260485891292591. (Accessed 31 March 2019). For the collapse in the same location on 2 March 2010, see: Peace Now, 'The Collapse in Silwan, 2/3/10': https://www.youtube.com/watch?v=QbESX5K5sWc. (Accessed 31 March 2019).

Figure 21. *Using the Potree point cloud visualisation web interface a section can be visualised through the area of the Siloam pool where the first tunnel begins running under the Wadi Hilwe road.*

Towards An Investigation Into 'Negative Archaeology'

A volume registration (a spatial photograph) of the site, showing its entangled spaces, their conflict and interconnection, also reveals its negative space. By focusing on the existing continuity of the surfaces excavated by Elad's project, I was able to map what was not excavated, the negative space left between the surface and the underground archaeology. A characteristic of the archaeological method practiced by the IAA and Elad at the City of David site is its use of horizontal excavation: instead of vertically exposing the layers of ground and revealing the historical chronology of it inhabitation, the site is explored by means of excavations that run horizontally along one or more historic periods. Digging in this manner, most of the historical stages of life in Silwan that lies in the different layers of archaeological strata are bypassed, giving rise to an impoverished understanding of its history. As described earlier, not all the locations in this expansive site were excavated in this manner by the various researchers and expeditions that visited it throughout its history. However, the excavation, preservation and presentation of artefacts in the horizontal work carried out under the direction of Elad demonstrate a clear bias. This bias is directly related to the political and religious/ethnic ideology espoused by Elad and to its agenda: the resurrection of the City of David in order to establish the ancient origins of a Jewish presence in East Jerusalem as justification for its messianic national project. In the process of amplifying the Jewish narrative, the importance of other narratives and archaeological discoveries are minimised. The tunnelling has left multiple layers of this site inaccessible, trapped above or under the current route. Similarly, in the Givati parking lot, where ex-

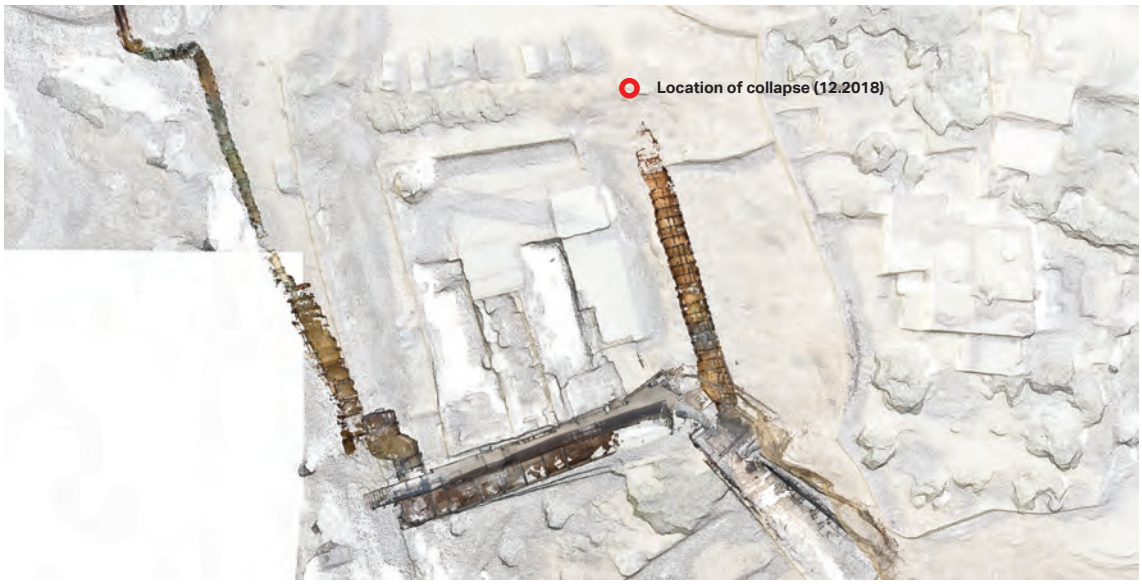

Figure 22. *At the time of scanning the Pilgrim's Walkway tunnel, the sections extending beyond those shown here were not excavated yet. however since, these excavations have already reached the old city wall yet are still not open to the public. In December 2018 a collapse took place in the area just on the rout.*

cavations began in 2007,[88] layers of the site were removed en masse and left unexamined. The current physical condition of the site clearly calls for a type of counter-practice that operates through highlighting what has been overlooked, a 'negative archaeology' that marks the location of the missing layers within the voids revealed by the survey of the surfaces of the excavations.

The Politics of Volume

Three-dimensional terraforming is not only (or even primarily) a form of security and control; rather, it is a much more diffused conflation of the two, with the underlying layer of prescient messianic immanence emanating from the excavated depths of the tunnelled cavities and pathways. Exposing the surface through the act of excavation is also as an act of emancipation:

While ethnocracy was a relevant analytical framework for understanding the urban dynamics of Jerusalem\Al-Quds up until two decades ago, this is no longer the case. Over the past twenty years or so, the city's geopolitical balance and its means of demographic control, as well as an intensifying militarization and a growing use of state violence, have transformed the city from an ethnocracity into an urban apartheid. Distinguishing between the two urban regimes does not suggest that urban apartheid is essentially a differ-

88 Ben-Ami, Doron, and Donald T Ariel. Jerusalem: Excavations in the Tyropoeon Valley, (Giv'ati Parking Lot). Israel Antiquities Authority, 2013.

ent form of control, but rather a radicalization of the ethnocratic phase.[89]

The urban process described by Haim Yacobi above is neither evolutionary nor natural but a meditated, concerted effort by the Israeli state and private, ideologically motivated organisations. There is a continuous effort to regulate mobility and produce a total separation between Israeli-Jews and Palestinians in the spheres of housing, work, politics and culture. Yet in all of these spheres, this project is constantly under challenge from wider economic forces and the city's mixed population. In his book Urshalim,90 investigative journalist Nir Hasson of the Haaretz newspaper, himself a resident of the city, writes of the rising level of interest among Palestinian residents in integrating into daily municipal life. Without officially recognising or supporting the Israeli occupation or its jurisdiction, increasing numbers of Palestinians are asserting their right to the city, demanding access to its universities, hospitals and public spaces.

Returning to the 'schizophrenic' nature of the policy described at the start of this chapter, the separation between Jew and Palestinian is overturned time and again, either through the deliberate insertion of Jewish settler enclaves into the heart of Palestinian territory or through the grassroots Palestinian drive towards reclaiming the urban space. Within and between these multiple spaces of enforced opacity and erasure, scientific archaeological research has been co-opted as a mechanism of settlement. Along the underground routes beneath the village of Silwan, the ideologically directed use of imaging and architectural systems is rendering select sections of the archaeological sites visible while deliberately amplifying the opacity of others. What this DIY collative project has striven to produce is a measure of resistance, not only by revealing different or further visual information but also by showing how a changed spatial dimension can be turned into a mode of practice that can bring the hitherto disparate volume levels of physical reality into sharp focus.

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89 Yacobi, Haim. "From 'Ethnocracity' to Urban Apartheid: A View from Jerusalem\al-Quds." Cosmopolitan Civil Societies: An Interdisciplinary Journal 8, no. 3 (November 30, 2016): 100–114. https://doi.org/10.5130/ccs.v8i3.5107.

90 Nir, Hasson, אורשלים: ישראלים ופלסטינים בירושלים, 1967-2017 = اورشليم ('Israelis and Palestinians in Jerusalem 1967-2017'), Urshalim, 2017.

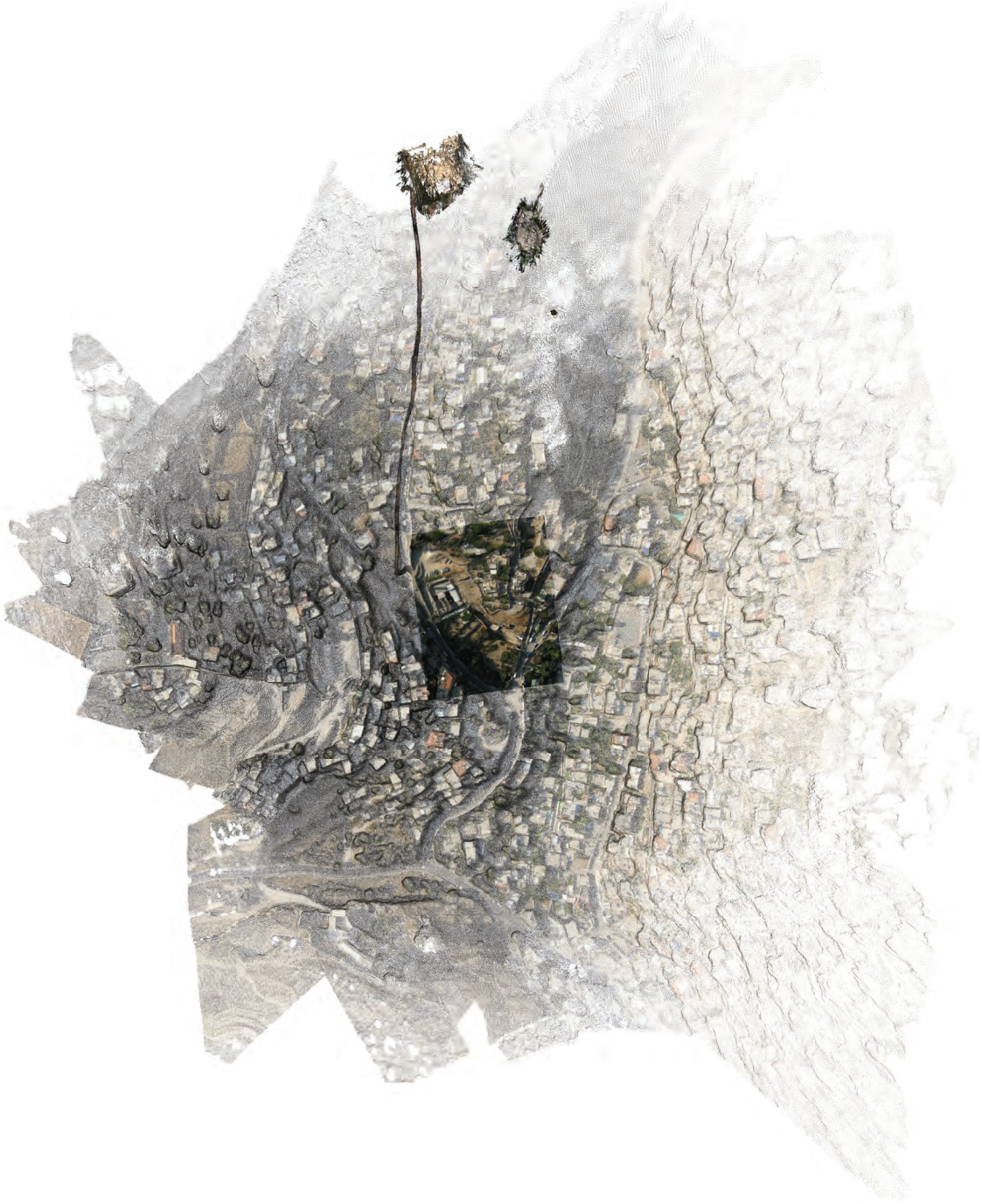

Figure 23. *Top view of sections of the point-cloud constellation of Silwan/City of David, giving the overground and underground views of the site. A high-density cloud section marks the location of the Pool of Siloam.*

Chapter 4

THE PALIMPSEST TOWARDS A COMMUNAL PHOTOGRAPHIC PRACTICE

Introduction

Whereas in Chapter Three the political contestation took place within three-dimensional spaces (that is, within the volume of the location) and was concerned with the layers existing above and below ground, showing how a counter-practice of spatial imaging could reveal the ideological/political intent behind the state use of apparently 'neutral' photographic technology, in this, my second project, the space of contestation is the surface. Here, the utility of photogrammetric spatial imaging lies in its ability to register the minute transformations of this thin surface layer of the earth as it is overwritten time and again by multiple users; its textures and undulations, in all their variations, tell the story of its use. Related to this is a further aspect of this project.

Land struggle itself here is collective in nature. It involves communities, many NGOs, the Forensic Architecture agency (to which I belong), activists, journalists and teams of lawyers. The chapter therefore explores whether the very production of the image could be a collective process, drawing on the inherent multi-viewpoint qualities of the spatial image.

The surface of contestation in this case is one on which many different layers of land-use are inscribed, erasing and interfering with each other. As such, I would argue, it needs

to be read as a photographic surface of inscription, not only through remote knowledge of the state, but also through the lived knowledge and history of the Palestinian Bedouin families resident in it. Hence, it is essential to meet the people on the ground, to understand the sets of laws and policies that affect them. To do this, we need to link the multiple forms of knowledge – legal, indigenous, surveying and imaging – by means of a durational and collective process. At its core this chapter is grounded in two fundamental concepts: the idea that the surface of the land is an archive on which the duration of its history is inscribed and the principle of collectivity as a new mode of photographic practice.

Control over land takes place at three levels: sovereignty is manifested in the law; ownership regulates who is in legal possession of the land; and land use describes the de-facto practices unfolding on it. If we understand surveying as fundamentally related to these three layers, it becomes evident that the relationship between surveying and ownership, as well as between surveying and sovereignty, has always determined control over the rights to land use. The 'counter-survey' seeks to undermine the relationship between these top-down layers and, by establishing a bottom-up relationship between surveying and user claims, to provide a re-assignment of ownership and sovereignty. This chapter presents a reflection on the spatial photographic methods and analytical processes I have developed as project coordinator of Forensic Architecture's Ground Truth counter-survey. The project itself formed both the case study and the practice element of the research through which the theoretical and conceptual ideas of the chapter were developed and tested.

The Background Of The Project

At the height of one kilometre above ground, Google Earth shows fingerprint-shaped patterns covering the terrain where the village of al-Araqib (which means 'the soft hills between streams' in Arabic) is supposedly located. Similar to the hachuring of an early nineteenth-century map, the thin curved lines delineate the form of the sloping hills. If we zoom into the limit of the US Digital Globe satellite image used by Google Earth (dated 6 June 2015. fig. 1), the pixelated lines appear with a somewhat greater nuance. From the height of 400 meters above ground, we can discern a thickness in the variations of and intermittent gaps in these patterns that could indicate earthworks. The darker dotted pixels areas are trees. The brighter lines are the unpaved dirt roads that run through the terrain, branching out from Route 40, the main highway which leads north from the city of Beersheba. At the midway point of this road, between the Goral and Lehavim junctions, a small, paved road branches to the left, leading into forest plantations and finally to an uncultivated area of brighter pixel shades. It is difficult to distinguish the al-Turi cemetery in this blurry mosaic of white, brown and dark green pixels. An older aerial image of the cemetery shows fencing around the compound, yet its traces are barely visible. Across the southern edge of the compound, there are traces of small-scale cultivation; however, it is

Figure 1. *View over al-Araqib. Google Earth, 2015*

impossible to see if anything is planted or growing there. A line of fully grown trees marks the eastern edge of the cemetery. Zooming back out to 1.5 km above ground to gain an overview of the area, the cemetery seems like an unmarked island in the midst of expanding forest plantations and land works.

On 27 July 2010, workers with heavy machinery, escorted by approximately 1,000 police, arrived at the village of al-Araqib. By noon that day, the village was entirely demolished, all its trees uprooted and structures levelled. (fig. 2) The authorities left around 400 residents with no alternative housing. By that evening, however, they had rebuilt what they could of their homes. At the time of concluding this thesis, there had been at least 140 such cycles of demolition and rebuilding of what remains of al-Araqib. By now, the population of the village has been reduced to slightly over half a dozen residents, members of the Abu Medigam family, part of the larger al-Turi family, who are now living under extremely harsh conditions within the confines of the al-Turi cemetery, alongside the graves of their ancestors. The head of the family, Sheikh Sayach al-Turi, is currently serving a 10-month jail sentence for 'trespassing' on his ancestral land.

A slow but constant process of land transformation has been taking place over the last sixty-eight years, gradually erasing all traces of Bedouin inhabitancy in al-Araqib in particular and in the larger Naqab[1] area in general. The young saplings described above belong to the Mishmar Hanegev (the 'Negev Guard') Forest, named after a nearby Jewish kibbutz.

1 The Naqab is the Arabic name for the Negev desert. Although it is used in part to signify opposition to the latter, Israeli Hebrew name, some contest that the term 'Naqab' is itself a colonial invention as it first appears during the era of British rule in the region. Bedouin families of the Beersheba region used to describe themselves as 'Urban al-Saba' (the 'Arabs of Beersheba'). See also: Mansour Nasasra, 'The Ongoing Judaization of the Naqab and the Struggle for Recognising the Indigenous Rights of the Arab Bedouin People', Settler Colonial Studies 2: 1 (January 2012): 81–107: https://doi.org/10.1080/2201473X.2012.10648827.

It is one of a series of afforestation projects established by the Jewish National Fund (JNF) and the Israeli Land Authority all along the northern edge of the Naqab desert. From Yatir Forest in the east to Be'eri Forest in the west, they form two conjoined lines of defence: one is guarding against the processes of desertification; the other, stretching from the Gaza Strip in the west to the West Bank ceasefire line, is focused on disrupting the continuity of the Palestinian presence that threatens to split Jewish-Israeli sovereignty over the land from north to south. What is unique about this strip of afforestation is not its ecological justification, part of a state 'green-washing' campaign, or its desired effect, but rather that a significant reason for its establishment has been the goal of uprooting the indigenous Palestinian Bedouins and eroding all evidence of their heritage in the area. Through this inverted use of eco-friendly afforestation, the JNF and the Israeli state are irrevocably chang-

Figure 2. *A Bedouin woman, residents of Al Araqib, watches border policemen arrive to her village to execute another demolition of housing structures, Negev, September 12, 2010. This was the 5th demolition in the village since July 27, 2010. The cycles of demolition and rebuilding have now reached 142 at the time of submitting the Thesis, 2019. Photo: Oren Ziv / ActiveStills*

ing conditions on the ground, circumventing both juridical processes and public discourse.

In the 1970s, the Israeli government formulated a policy directed at the Negev Bedouin, which consisted of a gradual process of land acquisition and nationalisation using the Land Acquisition Act of 5713/1953[2] and the Absentee Property Act 5710/1950.[3] Bedouin land

2 Ministry of Justice. Land Acquisition Law (1953), Pub. L. No. the Land Acquisition Act of 5713/1953 (1953). Find full copy of document in appendix for Chapter 4 Item no 8

3 Ministry of Justice. Absentee Property Act (1950). https://main.knesset.gov.il/Activity/Legislation/Laws/Pages/LawBill.aspx?t=LawReshumot&lawitemid=150181.

was registered as 'state property', using the argument that as its previous registered status was that of 'mawat' – that is, 'dead', ownerless land – it should be reclaimed by the state under the auspices of the new land registry. This process, described by Oren Yiftachel et al. (2012) as the 'dead Negev doctrine', in a sense an Israeli version of the British colonial 'terra nullius',[4] classified the entire Negev region as 'mawat', therefore, state land.[5] All Bedouin inhabitancy, outside of specifically allocated cities and townships erected betweein the 1950s and 1980s, was deemed illegal. Today, approximately 100,000 Bedouin families, just under half of the entire population in the Naqab, live in thirty-six unrecognised villages; the remainder of the population reside in villages acknowledged by the state and in purpose-built townships. Many of the former communities, however, are located on their own ancestral lands that predate the birth of the Israeli state, yet they live in a state of extreme precarity: they do not appear on any map and are disconnected from all basic amenities, such as running water, electricity, health services and education.

Transformation and erasure through afforestation on the ground is supplemented through erasure from the map and the aerial image. If, during the Ottoman, British and even early Zionist periods, maps and surveys tracked and registered the Bedouin presence on the ground, their tribal affiliations, occupation and modes of land use, predominantly by way of agriculture, in the decades since the passing into law of its new land code, the Israeli Land Authority has quite literally deleted them from anywhere on the map aside from the seven dedicated townships. Furthermore, at the behest of Israel, all US commercial satellite imagery over Israel/Palestine has been degraded for 'security reasons',[6] and so in addition to their physical destruction on the ground, any remnant or trace of architectural or archaeological Bedouin inhabitancy is obscured by the image pixilation on all US-based mapping and remote-sensing services, including those of Google, Bing and Apple.

This chapter looks at the relationship between surveying and power, and the ways in which both surveying and photography have been employed by the state to secure its power over the land. More specifically, the chapter and the project it introduces, examines how communities can counteract and intervene in this process by carrying out their own survey in order to challenge the state narrative on levels of land use and ownership. The argument in the Negev revolves specifically around the question of land-use and the state's employment of its legal regime to grant or reject the option of ownership. For seven decades now, imaging and surveying have played a central role in the ongoing expropriation of Palestin-

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4 'Terra Nullius' is a Latin expression meaning "nobody's land". the term was first used in a proclamation by the New South Wales Governor, Sir Richard Bourke, issued by the Colonial Office on 10 October 1835. The doctrine of terra nullius was the basis upon which British settlement was made possible, legally reinforcing the notion that the land belonged to no one prior to the British Crown taking possession of it. Its publication in the Australian Colony meant that from then, all people found occupying land without the authority of the government would be considered illegal trespassers.

5 Ahmad Amara, Ismael Abu-Saad and Oren Yiftachel (eds.), Indigenous (in)Justice: Human Rights Law and Bedouin Arabs in the Naqab/Negev, Cambridge, MA: Human Rights Program at Harvard Law School, 2012

6 Text of H.R. 3230 (104th): 'National Defense Authorization Act for Fiscal Year 1997 (Passed Congress Version)': www.govtrack.us/congress/bills/104/hr3230/text (accessed 18 December 2017).

ian Bedouin communities. A professionalisation of the legal rights discourse has increasingly depoliticised such fundamental questions as what constitutes 'inhabitancy', a 'village' or 'cultivation'. The ideological interpretation of the historical records and testimonies have enabled the formulation of a legal doctrine that undercuts the ability of any Bedouin family to successfully pursue a legal land rights claims as it a-priori negates their historic mode of sedentary existence. Mansour Nasasra et al. summarise the process thus:

> *Between Alhawashli and al-Uqbi an interesting development can be seen in the legal representation that moved on the one side from personal, customary and unmediated knowledge to 'scientific-academic legal' knowledge framed within a legal jargon. On the state's side, the formal legal language was supported by supposedly neutral academic knowledge. Thus, an increase can be observed in depersonalization of the conflict and attempts to depoliticize the dispute through 'professionalizing' and presenting it as one between experts and conflicting legal knowledge.*[7]

As I hope to show, traces of their cultivation and inhabitancy are registered in the historic mapping and imagery of the area, yet they still fail to pass the artificial legal bar erected for the definition of 'sedentary': as traces of Bedouin architecture and agriculture have shifted to a certain degree within the environment, the courts are able to argue that they do not constitute a continuous presence within the specific areas under discussion. This techno-professional practice of erasure is married to history, ethnography and legal geography to produce an 'ownerless' land.

If until recently the aim of survey-imaging was to compress geographical volume into its surface features, the past decade has seen the introduction of semantic, algorithm-aided, automatic feature recognition in the processes of remote sensing and GIS work. Deploying these AI tools for remote sensing, aerial surveying and the production of surveillance datasets has significantly increased the ability of the state authorities, as well as right wing NGOs such as Regavim,[8] to monitor and quantify any trace of new so-called 'illegal' expansion of Bedouin settlements, and act to curtail them.

Intervention in the political situation thus necessitates the convening of hybrid forums that can reconfigure the material production of testimony and documentation – that is, an intervention into the types of materials made available, their modes of interconnection, interpretation and the forms of knowledge they generate, combined with an understanding of the interconnection of time and movement with space and territory.

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7 Mansour Nasasra, Richard Ratcliffe, Sarab Abu-Rabia-Queder and Sophie Richter-Devroe (eds), The Naqab Bedouin and Colonialism: New Perspectives, Abingdon on Thames: Routledge, 2014, p. 172.

8 Regavim is an Israeli pro-settler NGO that monitors and pursues legal action in the Israeli court system against any construction lacking official permits undertaken by Palestinians or Bedouins in Israel or the West Bank.

Discussions have arisen over whether either the state or the Bedouin families have legal recourse for the actions they take – setting the state, its afforestation projects and its displacement and demolition activities against the families with their repeated acts of defiance or 'zumud', a deliberate practice of returning to their ancestral lands and rebuilding their demolished houses. However, I would argue that it is beyond question that the result of state actions has been the complete erasure of any meaningful Bedouin existence or cultural traces in the landscape. Moreover, the core of the Israeli state's claim is not that there should not or could not be a future Bedouin connection and presence on the land, but rather that it never existed in the first place. Later in this chapter, I will expand in greater detail on the different claims to land rights and indigeneity, as well as Israel's own policy and counter-claims; however, it is crucial to stress that although both parties are talking of land rights, the discussion is actually taking place on parallel, incommensurable plains.

***Figure 3**. A view of al-Araqib before (4.5.2010) and after (17.8.2010) its demolition. Photo: Oren Ziv / ActiveStills*

The Battle For The ('Dead') Negev

It is estimated that on the eve of the 1948 war nearly 100,000 Bedouins lived in the Naqab region[9] of Palestine; by the end of that war only 11,000 remained within the borders of the ceasefire line. Some were killed, others murdered,[10] the majority either fled or were expelled to neighbouring West-Bank, Gaza, Sinai or Jordan.[11] Today, the population has reached around 200,000, but approximately 100,000 of these reside in illegalised, unrecognised villages,[12] many of which lie on the Bedouins' ancestral land but remain disconnected from any public services supplied by the Israeli authorities.

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9 Benny Morris, 1948: A History of the First Arab-Israeli War, New Haven, CT: Yale University Press, 2008, p.13.

10 The story of 14 who were executed by Jewish forces is told by Nuri al-Uqbi, Sheikh Sayah al-Turi and Mhamad Aliyan al-Aseybi as told in individual testimony to the Israeli NGO Zochrot.

11 Oren Yiftachel, Sandi Kedar and Ahmed Amara, 'Challenging a Legal Doctrine: Rethinking the Dead Negev Ruling, Law and Government', Mishpat U-Mimshal, 20:1 (2012), 15.

12 A village or neighbourhood is 'unrecognised' when the planning authorities refuse to approve a plan that would regulate land use within an area. In such places, no building permits can be issued and all buildings are, by definition, illegal and prone to demolition. Unrecognised communities cannot be connected to electricity, water and sewage lines and other vital infrastructure. See 'Unrecognized Village and Neighborhood': http://bimkom.org/eng/unrecognized-village-neighborhood/ (accessed on 24 July 2017).

Contrary to the prevalent understanding of the Bedouin relationship to territory and land, the Naqab Palestinian Bedouins are not nomads. For well over 200 years, they have been leading a sedentary or semi-sedentary existence, cultivating land and raising livestock, and are deeply embedded in the environment through several architectural nodal points such as wells, houses and underground caves for grain storage. However, the land doctrine that was articulated by the Israeli Ministry of Justice in the 1970s, broke with Ottoman and British Mandate land law and classified the whole Negev region as mawat – dead and ownerless – rendering it state land.[13] Supreme Court judge Sara Dovrat justified the decision by arguing that the Bedouin families did not provide proof of the existence of villages or cultivation in 1858, and thereafter forewent the (putative) last possible date for registration of their land in 1921 (this registration was part of an attempt to create a 'modernised' system of land registry in British-ruled Palestine). Hence, she ruled that the tribes' ancestral lands in both al-Araqib and Zhahaliqa (some 20 km north-west of al-Araqib) should be registered as 'state lands'.

This relentless system operates through a combination of ideology and (avowedly politically neutral) bureaucracy. Ideologically driven government ministers and NGOs such as Regavim directly contribute to the Judaification of the Negev alongside those academics, barristers, politicians and planners who 'simply' push for an enactment of the rule of law. Visuality and erasure, imaging and planning, law and planning rights coalesce to form a nexus of reciprocal relations, a feedback loop, that gravitates between the ideological and bureaucratic. This system has maintained a steady course since 1948: its aim is the 'Judaification' of the contested lands and their so-called 'revitalisation', alongside the de-politicisation of the Palestinian Bedouin cause and the de-legitimation of Bedouin and Palestinian claims of illegal and degrading treatment by the varying levels of Israeli state authorities in their struggle to reclaim the right to their land in the face of Jewish ethnocracy. For example, Ehud Prawer, head of Bedouin Policy Planning at the Prime Minister's Office since 2008, argues:

> *The attempt to claim that the Bedouins are an indigenous group in the Negev is fraught with difficulties. Not only is it historically inaccurate, but it antagonizes unnecessarily, presenting the Jews in the area as invaders, which runs contrary to the fact that we have returned to our homeland. Again, I say, adopting the indigeneity approach will damage any Bedouin attempt to attain civil equality in Israel.*[14]

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13 Alexandre Kedar and his colleagues outline the eight core components of the 'Dead Negev doctrine' constructed by the Israeli juridical system in Alexandre Kedar, Ahmed Amara and Oren Yiftachel, Emptied Lands: A Legal Geography of Bedouin Rights in the Negev, Redwood, CA: Stanford UP, 2018.

14 This excerpt is taken from Ehud Prawer's presentation to the Ben Gurion University (BGU) conference Bedouin Space - Where to?, organised by the Arnow Center on 30 September 2011. Quoted from Yiftachel, O., B. Roded, and A. Kedar. "Between Rights and Denials: Bedouin Indigeneity in the Negev/Naqab." Environment and Planning A 48, no. 11 (n.d.): 2129–61. p. 20

Figure 4. *Aziz al-Turi sitting next to a well filled in by the JNF during an aerial mapping session, 5 December 2016. Photo: Hagit Keysar*

Figure 5. *Balloon aerial photography of the JNF (Kakal) terraces and afforestation in the al-Araqib area (left) and a ground photo showing the well seen in the aerial photo (shown in next figure), 5 December 2016. Photo: Hagit Keysar*

The concept of 'terra nullius', and its Israeli version in the form of the 'dead Negev doctrine', not only serves as a legal framework but simultaneously functions as an imaging perspective, driving the state-inflicted and state-backed violence that also obscures it. 'Terra nullius', Oren Yiftachel (2011) contests, 'is far more than a legal concept. It is a frame of mind typifying colonial and ethnocratic regimes. While the concept rests on legal foundations, its most powerful effect lies well beyond the legal – stripping indigenous peoples of their culture, histories and codes of governance.'[15]

This form of 'techno-visual erasure' manifests what Eyal Weizman (2015)[16] terms 'the violence at the threshold of detectability' as it is produced by the correlation of the materiality of photographic technologies and the land surface. The aim of this segment of the thesis therefore is to investigate these techno-professional forms of ethnic displacement and to suggest an alternative strategy and methodology, using DIY visual strategies

15 Oren Yiftachel, ' "Terra Nullius" and Planning: Land, Law and Identity in Israel/Palestine', in G. Bhan, S. Sviniras and S. Watson (eds), Routledge Companion to Cities in the Global South, London: Routledge, 2017, pp. 243-255.

16 Eyal Weizman, The Conflict Shoreline: Colonisation as Climate Change in the Negev Desert, Göttingen, Germany: Steidl, 2015.

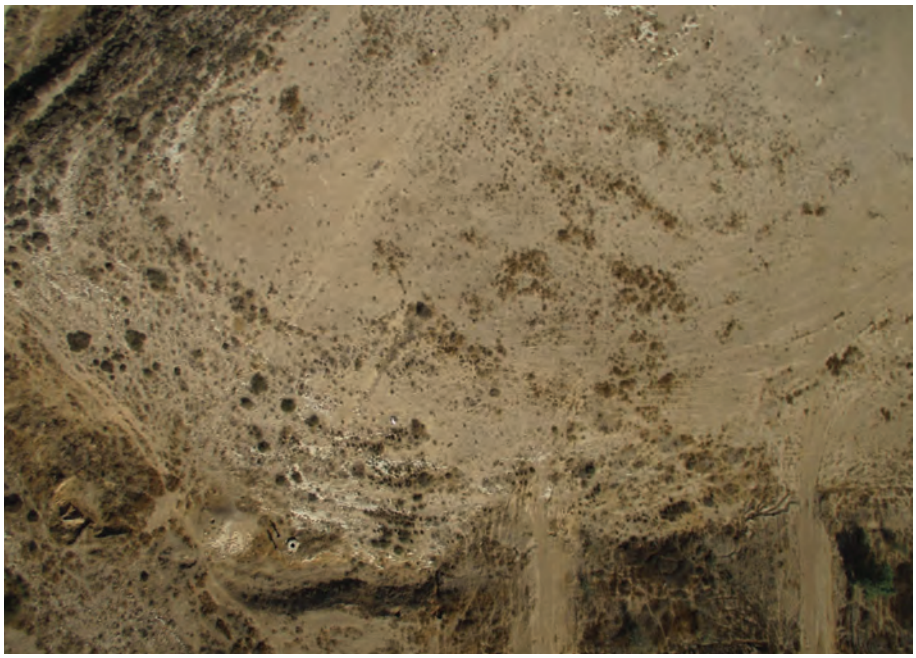

Figure 6. *Balloon photography of lands in the al-Araqib area. On the lower left-hand side, the round structure of a well can be seen, next to the shadows of the two DIY mappers holding the string of the balloon, 5 December 2016. Photo: Hagit Keysar*

for human rights activism based on citizen-science, open hardware and cutting-edge approaches to computational photography in the production of political testimonies, such as those produced by the 'Ground Truth project' described in this chapter.[17]

The Location Of The Test Case: Al-Araqib

I wish to open this section of the chapter, detailing the case of the village of al-Araqib, with an extract of the testimony Aziz al-Turi, a Bedouin activist and current resident of al-Araqib, provided during the Ground Truth aerial survey conducted on 5 December 2016:[18] He is speaking here with Hagit Keysar and Debby Farber, both collaborators on the Ground Truth project.

> ***Can you say whose well this is and what happened to it?***
>
> This harabeh[19] belongs to Ali Ahmad al-Juwabr al-Turi. Kakal[20] filled it with earth.Why did you build this belt of concrete around it? So [that] we will see it and recognise it.But how can you use it, now that Kakal has filled it with earth?We can't use it, but we want it to stay, so that people will see

17 'Ground truth' is a term used in various fields to refer to information provided by direct observation. In remote sensing, it refers to information collected on location.

18 The survey and interview was conducted by Hagit Keysar and Debby Farber with Aziz al-Turi.

19 A Palestinian-Bedouin term for a well or a pit in the ground for collecting rainwater.

20 Kakal (KKL) is the acronym for the Hebrew name of the Jewish National Fund (JNF).

> exactly what Kakal is doing. We can see how the terraces built by Kakal prevent the water from flowing to this harabe, and to the next, and to all the other wells after it. Year after year these wells are being erased by this forest. Now […] they [Kakal] will conceal all the places and resources that belong to the families who own these lands. Just to the east of this well, there was a tree. It was almost the only tree in the area, and they uprooted it […] There [pointing with his finger], there used to be a wadi (valley). You cannot recognise this wadi anymore; Kakal's terraces destroyed all the evidence. Here, there was a plot of land [with a] stone [wall]; they came with a bulldozer and removed it. Here, there was a tree that a Bedouin [planted]; they uprooted it.
>
> ***Does the erasure they create damage your ability to recognise the area?***
>
> When I see the tree, I know that this is the point where I'll find the well, to the west. If there is no tree, I get confused and I don't see the well. Today, many people cannot recognise the boundaries of their own lands. All the signs are based on nature – a hill, stony land, a wadi, a tree. They destroyed all these natural features and people don't know their own lands. They can only estimate because everything looks alike today: it is all terraces and trees planted by Kakal. So, all the things they felt and saw and lived with in the past, they can't find now and it's confusing. That's the basis for Kakal's practices […]: they destroy the relations between the Bedouin and his property, his land, his culture, his history. In the media, they say that they are 'greening' the Negev, 'making the desert bloom'. On the contrary, they ruin the beauty of the desert, because I, the Bedouin, have sown [it]. I sowed figs, I sowed carob, I sowed sabres; with my bare hands I worked and cultivated the land. Who taught them how to build these terraces? We, the Bedouins.

I first arrived at the village of al-Araqib on 31 December 2015. Throughout that Sabbath, between 1 and 2 January, the villagers, Zochrot[21] and Forensic Architecture held a 'Truth Commission', seeking to record and document Bedouin testimonies of dispossession and displacement since 1948. The forum also served as an opportunity to launch the Hebrew translation of Weizman's book[22] The Conflict Shorelines, which focused on the case of this village. Due to my work in Silwan, where I used photogrammetry and kite-mapping to form a three-dimensional transcoding of space, I was invited, along with PublicLab[23] organiser and researcher Hagit Keysar, to conduct a workshop on kite aerial

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21 Zochrot ("remembering" in Hebrew) is an NGO working since 2002 to promote acknowledgement and accountability for the ongoing injustices of the Nakba, the Palestinian catastrophe of 1948 and the reconceptualization of the Return as the imperative redress of the Nakba and a chance for a better life for all the country's inhabitants. Quoted from: Zochrot. "Our Vision." Accessed April 8, 2019. https://zochrot.org/en/content/17.

22 Eyal Weizman, '. סף המדבה, קו העימות: יישוב ופינוי כשינוי אקלים בנגב' Israel: Babel, 2016, Accessed January 16, 2019. https://www.babel.co.il/products/1451229024.

23 The Public Laboratory for Open Technology and Science (Public Lab) is a community which develops and applies open-source tools to environmental exploration and investigation. By democratizing inexpensive and accessible Do-It-Yourself techniques, Public Lab creates a collaborative network of practitioners who actively re-imagine the human relationship with the environment. quoted from: Public Lab, contributors. "About Public Lab." Public Lab. Accessed February 11, 2019. publiclab.org/n/4.

photography – what Keysar (2016) describes in her PhD thesis as the 'civic view from above'.[24]

Our workshop aimed to give an insight into the civic modes of image-making practices that could be used to produce up-to-date, accurate aerial images of the material remains of Bedouin life in the area before it disappears. Elaborating on PublicLab's methodology of DIY kite aerial photography, I then augmented the process with it's implementation through advanced data-visualisation technologies and photogrammetric processes for surface reconstruction. As part of the workshop, we (Keysar, the children of the village and myself) carried out the first attempt of photogrammetry-driven kite mapping in al-Araqib, focused on mapping the al-Turi cemetery from above, at the same time as we remained with our feet firmly on the ground, walking through the terrain, mapping and scanning it at ground level. This is a highly intimate and at the same time mysterious and speculative process by which detached observation, virtual transcoding and the lived knowledge of a place simultaneously form a comprehensive record. But alongside this, of course, there also exist gaps and technological glitches, and the unavoidable distance of a model formed by an image from the actual terrain.

Once we brought the kite down, we immediately started processing the images in two separate ways, photogrammetric 3D point clouds as well as stitching them into flat Orthophoto-mosaic. The first gave us an indication of the terrain's volume, while the second provided a high-res orthophoto of the entire site as it stood on the day of our Truth Commission. Scanning the image by eye, the traces of the bulldozers' movement on the earth's surface became apparent: a fresh scraping of the ground ending in the remains of a demolished structure pointed to a recent demolition; older scraping marks, with their own set of disintegrating material remains, clearly showed the recurring twin processes of destruction and rebuilding (zumud or 'steadfastness' in Arabic). The older grooves in the earth could be distinguished by the degree of newly grown vegetation they contained. In this semi-arid land, each fluctuation in the earth's surface impacts the micro-climactic conditions around it, and so a groove in the earth increases its capacity to collect and retain moisture, allowing vegetation to spring up. In some images, we could also see a dark, circular pattern above the cemetery, which clearly showed that it contained multiple types of graves: in the centre, shallow mounds encircled by small stones marked the oldest graves, dating back to the early twentieth century, while stone graves with concrete frames were more recent.

On the second day of the Ground Truth event, Keysar and I organised a presentation of the materials from the previous day's aerial mapping and asked the residents to annotate the images by placing yellow stickers on top of the prints (fig. 46). This annotation and

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24 Hagit Keysar, 'Prototyping the Civic View From Above: Do-It-Yourself Aerial Photography in Israel-Palestine', PhD, Ben Gurion University, 2016.

Figure 7. *Images of a tent and Sira taken by the kite held camera along with annotations by residents. Photo: Ariel Caine and Hagit Keysar, 2016*

close reading of the images with the help of the families formed the first building block from which the larger Ground Truth project and the Naqab.org platform[25] developed.

Through the coordination of the community-led aerial photography (with kites and helium balloons), ground photography and archival photographs, the group was able to start a process of photomapping al-Araqib and its environs. Situated knowledge of this fast-disappearing Bedouin terrain is not publicly available, let alone geolocated, photographic-based knowledge. It was essential to begin photo-mapping, geolocating and historically anchoring the remaining physical features of the land and architecture in advance of the fast-approaching JNF land works.

The aerial photograph, taken in collaboration with the community, did not produce or reproduce 'the gaze from nowhere'; rather, it acted as a direct extension of the experienced vision and knowledge on the ground. This project does not model itself on the continuity and totality of the techno-scientific eye of hegemony but operates through a different mode of engagement between the photographic process and the lived visible surface. This slow process – discontinuous and fractured yet more detailed, situated in time and location, and linked to local experience and memory – was inspired by PublicLab and informed by some of its methodologies. The project is committed to working with open-source platforms and low-cost affordable equipment in order to make the whole process accessible to as wide an audience as possible. Its aim is to break the existing dichotomy between the 'view from above' and that from the ground.

Immediately following the Ground Truth event, Forensic Architecture, Zochrot and the residents of al-Araqib, from the al-Turi, al-Uqbi and Abu Freih families, initiated a

25 Forensic Architecture. "Ground Truth." Accessed March 21, 2019. https://naqab.org/.

community-led mapping project. Al-Araqib no longer exists as an active village in the form it did nine years ago. Court cases over land rights and state-executed demolitions have meant that the struggles of the al-Turi and al-Uqbi families now mainly take place at a symbolic level, as they have been forced to shift their actions to the realm of what could be likened to 'salvage excavations' and the preservation of what is left, in the shadow of the rapidly advancing JNF afforestation programme. Therefore, the project has a threefold aim: to visually transcode the surface features in their present state; to begin a continuous registration of the changes as they take place; and to attempt to anchor the Bedouins' continuous presence on the land to the identification of current landmarks, linking them to their appearance in visual and textual archival records and testimonies.

Figure 8. *Al-Turi Cemetery as seen through the community satellite point cloud, 2016 (left) and as seen on Google Earth, 2017 (right)*

The Negev As Palimpsest: The Pixel And The Plot

Historical Maps And Photographic Traces Of Bedouin Occupancy

From the early map charted by Pierre Jacotin during the Napoleonic expedition in 1799 to the Dutch and mainly British cartographic expeditions throughout the nineteenth century, Palestine and the area that would eventually be named the Naqab/Negev were brought into the fold of modernised land cadastre (record of real estate) and ownership.[26] Inversely, as the mapping, parcelling out and registration of land by the sovereign pow-

26 Pierre Jacotin (1765-1827) was a surveyor and geographer who accompanied Napoleon on his 'expedition' to Palestine in 1799. This version of the resulting map (linked to below) was published in 1826 in the atlas, Description de l'Egypte ou recueil des observations et des recherches qui ont ete faites en Egypte pendant l'Expedition de l'Armee francaise (2nd edn.), Paris: Imprimerie de C.L.F. Panckoucke, 1826: http://users.cecs.anu.edu.au/~bdm/yabber/yabber_maps.html.

er increased, other modes of land occupancy and ownership, such as the internal land transactions practiced by the Bedouin families and tribes of the Beersheba district, were gradually superseded. The maps produced across the last 200 years span the changing sovereignties in the Naqab, from the Ottoman Empire to the British Mandate to Israeli rule. With their different logics of abstraction, the maps reflect the changing policies concerning thresholds of jurisdiction and occupancy, and are therefore useful in helping us to better understand the historicity of this tenet that plays such a central role in the present-day conflict. By comparing the maps with the aerial photographs used for their production, it is possible to further assess which areas were deemed important and which were to be discarded and converted to a smooth, featureless surface.

Many of the existing historic maps of the Naqab come from the European colonial expeditions and not from the ruling Ottoman administration. Even after the 1858 promulgation of a land code by the Ottoman rulers, in which it attempted for the first time to create an official system of land records, there seems to have been little cartographic activity to support the land registry efforts. Registration was slow to advance, most of it on the basis of written documents of agreement. In cases where drawings were made, they demarcated specific sections or plots but were not part of any larger, general cadastre or systematic land inventory.[27] The first attempt to produce a survey of the area by Jacotin cannot provide us with a picture of the situation in the Naqab as it was only carried out along the coast and main roads due to the constant danger of attack and the scarcity of resources. The entire desert area was left completely uncharted.[28] First cartographic records to possess some level of detail were the maps produced for the Palestine Exploration Fund (PEF) in 1879 by Claude Reignier Kitchener and H. H. Conder. This survey ends at Beersheba; however, it was the first to show isolated houses and agricultural areas, and to record the names of more than seventy Bedouin tribes throughout the entirety of Palestine.[29] It also marked a rough affiliation of Bedouin tribal confederation names such as Tayaha, north of Beersheba. The 1879 map therefore partially recognised the Beni Uqba or al-Uqbi family, which is part of the Tayaha tribe.

The introduction of aerial photography in 1915 by the British to assist their mapping process helped to expand both the scale and level of detail of the maps produced by the topographic section of the Egyptian Expeditionary Force (EEF). The introduction of the prerequisite of a new land registry during the British Mandate in 1920 paved the way for a triangulation grid as well as a new land survey project. Landowners were required

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27 Dov Gavish and Ruth Kark, 'The Cadastral Mapping of Palestine, 1858-1928', *The Geographical Journal* 159: 1 (March 1993): 70: https://doi.org/10.2307/3451491.

28 Noam Levin, Ruth Kark and Emir Galilee, 'Maps and the Settlement of Southern Palestine, 1799-1948: An Historical/GIS Analysis', *Journal of Historical Geography* 36:1 (January 2010), 1-18: https://doi.org/10.1016/j.jhg.2009.04.001.

29 Noam Levin, Ruth Kark and Emir Galilee, 'Maps and the Settlement of Southern Palestine, 1799-1948', p. 7

to come forward and register their plots.[30] Despite the presence of a grid, however, the actual mapping of the Negev did not take place until much later, during the later stages of Second World War, when both ground and aerial surveys took place. The aerial photographs taken by the Palestine Survey (PS) in December 1944 and January 1945 form the earliest basis for all arguments and discussions regarding cultivation and inhabitancy. One of the most important maps based on the PS aerial imagery is the 1:250,000-scale map titled 'Distribution of the Nomad Population of the Beersheba Sub-district'. Photographs taken from the air by the PS between 1945 and 1946 were scoured for tents and each one that was discovered was marked on the map. It shows 7,859 tents, mostly dispersed in the area north of Beersheba. After they assumed power, the British sought to include as many of the nomadic population in the Negev in 'village units' rather than 'tribal units', as they did in 1922 in the north and centre of Mandate Palestine, yet the Bedouin of the Naqab resisted or evaded these attempts.[31] Nevertheless, the development of precise mapping through aerial photography and the extensive coverage of the northern Naqab by the PS enabled the first application of a snapshot, remote population census via the tent count.

Once the state of Israel was established in 1948, it took over responsibility for the land survey and legal registration of ownership. The land laws from British and Ottoman times were adapted and transformed into a new Israeli cadastre. From this point on, visibility, invisibility and in-between levels of opacity played a continuous role in determining the ability of Palestinian Bedouins to maintain a hold on their land. Perhaps the most marginalised group in Israeli and Palestinian societies, their cultural knowledge was awarded no place in the new state. The documentation, evidence and memory – both communal and private – of their actual continued existence on the land was systematically negated. Today, through the omission of their presence on its maps, the use of deliberately degraded satellite coverage of the area and the promotion of afforestation, agricultural and construction projects, and by denying them access to legal routes of redress, the Israeli state has obscured or erased the very knowledge and material recognition of the Bedouin presence.

Salvage Photography in Al-Araqib

On 5 January 1945, a British Royal Air Force (RAF) reconnaissance plane passed over the northern Negev as part of their aerial survey of Palestine. On that morning, Flight

30 Article 11 of the British Mandate land registry states: 'It shall introduce a land system appropriate to the needs of the country, having regard, among other things, to the desirability of promoting the close settlement and intensive cultivation of the land.' ('The Avalon Project: The Palestine Mandate': http://avalon.law.yale.edu/20th_century/palmanda.asp#art11 (accessed 21 January 2019).)

31 Owing to the reluctance of the Bedouin in certain areas to co-operate in the general census, a special system of enumeration was devised 'to obtain information as to their numbers by sex and marital condition, and as to the distribution of occupations [among them]'. These enumerations were revised as far as possible towards the date of the general census. For this reason, the enumerations were not synchronous with the general enumeration of the population. In the detailed tables, the results were shown under a special heading, 'Non-synchronous enumerations'. Since the areas in which these enumerations were conducted were considered principally areas of 'nomadic life', their populations were classified as nomadic as distinct from settled.

Number 13 left Port Said and took a series of nadir (top-down) topographic images from an altitude of 15,000 ft. Five of these images captured the area of al-Araqib. By aligning, georeferencing and overlaying these with the use of QGiS,[32] it is possible to examine closely the full detail of the images in reference to their real-world location and to other survey sources. They reveal extensive Bedouin cultivation of the area, showing stone houses, cultivated fields, animal pens, tents, terracing and gardens. Moving in even closer, up to the level of the image grain, darker grains surrounded by small bright encirclements or mounds can be discerned. However, despite the high quality of the images and the fact that they have been taken at a nadir orientation in relation to the ground, the quality of the scan, fluctuations in exposure settings and occasional blurring means it is somewhat difficult to analyse them, especially as the features we need to identify exist at the threshold of capture-resolution and visibility.

Reading an aerial image is a skill that has to be learnt and developed. Each feature present on the ground at the time of the photograph can potentially leave a slightly different mark on the film depending on the conditions of light and shade at the time, its position and orientation in relation to the camera, and the amount or even the colour of its surroundings. On a grayscale image, the opening of a well, already at the limits of detectability, could either be mistaken for the shadow of a small bush or tree, or could blend in with a dark patch of land. On an even simpler level, even the mere position of viewing from above, observing an environment that has been flattened by the foreshortening propensities of the camera lens, can be extremely disorienting. Despite having more than ten years' experience in reading satellite and aerial images through my artistic practice and photographic training, the RAF aerial images of the Naqab presented me with the need to build a repository of the military landmarks[33] (fortifications, artillery positions, encampments and vehicles) as well as Bedouin land features, agriculture and architecture that existed at the time, and how these features appear under the specific optics and atmospheric conditions. The RAF images of al-Araqib were taken in early January, at the height of winter. If they had been taken during springtime, for example, the environment in this liminal climactic region would have resulted in a completely different image. Identifying traces of inhabitancy and cultivation in the image therefore also brings the question of the agricultural calendar into consideration.

Given the above difficulties, it was essential to compile a training dataset of aerial features of the Naqab using several sources, including firstly Weizman's (2015) own close

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32 QGiS is an open-source geographic information system.

33 Reconnaissance interpreters were 'trained to know how things ought to look under all sorts of different conditions in a vertical photo' (Herbert E. Ives, Airplane Photography, London: Philadelphia Lippincott, 1920, p. 355) and to detect deviations from the expected norm. Against the uneventful baseline of the learned conditions ('how things ought to look'), they scanned for signs of an event or 'some new initiative by the adversary that would require the event-in-kind of targeting' (Paul K. Saint-Amour, 'Modernist Reconnaissance', Modernism/Modernity 10:2 (2003)).

reading of the 1945 RAF images of al-Araqib,[34] as well as those by Oren Yiftachel (2018). The work of both these scholars, as well as Weizman's personal one-on-one guidance, were invaluable for gaining an understanding of the truth on the ground by combining cultural and agricultural knowledge with the material surface reality, which was then recorded on film.[35] Secondly, multiple (predominantly Israeli) researchers have produced a huge treasure trove of research into Palestinian Bedouin inhabitancy in the Naqab region in particular, as well as examinations of the use of aerial imagery throughout the first half of the twentieth century in Palestine in general. Researchers such as Dov Gavish (1991, 1993, 2003),[36] Ruth Kark (2013)[37] and Noam Levine (2010)[38] have published analyses based on the close reading of the surface features captured in aerial photographs and combining geographic, historical and image/cartographic research. These analyses provided an invaluable resource that I relied upon in my own training. A third source of reference, which was perhaps the most instructive, was a document containing expert geographic testimonies that was produced in advance of an upcoming court hearing in one of the cases involving the al-Turi and Abu Freih families over six of their contested plots. The author of this document, Dan Sharni, a geodesy expert, meticulously analyses each aerial image of the relevant plots in al-Araqib, from the RAF 1945 photographs through to the 1999 images produced by the Israeli Land Authorities.[39] Overlaying the photographs with plot-shaped files using GIS (geographic information systems) software, he then continues to mark and explain in detail each type of feature on the ground, tracking stages in cultivation, transformations in land-use, the movement of tent clusters across time, as well as the Israeli state's development projects. Unlike any other report I have examined, including the extensive research conducted by Levine, whose internal processes of analysis were extremely thorough, this evidence provided an invaluable opportunity to learn about the specifics of the case, as well as an insight into the mechanics and methodology of a geodetic expert report. Lastly, the backbone of this entire research into aerial image analysis comprised multiple archives and reports relating to the use of European aerial photography in the first half of the twentieth century, both in Europe and in the Near East, as a tool of reconnaissance and of archaeology.[40]

Whether each of these experts agreed with the Bedouin families' claims or not, their

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34 Weizman, Eyal, and Fazal Sheikh. The Conflict Shoreline: Colonization as Climate Change in the Negev Desert. 1. edition. Göttingen: Steidl, 2015.

35 One simple example is the seasonal circular animal pens constructed by the families for their goats and sheep. The excrement taints the ground, leaving a circular imprint even after the herd has moved on to another nearby spot or after the families have been displaced.

36 Gavish, Dov. Land and Map: The Survey of Palestine, 1920-1948. Jerusalem: Yad Izhak Ben-Zv, 1991. Gavish, Dov. Man-Made Birds on Our Horizon: First Flights over Palestine 1913-1914,. Jerusalem: Yad Izhak Ben-Zv, 2003. Gavish, Dov, and Ruth Kark. "The Cadastral Mapping of Palestine, 1858-1928." The Geographical Journal 159, no. 1 (March 1993): 70. https://doi.org/10.2307/3451491.

37 Kark, Ruth. "Counting Nomads: British Census Attempts and Tent Counts of the Negev Bedouin 1917 to 1948." Population, Space and Place, no. 20 (May 27, 2013): 552 – 568. https://doi.org/10.1002.

38 Levin, Noam, Ruth Kark, and Emir Galilee. "Maps and the Settlement of Southern Palestine, 1799–1948: An Historical/GIS Analysis." Journal of Historical Geography 36, no. 1 (January 1, 2010): 1–18. https://doi.org/10.1016/j.jhg.2009.04.001.

39 The document and materials were shared with me (as project coordinator for the Ground Truth project at Forensic Architecture) with the intention that we contribute to the evidence for the trial at a later stage using our platform, evidence and analysis.

40 Mnay books and papers accounted for the significance of this regions place in the history of archaeological research from the air.

feature identification and even their interpretations of the evidence were instructive when producing my own analysis. As stressed earlier, a key point of contention at the heart of these conflicting versions relates to the basic definitions of what constitutes presence, cultivation and inhabitancy in relation to ownership. The definition of these concepts determines the interpretation of the relationship between the visible features in the image and those on the ground. For instance, in their conclusion that Bedouin families had no sedentary presence in specific plots of al-Araqib, Levin and Kark (2010) rely on the fact that when examining the plot areas over time, tent clusters are present at certain times and not at others. However, examining the area in a slightly wider prism, shows that the tents do not disappear; but rather, they move to an adjacent hill in order to make way for denser agricultural cultivation within the plot's limits. The Bedouin observed the limits of the borders of their plots, although not at the strict levels of GIS accuracy, and therefore it was necessary to allow for a level of flexibility within a family's own set of plots. As much as it was sedentary, this type of agricultural and livestock-based family village structure, which was organised through nodal points in the environment, retained a level of flexibility that clashes with what the Israeli state and courts are willing to concede as constituting settlement. As we have seen, despite the formalisation of a land cadastre and the spread of land registration under late-British Mandate rule, and then again under Israeli sovereignty, the Naqab existed as a zone of relative exception. The British admittedly did not assert full control over the Naqab, and Israeli rule, once the 1948 war ended, immediately opted for a quite different method of control through the creation of a 'siyaj' area ('fenced area' in Arabic) of military rule into which it forcibly displaced the entire remaining Palestinian Bedouin inhabitants.

In order to construct an overall analysis regarding the question of the continuity of the Bedouin presence for this research, the extant historical documentation had to be examined in relation to remains on the ground and, most importantly, through incorporation of knowledge and history as narrated and relayed by the families of al-Araqib. As we saw in the case of the 2009 IAA land survey, even outside of the land claims, once the Bedouins' voice is denied a hearing, their entire presence can be completely ignored and overwritten by vague, technical language. One example is the case of the houses of ibn-Bari and al-Malahi of the al-Turi family. These were constructed at the time of the early British Mandate by individual heads of the al-Turi family, yet Israeli researchers simply write them off as anonymous structures dating from the Mandate period. Other landmark features, however, such as wells, are not even awarded that mysterious ambiguity; they are simply referred to as remains from the Byzantine period, completely erasing the fact of their upkeep and use over the past 200 years by individual families.

Figure 9: *Aerial photograph screenshots from the Israel GIS system displaying 2010 images over al-Araqib. The al-Turi Cemetery and adjacent village can be seen before their demolition several weeks later (left). The house of Hussein Mahmoud Abu A-Tayf is clearly visible (right).*

In contrast, by laying the georeferenced survey conducted by Odeh Abu Friha in 2011[41] over the black-and-white RAF photograph on the QGiS console, it is possible to compare the features seen in the 1945 aerial image with the historic Bedouin 'remnant' sites documented in 2011. I also loaded the orthographic images created by the kite surveys in 2016-17 in order to view those same locations in extremely high detail. The 1945 images, like the earlier ones taken by the RAF, the Australian forces and the German Air Force during the First World War, were intended to survey infrastructure and enemy positions but inadvertently left an invaluable documentation of the form and extent of Bedouin presence on the land before the establishment of the state of Israel in 1948. Importantly, contrary to the later claims that the Negev Bedouins were nomads, we can see that there is a distinct spatial relationship between architecture, topography and agriculture that supports the families' claims of a historically sedentary mode of inhabitancy. The clear geometry of architectural and agricultural relations can be seen as each household with its cluster of tents, organised in rows in a south-north facing axis, is located at the higher points of the hills. Adjacent to the tents, a series of wells and cisterns are located towards the lower parts of the hill, following the route of the river. The small estuaries in the main river valley have been dammed in order to create garden enclosures, while nearly all the hills encircling the tents display signs of cultivation. At least one stone structure is located next to the areas containing the tents and animal pen. In most cases, these structures consist of one or two rooms but sometimes they are large multi-room complexes, such as

41 See 'Appendix chapter 4 Item no. 8: Locations of settlement remnant sites near claimed land in the 'Araqib area, 2011' in the survey by Odeh Abu-Friha, independent surveyor, Beersheba, submitted to the al-Uqbi land claim CC (BS) 7161/16.

Figure 10. *On the aerial image by the Israel Survey (top) and on the 1944 British Survey map (bottom) a mark is placed at the location of the stone house of Salem A-Sabihat Al-Uqbi, however neither of them states the Bedouin assiciation to the structure.*

those of al-Malahi and Abu A-Tayf.[42]

Comparing the series of 1945 RAF images with those of a 2017 Geo-Eye satellite used on Google Maps and Google Earth, it is clear that almost none of the detail visible on close examination of the historic photographs is identifiable on the satellite images. Thus, while displacement, destruction, land works and afforestation have quite literally transformed the landscape, converting it from agricultural land to forest, and preventing and rendering illegal the return of the families to their land, this transformation on the ground is mirrored by an obfuscation at the level of the image.

IAA Surveys and the Israeli Mapping Service

One of the most significant forms of recent land survey in Israel is the one conducted

42 In 1953, Abu A-Tayf's family was expelled north of the cemetery, only 400 meters from their original residence. Hussein Mahmoud Abu A-Tayf was slaughtered and buried in the cemetery under the cactus tree. The cemetery itself is still in use. The uprooted A-Tayfs currently live in Rahat, Lod (Lydda) and Gaza.

by the Israeli Antiquities Authority (IAA) in advance of any form of land work or construction. Any land work undertaken in Israel is preceded by an archaeological survey which then either authorises the project to proceed in full or marks sections for some form of preservation or salvage excavation and record before allowing it to proceed. Finally, the survey can recommend a cancellation of the work due to the need to preserve and protect of an identified heritage site.

Figure 11. *The overlay of the Google Earth satellite image with the survey map by Oren Yiftachel and Oda Abu Friha, 2010.*

In 2008, the IAA conducted an archaeological survey[43] of the entire region of al-Araqib (or, as Israel refers to it, the Fahar and Dudaim Rivers area) in advance of the JNF afforestation project and prior to preparing the ground for planting trees. The survey, undertaken on behalf of the IAA and financed by the JNF, was directed by Emil Aladjem, with the assistance of Sharon Gal (GPS). The survey denotes forty-nine sites consisting of cisterns, wells and field watchtowers, as well as cemeteries and graves. The last received a dedicated survey and report, conducted by Beni Tfilin of the JNF. This specific survey was conducted in response to claims by Bedouin activist Nuri al-Uqbi, on behalf of his family, that the proposed JNF plan for afforestation would damage existing burial sites. The JNF survey identified four burial grounds, and two of them, the al-Turi and Birkat al-Batal cemeteries, were acknowledged to be still active.

43 'Volume 126, Year 2014, Nahal Dudai'm, Mishmar Ha-Negev Forest': http://www.hadashot-esi.org.il/Report_Detail_Eng.aspx?id=12657&mag_id=121 (accessed 6 February 2019).

Figure 12. *Nearly each one of the Bedouin sites has a corresponding archaeological registry in the IAA survey. These registries, marked in the above images by orange rectangles, seen through the Israeli survey platform, date from the Byzantine to the Ottoman eras but in nearly all, these cases fail to acknowledge recent use by local Bedouin families over the past 200 years.*

All the forty-nine sites thus identified are described in the surveys, along with their use, their date of origin and historic use. In all but three instances, however, no mention is made of their Bedouin origin and historic use, and there is only one reference to modern-day use in example 20 (map ref. 179121/583722),[44] which describes an ancient cistern renovated in a modern fashion, with a side opening for collecting water. The three historical references relate to British Mandate-era origin. For example, one (map ref. 179736/586606) describes 'a farm (20×20 m), with eleven rooms arranged around a central courtyard, the walls built of unworked chalk stones (max. preserved height 1.5 m)'. The survey mentions that 'the construction style of the farm structure is characteristic of the outlying regions during the British Mandate. It might have been constructed atop the remains of a Byzantine building.' Yet, in 2011, when independent surveyor Odeh Abu Friha overlaid and compared the IAA and JNF surveys, which marked the locations of 'remnant sites' near land claimed by Bedouin families in the al-Araqib area, with one another,[45] it became immediately apparent that all the sites marked by the archaeologists had either been constructed or historically used by the Bedouin families. The late Ottoman or British Mandate-era constructions referred to in this report are mirrored one-to-one by the names of individuals belonging to Bedouin families and tribes. The first site is identified by the al-Turi family as the well of Sliman Ibrahim Al-Qusair, while the second is the house of Hussein Mahmoud Abu A-Tayf, who was slaughtered in 1948 and buried in the adjacent cemetery (see note 42).[46]

The report concludes with the paragraph: 'Most of the archaeological remains surveyed are characteristic of the habitation in the region during the Byzantine and early Islamic periods. Isolated farms and agriculturally related remains such as cisterns, farming terraces and installations were found in the survey area.'[47]

Taking just one house as an example through which to examine an anchoring of the present to the Mandate-period maps and aerial images, the site identified today by the al-Uqbi family as that of Salem A-Sabihat's home, although anonymised by the IAA, is clearly present (in 1945), and is marked on the 1940 British survey. This house belonging the al-Uqbi family is located directly adjacent to tents, wells, and cultivated fields and gardens. To its south and west, two other al-Uqbi households exist alongside the same architectural structure. The al-Uqbi cemetery and one additional house are located to the east, ending right where the al-Turi properties and cultivation begin.

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44 'Volume 126, Year 2014, Nahal Dudai'm, Mishmar Ha-Negev Forest': http://www.hadashot-esi.org.il/Report_Detail_Eng.aspx?id=12657&mag_id=121 (accessed 6 February 2019).

45 Odeh Abu-Friha, 'Appendix chapter 4 Item no. 8, Locations of settlement remnant sites'.

46 Information gathered from an account given by Awad Abu Freih.

47 'Volume 126, Year 2014, Nahal Dudai'm, Mishmar Ha-Negev Forest': http://www.hadashot-esi.org.il/Report_Detail_Eng.aspx?id=12657&mag_id=121 (accessed 6 February 2019).

The Use Of Drones And GIS To Monitor 'Illegal' Construction

The objective of Operation Yoav,[48] which took place during the 1948 war, was to 'free' the Negev and sever the continuity of Arab control along the line connecting Samaria and Gaza. The preservation of this state of separation through monitoring any sign of construction or attempted return became the focus of the Israeli state's systems of surveillance, control and pre-emption. The armed conflict turned into one waged by means of land cultivation, development, construction and demographics. Keeping the balance on the side of the (Jewish) state meant there was a growing need for fast and efficient organisations for monitoring. Aerial surveys and monitoring was the most efficient method by which to keep up with the 'illegal' construction, cultivation and attempts at return by Palestinian Israelis in the Naqab/Negev. Another operative arm of the authorities against construction and development in the illegalised unrecognised villages was the 'green patrol', founded in 1976, set out to monitor and enforce the safeguarding of national lands from 'invaders and harm-doers'.[49]

As Neve Gordon and Nicola Perugini (2015) describe succinctly,[50] in parallel to the escalating juridical disputes between the state and the Bedouin inhabitants, the Zionist NGO Regavim (the Hebrew word for 'clods of earth') was established. According to the English version of its website, it is dedicated to the 'responsible, legal, accountable and environmentally friendly use of Israel's national lands and the return of the rule of law to all areas and aspects of the land and its preservation'. This quote is phrased in such a way as to reflect an apparent professional and civic concern for the rule of law. And yet, in the Hebrew version of the webpage (as well as in other slightly deeper sections of the English site), the language changes from that of environmentalism and upholding the law to that of a straightforward ethno-national war of survival, which must be waged through cutting-edge remote sensing and surveillance, hand-in-hand with Jewish agriculture, afforestation and settlement.

Regavim is a unique example of the way in which religious right-wing settler ideologues have shifted their mode of operation. On the one hand, the NGO adopts the discourse of human rights and international law in order to portray Israel's actions against the Palestinian population as defensive, even within its own international borders (that is, not in the occupied West Bank and Gaza but within Israel's 1948 borders). On the other hand, inversely to the rise in Palestinian national sentiment among the Bedouin and Pal-

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48 Wikipedia. "Operation Yoav." In Wikipedia, February 26, 2019. https://en.wikipedia.org/w/index.php?title=Operation_Yoav&oldid=885138630.

49 See Slideshow of the green patrol objectives at http://www.moag.gov.il/NR/rdonlyres/89A0122E-924B-4350-8151-8EB49D80DE09/0/אכיפתההגנהעלאילנותמחרוליער_הללעזרן.pdf.

50 Nicola Perugini and Neve Gordon, The Human Right to Dominate, New York: Oxford University Press, 2015.

estinians citizens within the 1948 borders, it seeks to further blur the distinction between the Negev and the West Bank and Gaza. A present-day escalation of the 'battle for the Negev' is being waged through an alliance between the state planning authorities and this new Zionist settler NGO's remote-sensing organisation.

Regavim operates through the parallel use of ground survey, legal action and advocacy. Emulating the work of liberal activist organisations like Peace Now and B'tselem, which deploy remote sensing across time to monitor illegal actions by the state while pursuing legal (and advocacy) routes in an attempt to hold the state to account on behalf of civil society and the unrepresented residents of the Occupied Territories, Regavim has adopted similar techniques against the Palestinian population in order to spur the state into action. Increasingly, GIS and satellite imagery analysis form an essential part of their reports and position papers.[51] Due to its symbolic status as a beacon of Bedouin steadfastness in the Naqab, the village of al-Araqib has been the focus of several Regavim reports, all of which systematically attempt to counter the main claims set forth by the families of al-Araqib in the courts. Its latest report, released on 31 December 2018 and titled 'The truth about the Bedouin in the Negev', sets out the testimony of the state's expert witness, Prof. Kark, countering Bedouin claims for indigeneity, the continuity of their presence predating Israel's formation, and their inherent spiritual connection to the land. Kark's findings, referred to in the previous section of this chapter, are backed up by Regavim's analysis of their own aerial images, which states that claims for the existence of the village and cemetery of al-Araqib are false as evidence of the cemetery only appears in 1965, and the village itself only came into existence in the 1990s.

However, a simple examination of the images laid out in the report reveals that they have been deformed and, more significantly, the yellow marking pointing at the area of the cemetery is placed in the wrong location in all but the 2010 image. Furthermore, as demonstrated by Prof. Weizman, the size of the al-Turi cemetery was still small in the 1940s and its graves were merely small mounds of earth. As such, the level of detail on Regavim's aerial photography is not sufficient to differentiate between land and grave; only by zooming into the level of the silver halide grain on the photographs, overlaid by GIS software, can allow us to discern that, in the 1945, 1949 and 1956 images, traces of the cemetery are in fact present. It is true that no village existed in its modern form until the late 1990s but, prior to the founding of Israel and the Palestinian Bedouin displacements in 1951, Bedouin families did inhabit the land in a sedentary fashion in a clustered formation of households, according to family association, with each household owning and cultivating its lands, with a supporting architecture of tents, stone and mud houses,

51 Regavim (blog), 'Maps & Position Papers Archives': https://www.regavim.org/category/position-papers-maps/ (accessed 22 January 2019).

wells, underground caves for grain storage and cemeteries.

In late 2016, Regavim set up a drone unit in order to expand its ability to monitor land use and construction throughout Israel and the West Bank. The threshold between the Negev region and the West Bank received particular attention in the unit's activity as it is perceived as the forefront of the architectural war being waged by the Palestinians and Palestinian Bedouins and is regarded as a fault line within Israel's own line of defence. Thus, the NGO is using remote sensing to monitor the so-called 'rampant Bedouin take-over' of lands in the Naqab/Negev.

Disregard Of Al-Araqib's Bedouin Records And Documentation

In a self-referential loop, a weakened visual presence leads to a weakened hold on actual land and memory. If, in the process of mapping al-Araqib and other Bedouin 'unrecognised' villages by the civic authorities and right-wing NGO's, the close co-constitution of terrain and images can result on an elementary material level in the displacement from the image of the Bedouin owners of the land, this can lead on the ground to a disappearance of territory, along with its human and nonhuman ecology. This is a terrain that is rapidly and constantly changing its visuality. However, contrary to the picture that emerges from the state-held perspective discussed in the previous section, a completely different understanding of the historic and current situation emerges when examined through the accounts and records of the Bedouin families. Research into the past records of Bedouin families existing on the land around al-Araqib reveals clear traces of their occupancy, from Ottoman tax receipts on grain quotas to internal agreements between tribes, families and family members. Written deeds and agreements were sometimes approved by local officials – Ottoman, British and Israeli – although at other times these were completely internal agreements. However, German and then British maps, and even early Zionist surveys, record the land dealings of the Bedouins of the area. For example, the precise date when burials began to be performed at the al-Turi cemetery of Al-Araqib can be established as taking place in the early twentieth century on a plot of land registered to the al-Turi family. It is further recorded that the al-Turi family bought it from the Al-Uqbi family in 1905.[52] The previous continuity of recorded ownership of this land by the al-Uqbi family from 1807 to 1951 is, nevertheless, disregarded by the Israeli regime and its institutions.

Legal Rationale

The claims of landgrab, illegal construction and trespassing brought against the al-Turi, al-Uqbi and Abu Frieh families of al-Araqib rest on the a-priori negation of their long-

52 See Appendix for Chapter 4 Item no. 6 for a reproduction of the land transaction document.

term presence and ownership of these lands. What is not (entirely) contested, however, is the fact that the families were there at some point during 1951 and 1953, when they were officially evicted by the Israeli military. Throughout the Naqab, Palestinian Bedouin villagers were asked to evacuate their lands and move into a corralled region north of Beersheba, later termed the 'siyaj'. The families were give different reasons for this removal, such as security needs, military training manoeuvres, infrastructural development, and so on, and in most cases the families were encouraged to believe that that their absence from the land would be a temporary one and that within a few months the military would move out and they could return. In al-Araqib, the al-Uqbi family were promised in 1951 that they would be back within a period of three months. Thus, two main types of legal claim form the basis of the current Bedouin challenges against the state: first, the claim of their historic continuity of sedentary presence, ownership and cultivation of the land;

Figure 13. *Aziz Al-Turi points out the layout of al-Araqib prior to its destruction.*

and second, the question of the dubious legality and therefore validity of their 1951-54 displacements and of the confiscations that took place during the 1950s – that is, whether the pretexts for the Israeli state's 'need' for the land were true and the land was actually used for the purposes given as reasons for their displacement at the time. Both these legal processes put into motion by the Bedouin families require evidence that 'anchors' them to land through spatial analysis and historic and present-day documentation. Any form of argumentation supporting their sedentary presence prior to the foundation of the Israeli state needs to link all existing forms of testimony and documentary evidence to both the physical as well as the image-based record.

Zumud: Residents' Struggles And The Incorporation Of Visual Documentation

Documentation of the long ongoing struggle in al-Araqib has been carried out for the greater part by the residents themselves. Men, women and children, using smartphones and video camcorders, have been documenting each and every demolition since the large-scale destruction of the village in 2010, when the already-mobilised families welcomed in the media with cameras and surveys to support their cause. Working with researchers, activists and several NGOs, they began to systematically record the ongoing violations on the ground and the expansion of land works, and to mark the erosion of their existence on the land.

One violation by the Israeli state where eventually the Bedouin residents managed to succeed in their petitions regarded the use and weaponised of herbicides to kill the crops in al-Araqib as part of the attempt to drive the families off their land. The 2007 ruling on the question read:

> *Are aerial spraying operations, carried out by the state and on its behalf in the lands that it owns and maintains in the Negev, a legitimate tool when dealing with the problem of invasions carried out by residents of the Bedouin diaspora? This is the main question that stands at the center of this petition…. Indeed, an invasion of state land is an illegal act, which is intended to deprive the state of its right and its obligation to manage its lands according to criteria and needs established by the institutions. However, the state's coping with the phenomenon of invasion by means of air spraying is illegal, although the state's argument maintains the complete use of pest control. [my trans.].*[53]

In a conversation I conducted in al-Araqib in 2016,[54] Aziz Al-Turi, son of the head of the Al-Turi family and a leading activist in the Bedouin families' struggle to remain on their land in al-Araqib, explains the layout of the village prior to its destruction in 2010. The al-Turi family commissioned the aerial photograph in 2008 as part of their attempts to document and demonstrate their cultivation and development of the land in advance of the coming destruction. Today, nothing remains in this area, which is already covered in young saplings. Walking through the terrain with Aziz al-Turi and Nuri al-Uqbi, with the kite camera above us, we transcoded and photo-mapped the material remains of their families' past existence. Even from the ground, using the georeferenced map of the remains of all Bedouin settlement sites in al-Araqib created by Abu-Friha,[55] it is extremely

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53 Supreme Court 15-04-2007 סלים אבו מדיגם נ. מינהל מקרקעי ישראל 2887/04 (בג"ץ-2007) https://www.ruling.co.il/%D7%91%D7%92%22%D7%A5-2887-04-%D7%A1%D7%9C%D7%99%D7%9D-%D7%90%D7%91%D7%95-%D7%9E%D7%93%D7%99%D7%92%D7%9D-%D7%A0.-%D7%9E%D7%99%D7%A0%D7%94%D7%9C-%D7%9E%D7%A7%D7%A8%D7%A7%D7%A2%D7%99-%D7%99%D7%A9%D7%A8%D7%90%D7%9C_1e45cadc-f105-861f-e8fd-043466e086dd

54 See Appendix for Chapter 4 Item no. 17

55 Odeh Abu-Friha, 'Appendix Chapter 4 Item no 8 . Locations of settlement remnant sites'.

difficult to find the wells, cisterns, storage caves, graves and ruined houses. Some wells still contain water but others have been filled with sand by JNF workers, while still others have simply dried out as a result of neglect or shifts in land height and water flow. However, although it is nearly impossible to discern (both from the air and on the ground) the multitude of wells that once existed all over the area, when looked at from beneath the thin surface 'crust', the 3D imaging of the protruding wells reveals their architecture.

Ground Truth: Towards A Participatory Spatial Counter-Practice

Thus far, the aim of this section has been to demonstrate that the state of Israel has succeeded in taking over the Naqab region and asserting its sovereignty. It has done so by over-writing the land, obfuscating the visible, historical record of its Bedouin occupants and their present existence, and establishing a land code that in effect criminalises any form of zumud. The abstraction of maps has enabled the erasure of Bedouin names, landmarks and affiliations while inscribing the future land use as a fait accompli. Aerial surveys, both historic and current, while containing important records, have been interpreted through an analytical and semantic lens that has only contributed to further dispossession. On the ground, uncharted, illegalised and denied any basic public amenities, the Bedouin citizens of Israel have become the most marginalised, poorest sections of the population. Their internal cohesion has disintegrated in both the recognised and 'unrecognised' villages and townships, but even more so in the former.

However, in opposition to such situations, a growing field within anthropology is 'oriented toward the creation of spaces of collaboration between researchers and those who formerly would be considered their subjects of inquiry'.[56] Sherry Rubin Arnstein developed a typology of citizen participation. Published in 1969 the "Arnstein's Ladder" offered 8 stages of citizen participation and non-participation, from 'manipulation' to 'citizen control'.[57] from participation which enables powerholders to "educate" or "cure" the participants to one in which participants obtain the majority of decision-making seats, or full managerial power. Early in 2011, Prof. Muki Haklay from the GIScience, University College London developed a new ladder of participation focused on citizen science.[58]

The concept of public, participatory GIS practices entered into the discourse and prac-

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56 Marcus, George. "Prototyping and Contemporary Anthropological Experiments With Ethnographic Method." Journal of Cultural Economy 7, no. 4 (October 2, 2014): 399–410. https://doi.org/10.1080/17530350.2013.858061.

57 Arnstein, Sherry R. "A Ladder Of Citizen Participation." Journal of the American Institute of Planners 35, no. 4 (July 1969): 216–24. https://doi.org/10.1080/01944366908977225.

58 Haklay, Muki. "Citizen Science and Volunteered Geographic Information: Overview and Typology of Participation." In Crowdsourcing Geographic Knowledge, edited by Daniel Sui, Sarah Elwood, and Michael Goodchild, 105–22. Dordrecht: Springer Netherlands, 2013. https://doi.org/10.1007/978-94-007-4587-2_7.

tice of geography in the late 1990s alongside a growing concern for participatory and civic led practices. The increasing ubiquity of digital means of sensory recording, as well as growing bandwidth and coding structures for mapping, means that database-driven and user-input web-based pages can enable, on a technical level, collaborations between the public and experts.(Goodchild 2007, Haklay & Tobon 2003) In the spirit of this principle of collaboration, this project has put these technologies to work to ascertain the thread of continuity of Bedouin occupancy in al-Araqib through cross-referencing the aerial visual record gathered through satellite and current kite/balloon photography as well as ground photos. Once georeferenced, all these materials can be accurately overlaid, one over the other, along with the British and Ottoman maps of the area. Through such layering, each site and point of interest can be inspected across time and through media sources. Land use, the size of land features (that is, the size of stone structures, the extent of the cemetery, etc.) and their integrity, as well as their location and movement over time, could be tracked.

As this chapter has shown, at the same time as forced physical displacement and illegalisation render these communities non-existent on maps and aerial imaging, state-led land works and afforestation on the ground transform and erase their material cultural remains. Ground Truth, the collaborative project led by Forensic Architecture aims to document and collate the disparate legal, historical and material evidence of the continuity of sedentary presence of the Bedouin on this land, as well as traces of their repeated displacement and the destruction of their communities by government forces.

At the heart of the project lies a community-led photographic file and a bespoke 3DGiS platform that uses contemporary and historical images to chart the continuous presence of the Palestinian Bedouins in the Naqab. The first iteration of the project, discussed here detailed in the following sections of this chapter, centres on the village of al-Araqib. Thirty-five further 'unrecognised' villages and townships exist in the Naqab, under continuous threat of demolition. Hence, a second phase of the project is planned, expanding the current work and its methodologies into those locations where civic-led documentation could assist in establishing proof of continuity of presence or in creating planning alternatives on behalf of the communities at risk.

The Methodology Of The Project

At the core of this project is an experiment in the collaborative potential use of spatial photography as a tool of survey and record, combining ground-level images with DIY kite and balloon aerial photography. Stemming from an urgent need to document the disappearing Palestinian Bedouin environment, Forensic Architecture, together with PublicLab, Zochrot, and the local families of al-Araqib, created a kind of 'community

satellite',[59] fusing aerial and ground perspectives and combining colonial and Israeli archive materials with the families' own archives in order to give voice to a negated, unheard and unregistered mode of existence on this land. Learning from and collaborating with Hagit Keysar, PublicLab organiser and researcher, we used kites and balloons equipped with simple cameras to gain a view from above. These low-altitude aerial images, though acquired by extremely low-tech means, provide a final image far superior to any officially produced image, enabling the residents to conduct such surveys whenever and wherever they need them.

Hundreds of image datasets, gathered across multiple expeditions, were assembled through photogrammetry into stacked, geo-referenced, 3D point-cloud photo terrains. These spatial photographs, taken by residents and activists, document not only expulsion and destruction but also their ongoing life and resistance, and along with other media, data and testimony, attest to the violence that has been inflicted on the occupants of this area by connecting the history of their local land struggles to larger-scale and longer-term environmental transformations and to the conflicts such changes have provoked.

Ground Photography

All individual sites of heritage and destruction related to specific claimant families of al-Araqib were photographed from ground level for the purpose of 3D reconstruction. Each site, regardless of size, was documented by still images taken using cell phones, an Olympus TG-4 GPS-enabled point-and-shoot camera, a GoPro Hero5 Black with GPS and several models of Sony and Canon point-and-shoot cameras without GPS. The images were taken while moving in a circular motion around the site. In most cases, this encircling was then repeated at several heights around the site.[60] Once an overview of the site from all angles was recorded, we repeated the process for specific features within the larger site to gain more density and detail. In order to attain a good coverage of the object in terms of height-volume, images were taken at a height close to the ground (kneeling), at eye-level and finally, using a monopod to raise the camera, at approximately 3 meters above ground. Overall, each site was covered from an average of around 300 viewpoints. In the case of structures such as the al-Malahi[61] stone house, which has several rooms, the process was similar but required many more images (over 1,000) in order to adequately cover all angles in detail.

Wells, cisterns, zunars[62] or storage caves required sending the camera underground.

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59 Public Lab, 'About Public Lab': publiclab.org/n/4 (accessed 11 February 2019).

60 See the diagram of the photogrammetry method of photography in the introductory chapter of this thesis. Appendix for Chapter 2 Item no. 5

61 https://goo.gl/maps/JmLsXUsaUj12 (Accessed 28.4.2019).

62 The small entry hole to the underground storage cave was sealed once the grain was stored in order to prevent moisture from spoiling the wheat and barley.

Operating according to the same logic of 'structure through motion', the camera was lowered into the cavities using a long monopod, all the while being continuously rotated in a consistent motion. The lighting was provided by small LED lights that were lowered with the camera. Geo-registration and measurement were taken on the surface, at the entrances to these structures, as it was not possible to enter them physically, and their internal measurements were deduced in the point cloud from these exterior control points.

Aerial Photography

The method of aerial photography employed by Forensic Architecture for this project was adopted from our collaborators PublicLab and from the experiments I conducted in Jerusalem with PublicLab researcher Keysar. As the use of drones was not possible at the start of the project for several reasons, our choice of method for low-altitude aerial survey was that of kite and balloon aerial photography. Large wing span, single-line kites and large helium-filled balloons were used to carry lightweight cameras, encased in bespoke 3D-printed[63] and plastic bottle[64] rigs. Consumer-grade cameras (such as the models detailed in the ground photography section) were secured to these rigs and set to take still images on continuous mode. Once the exposure was set and the camera had started time-lapse recording, we raised the kite or balloon into the air. At about 20 meters along the line below the kite, we attached the camera and continued to raise them into the air, usually to a height of between 300 and 400 meters. Then we started walking the terrain, pulling the kite/balloon along behind us. The kite is best used under windy conditions while the balloon can be used during summer months when the wind is scarce, especially at midday. However, because helium was both expensive and difficult to deliver to the survey area, we tried to avoid using balloons unless absolutely necessary.

Once in the air, both kites and balloons are unstable and continuously shift position and height. Due to their motion, the camera itself swings and rotates, providing a recording that is always shifting its viewpoint. These multiple viewpoints are perfect for later use in photogrammetry reconstructions. We walked the terrain that we were documenting from above. At each site, we pulled in and lowered the camera in order to collect another image set from a lower altitude, approximately 30-60 meters, which would provide us with even greater surface detail and better volume reconstruction. Once the intended survey had been completed, or the kite has crashed, the line was reeled back in, the kite folded, the camera taken out of its rig and recording stopped. It was only then that we could actually see if the recording had been successful, if the camera had been in correct focus and exposure, or if (due to the shaking of the kite and the wind) it had shifted its position in the

63 Thingiverse.com, 'Redstone Rig by Cfastie': https://www.thingiverse.com/thing:281664 (accessed 11 February 2019).
64 PublicLab, 'Soda Bottle Rig': publiclab.org/n/314 (accessed 11 February 2019).

rig and its line of view had become obstructed by the bottle encasing, potentially losing all our images from that flight. Perhaps only half of the days of the expeditions were fully successful: on some occasions, there was either no wind or too much, causing turbulence, crashes or camera malfunctions. However, overall, this simple DIY method provided materials of incredible detail and beauty through the most rudimentary of means. In all cases, whether successful and unsuccessful from an image perspective, the walks that took place with the children of the village, as well as with Aziz al-Turi and Nuri al-Uqbi,[65] who not only operated the kites and balloons but also led us through the terrain, speaking about each site, recounting its history, its current conditions and the effects of the transformation of the land, comprised the heart of the entire project.

Photogrammetry Processing

All ground and aerial images recorded during the expeditions were first organised into folders according to date and site. Each dataset was cleared of blurry, over/under-exposed, accidental images (photographs of the sky or those taken of the ground before lift-off). Entire flights and walks were set aside for processing together, in order to reproduce the overall terrain. Photogrammetry computation was accomplished using several software packages, the main one being Agisoft Photoscan Professional, a proprietary software, while COLMAP, an open-source software, was used for some of the later reconstructions. Reality Capture was another software package that I started testing during 2018, and some of the sites were reprocessed through it for the current iteration of the Naqab.org platform.

All software packages operate through three main stages:

- Initial automatic alignment resulting in a sparse point cloud
- A manual process of adding location markers noting shared features between cameras and locations in order to assist the automatic reconstructions where they are wrongly aligned or fail to identify associations between the images.
- During this stage, ground control points and scale measurements are added to the sparse point cloud.
- The final stage of the reconstruction is the creation of a dense point cloud, building on the sparse cloud and the manual corrections. The result is a georeferenced and scaled dense point cloud.

65 See Appendix Chapter 4 for the testimonies of Aziz al-Turi and Nuri al-Uqbi.

The Using photogrammetry software, I processed the tens of thousands of images, transcoding them through triangulation and SIFT (Scale-Invariant Feature Transform) computational processes into three-dimensional point clouds. Over the course of two years, I first divided the image sets according to regions, dates and individual architectural/land features, and then ran 'structure-through-motion' and reconstruction processes in order to compute the surface features and reverse-engineer each camera's position in space. Using four different packages, including both open-source and proprietary software options, I tested which program algorithms work best with different types of material, and this resulted in tens of individual point clouds, which then combined into one file of over 1b points. Dense point clouds were treated as clusters, local constellations that were then aligned next to or integrated with other clouds. For example, the dense cloud of a well was processed independently but was then embedded in another dense reconstruction of its surrounding terrain. This was done through the GPS information embedded in the point clouds. Once they were aligned, I examined the intersection points to check that the connection was smooth and accurate; if not, it was possible to adjust the information on both clouds and re-align them until they combined correctly.

Georeferencing: Model,Maps And Aerial Photographs

Each segment of the point-cloud model was georeferenced through ground control points (GCP) noting longitude, latitude and height. The georeferencing was achieved through a combination of on-camera metadata, existing survey information from maps provided by Yiftachel and Abu Friha, and manual additions from the GCP. Within each point-cloud model, several key features could be located, features that could be identified on the MAPI GIS system (Survey of Israel and GovMaps) and Google Earth satellite images.

The most valuable visual evidence for the Bedouin families' historic presence on the site of al-Araqib was gathered from maps and aerial photographs produced primarily by the British Mandate during the 1930s and 1940s. Further aerial photographs taken by the Israeli Airforce and the Israeli Land Authority between 1949 and 1999, on the instructions of the lawyers Michael Sfard and Carmel Pomerantz in the Beersheba district court, were made available to Forensic Architecture as part of our contribution to the legal effort in support of the al-Turi and Abu Freih cases against the state.

Map materials from the era of Ottoman and British rule were acquired through two main online sources. The scanned, referenced and tiled maps could be linked directly into QGIS (a free open-source information system). British maps produced by the Geographical Section, General Staff (GSGS) were scanned at my request at the British Library and then georeferenced in QGIS using the coordinates on the map itself. These maps use the

Palestine 1923 cadastre and, once referenced, were converted to the WGS84 Mercator in order to integrate with other GPS materials and the web platform. Similarly, all plot information pertaining to the court cases that was originally drawn by hand in the 1970s was transferred by the same method using the coordinate grid within the drawings; the drawings were then converted to vector shapes and exported as individual geojsons[66] for integration into the web platform.

All aerial photographs were referenced using a manual identification of persisting features in the landscape between the time of photography and the current satellite image on Google (tiled into QGIS as a layer). Each photograph was anchored to at least four points around its edges, using large natural features such as river intersections or stone houses whose remains can still be seen on the satellite image today. Once the reference points were in place, the new coordinate reference system was set to WGS84 and the images were exported as geo-tiffs. These were then imported into QGIS for analysis and comparison alongside the other aerial images, plot-vector information maps and the orthophotos produced by the kite surveys.

A Common Data Infrastructure

> *Now it is the virtuality of the data-based constructions that seems self-evident. And their basis in remotely sensed data helps us understand what has become of truth in the era of the digital data stream: it is intimately related to resolution, to measurability, to the construction of a reliable algorithm for translating between representation and reality. The fact that they are virtual images does not make them any less true, but it should make us pause and consider what we mean today by truth. (Kurgan 2013)*[67]

From a conceptual imaging perspective, a central question of this chapter is: in what ways can spatial photography reveal changes to surface conditions that were previously impossible to discern through a planar image? In what ways are the relations between surveying and photographic imaging changed by the addition of this spatial dimension? And finally, how do the inherent properties of this form of imaging enable a different,

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66 GeoJSON is a geospatial data interchange format based on JavaScript Object Notation (JSON). It defines several types of JSON objects and the manner in which they are combined to represent data about geographic features, their properties, and their spatial extents. GeoJSON uses a geographic coordinate reference system, World Geodetic System 1984, and units of decimal degrees. In: Gillies, Sean, H. Butler, M. Daly, A. Doyle, and T. Schaub. "The GeoJSON Format." Accessed April 9, 2019. https://tools.ietf.org/html/rfc7946.

67 Laura Kurgan, Close up at a Distance: Mapping, Technology, and Politics, Brooklyn, NY: Zone Books, 2013. pp. 12-13.

communal mode of practice, one that is fundamentally different, both conceptually and methodologically, from existing practices?

An early understanding that emerged while working in Silwan/'City of David', which grew in the discussions around beginning a community-led surveying project in al-Araqib, was that a custom infrastructure would have to be established in order to view and navigate all data types together. Furthermore, within Forensic Architecture much of the work and understanding of the operative model and the 'image data complex'[68] was again developing around a similar conceptualisation of the need for a networked mode of evidence collection and verification. The PATTRN[69] platform that had just been released at the time offered a first open-source technological platform for data-pattern recognition and visualisation; it was specifically employed by Forensic Architecture in the case related to the Israeli attacks during the 2014 Gaza conflict.

In order to amalgamate the present-day interior of a well, a 1945 view by the RAF from the height of 15,000 feet and the oral testimony of a Bedouin resident, recorded sitting inside his tent, along with a resident's cell-phone video of an ongoing demolition, we needed to set up a method and technological platform that would bring them all together in space and time. This system had to be accurate and operable according to global (Western) GIS standards and yet remain true to the slightly different logic of Bedouin inhabitancy, including a more flexible notion of demarcating territory, as well as information regarding movement in space and presence/displacement across time. Therefore, it was necessary to not only develop a data and knowledge-collection methodology but also a technological platform to fuse all the resulting evidentiary 'pieces' together. Using all the means and methods described so far in this chapter, our participatory counter-survey aimed to culminate in a 3D participatory GIS web platform that would allow for four main objectives to be achieved:

- Document and preserve spatial evidence of the local Bedouin heritage (baikas, graves, wells) that are being destroyed and subsumed by the JNF afforestation.
- Provide a research tool that would enable lawyers, prosecutors and judges to understand the various elements and stages of the aforementioned set of events.
- Create effective and affective visual products (films, maps, models, etc.) for public advocacy.
- Provide a heritage resource for the Bedouin families themselves.

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68 This is a term developed by Forensic Architecture around the case of 'Black Friday' in Gaza. See Forensic Architecture, 'Rafah: Black Friday': https://www.forensic-architecture.org/case/rafah-black-friday/ (accessed 16 February 2019).

69 'Pattrn – Data-Driven, Participatory Fact Mapping': http://pattrn.co/ (accessed 16 February 2019).

In order to build this dedicated platform, Forensic Architecture[70] set out to use a unique combination of open-software and bespoke code development.

Photogrammetry

Imaging systems employed in this region by the state are based on two-dimensional surveys and remote sensing-based GIS analysis. As we have seen so far, the surface layer of the land is treated as flat, and yet, with the terraforming earthworks and the nuances of the repeated layering of earth, the bulldozer-teeth marks in demolition sites or the filling-in of wells and underground storage caves, it is the three-dimensional recording of the intersecting human, architectural and environmental changes over time that provides evidence of the full spectrum of spatial violence taking place. It was therefore within these fluctuations in the thin volume of the surface layer of the land that we proposed to record the violence and position our resistance.

Thinking through the potential advantages of working through a three-dimensional (spatial) form of photography in the context of al-Araqib, I identified several key points:

1. A salvage archaeology of architectural features under imminent threat by land works could be conducted through photographic means and examined digitally at a future point in time.

2. Volume registration in combination with multiple recordings over time would enable an assessment of the change/damage to volume over time.

3. Recording the environment as a volume would enable the use of the image as a space of simulation for research into the behaviour of rainfall and water runoff in the changing landscape and its effect on existing Bedouin cisterns and wells.

4. The dichotomy or separation between the aerial perspective and the lived perspective, on the surface and underground, could be fused in a spatial image aggregated through multiple point clouds. Images could be taken both on and off the ground. Experiencing and analyzing the spatial image could be done across all viewpoints through an uninterrupted, smooth motion.

5. Photogrammetry is based on a process of photography that at its core depends on the multiplicity of viewpoints. Whether the images are taken simultaneously from multiple points in space or sequentially, in a process

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70 In order to develop this code environment, we first worked with freelance coder Gottfried Haider, who built the first alpha infrastructure during 2016. Early in 2017, we started work on a more comprehensive version of the platform and moved to working with our in-house software developer, Franc Camps-Febrer. The final stages of the work towards the launch of Naqab.org in August 2018 were completed with the added help of Forensic Architecture's current software developer, Lachlan Kermode.

now termed 'structure through motion' (SFM), it potentially lends itself to a communal mode of practice as opposed to single authorship.

6. Technically, photogrammetry needs very little equipment or even software, and the skills required to execute it on a basic level are accessible, almost 'natural' in today's smartphone-enabled cultural environment.

7. Photogrammetry works across scales and can provide shifting levels of density and detail according to the amount, quality and resolution of the image sources.

Underlying all these potential inquiries was a prerequisite that the survey expeditions would be conducted as a full collaboration. As this project emerged from the Ground Truth workshop, from the very beginning its defining principle was that of participation, aiming to extend throughout all levels of what Muki Haklay defines as the 'ladder of par-

Figure 14: *A plastic-bottle camera rig (right) (Alina Schmuch and Jan Kiesswetter 2016) and a kite equipped with a camera hovering over the cistern of Muhammad Ibn Salame Al-Uqbi in the Negev desert (left). The line of JNF saplings can clearly be seen on the left. (Rajal Khateeb 2016)*

ticipation'.71 Other forms of 3D photo-imaging such as structured-light, infra-red or laser-scanning systems are either extremely expensive (Lidar) or have difficulty operating in daylight conditions. They do not work across scales (large environments or small objects) and all require specialised equipment and a large amount of financial resources. In addition, they all create a point cloud or model out of one imaging source. Photogrammetry and SFM therefore served as an extremely useful technical, pedagogical and social entry point into the spatial method of recording through communal practices.

71 Muki Haklay. "Citizen Science and Volunteered Geographic Information: Overview and Typology of Participation." In *Crowdsourcing Geographic Knowledge, edited by Daniel Sui, Sarah Elwood, and Michael Goodchild, 105–22. Dordrecht: Springer Netherlands, 2013.* https://doi.org/10.1007/978-94-007-4587-2_7.

Figure 15. *Al-Araqib, Negev, Israel, 3 December 2009. (Yotam Ronen/ Activestills)*

Figure 16. *Muhammad Saad and his children in their garden in al-Araqib, 2009 (Yotam Ronen/Activestills)*

A counter-photographic practice of surveying that aims to record the ongoing violence as well as to reinterpret past records should also operate under different conditions from those practiced by the sovereign power. Indigenous knowledge should be read alongside that produced by the state, with an emphasis on an integration of the material and media evidence of remains and their contextualisation using the history of ownership and modes of use by local families. This type of integration of a lived knowledge-base of the indigenous families with that of different types of expert knowledge (geographic, photographic, historic) has not been widely attempted previously in the context of the Naqab Bedouin, and even less so with regards to imaging.[72]

72 Several examples of photographic work regarding the Naqab Bedouin and an attempt to grapple with their long history of dispossession and marginalisation can be seen in the work of Ahlam Shibli (2002-3), Miki Kratzman (ongoing) and Fazal Sheikh (2015), as well as in some parts of the work of Asher Tlalim (1986).

The methodology described in the first section of this chapter[73] provided a means by which to work with the residents themselves, photographing from the ground and from the air, with each family assigned its respective sites and plots. From the ground, our walks across the terrain were documented through time-lapse still sequences and video, recording our movement within the environment as we retraced the paths connecting the family sites. Along each route and at each site we would discuss the history of the place and the agricultural traditions, and go through demonstrations as to the ways in which the ongoing land works are transforming the terrain. I would explain the methods of reconstruction and how we were planning to conduct the recording, and through discussion arrived at a consensus over what should be recorded visually, what to look at and at what resolution, particularly as a key consideration of this type of volume photography relates to the capture of the spatial relations between sites and their surrounding environment.

Photographing With The Kite Camera While Filming On The Ground

The methodology developed for this project, which combines the DIY KAP with SFM photogrammetry, should primarily be seen as a critique of and response to the existing apparatus of vision while offering a nuanced form of heterogeneous and communal imaging practice. By organising all aspects of the project around hybrid forums,[74] which addressed the issues through the involvement of various local, technological and scientific expertise, we strove to extend beyond the bounds of the legal/professional discourse of land rights.

Situated testimony and visual transcoding took form simultaneously. Each segment of the documentation re-enacted a route walked for decades, identifiable on the 1945 aerial RAF image, from the house or tent to the well and the field, and from both to the cemetery. The performative facet of the 'structure-through-motion' method, whether by air or on the ground, was that of constant negotiation and dialogue, with fellow walkers as well as with the environment and the material remains embedded in it. Each expedition deposited a trail of its own in the form of a set of distributed cameras in 3D computational space, from whose viewpoints and space-time coordinates the surrounding terrain could be calculated. The path created a vector of movement, set and indexed in a specific time across the terrain. This embodied experience of the environment and the historic connections within it was partially transferred onto the spatial image by means of the properties of density or the direction of the gaze. It was also connected by way of a re-enacted navigation and embedding of the situated testimony and material evidence within point-cloud transcoded space.

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73 See the project description in the methodology section of this chapter.

74 Michel Callon, Pierre Lascoumes and Yannick Barthe, Acting in an Uncertain World: An Essay on Technical Democracy, Cambridge, Mass: MIT Press, 2009.

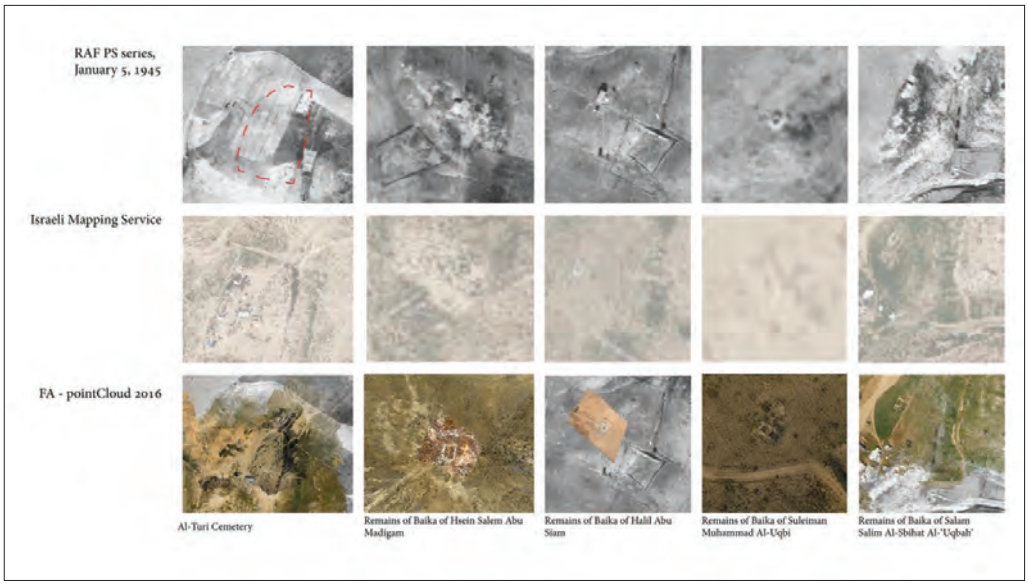

***Figure 17**. chart comparing RAF, Mapi and FA images of five locations across time between 1945 and 2016.*

***Figure 18.** RAF images numbers 5033 & 5034 part of a larger series of images taken by the Palestine Survey flight number 13 on the 5th January 1945.*

The combined movement on the ground and in the air simultaneously served as a performative act that linked practitioners like myself to the lived knowledge of the community as we attempted to articulate our own practiced understanding of Ground Truth through all aspects of the project, from the physical through to its aim of offering a different way of surveying and imaging through a spatialised photographic practice.

Both kite mapping and photogrammetry inherently demand a measure of 'letting go' and allowing for chance and gaps in material, knowledge or certainty. However, due to their open structure – aerial kite photography, through the need to walk on the ground and simultaneously record the 'ground truth', and photogrammetry, through the prac-

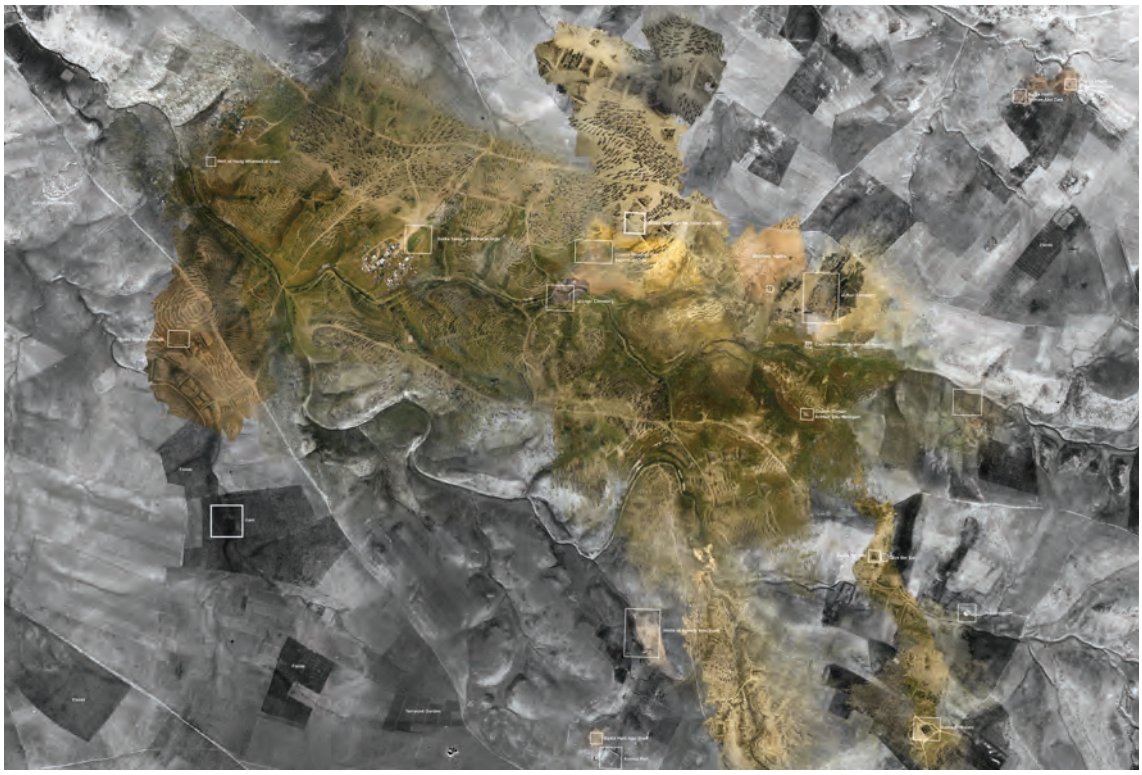

Figure 19: *Al-Araqib 1945/2017 – a composite of Royal Air Force aerial photograph and community satellite point clouds. (Ariel Caine (Forensic Architecture), Aziz al-Turi, Nuri al-Uqbi, Debby Ferber (Zochrot), Hagit Keysar (PublicLab), 2017)*

titioner's acquisition of the source data and control over the form and accuracy of its reconstruction – they challenge the black-box of expert, professional data, adopting a 'white-boxing perspective, where the emphasis is shifted to how "socio-technical practices constantly exfoliate, disclose and re-source their capacities for agency and relation", providing an equally accurate yet alternatively sourced record.[75] This record can be linked to the already-existing process of documentation and struggle begun by the families themselves. At each location along the way, oral and video testimony, measurements and geolocation control points were recorded, as both material and lived evidence of the ongoing violent transformation of the land. These recordings were made as situated testimonies, whether on the ground or in front of a screen while viewing images or navigating the 3D point clouds.

Consolidating The Survey Materials

Positioning each media element and testimony in space and time enabled a cross-ref-

75 Jiménez, Alberto Corsín, Adolfo Estalella, and Zoohaus Collective. "The Interior Design of [Free] Knowledge." Journal of Cultural Economy 7, no. 4 (October 2, 2014): 493–515. https://doi.org/10.1080/17530350.2013.859632.

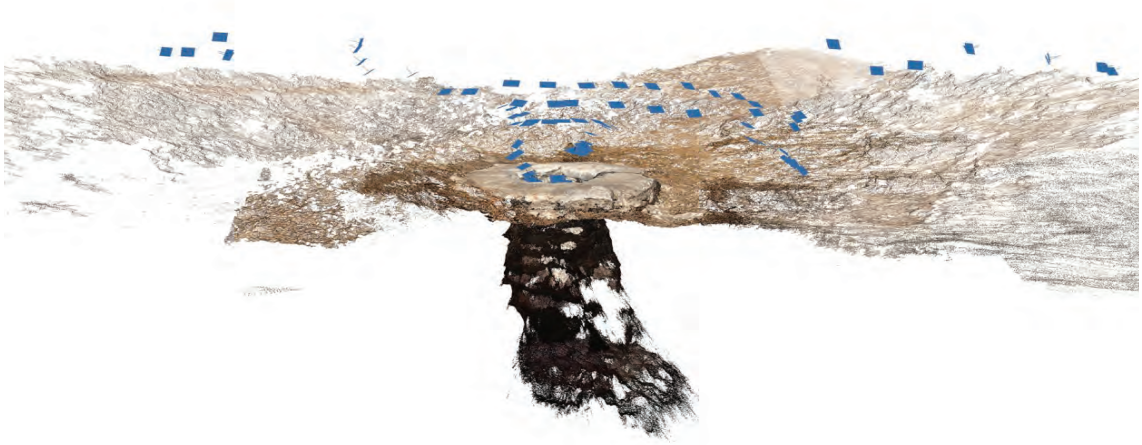

Figure 20: *Point cloud of the well of Awimer Salman Abu Medigam, 2016. The blue rectangles depict the positions of individual image frames from which the 3D information was derived. Photo: Ariel Caine, Forensic Architecture, 2017*

erencing that either strengthened or contradicted earlier assumptions. All the previously examined maps, as well as the RAF and Israeli aerial imagery from 1945 to 1999, were georeferenced and sequenced. The survey by Abu Friha and Yiftachel was also added as a first layer, marking known Bedouin remains on the ground. Information from the IAA archaeological survey was paired to each of the Bedouin sites that were identified by the Abu Friha survey as well through the on-the-ground evidence collected by examining the materials with the al-Uqbi and al-Turi family members. The Six Ground Truth mapping and survey expeditions were also added. The calendar of this collation was as follows:

January 2016: The first KAP survey of the al-Turi cemetery took place as part of Ground Truth's Truth Commission and workshop.

May 2016: The first large-scale survey: we mapped in two groups, both starting from the al-Turi cemetery. One group, headed by Nuri al-Uqbi, walked west towards the al-Uqbi family plots. The second group, led by Aziz al-Turi, walked south, covering the al-Turi, Ibn Bari and al-Malahi sites.

August-September 2016: Another expedition, led by Aziz al-Turi and myself, mapped the sites of the Abu Siam family to the south west of the al-Turi cemetery, as well as the Abu Medigam sites to its east and north-east, reaching all the way to the Lehavim Junction and the Abu al-Tayf family sites.

December 2016: A further expedition, led by Aziz al-Turi, with Farber and Keysar, mapped the sites of the Abu Freih and Abu Medigam (al-Turi) families to the north of the al-Turi cemetery, all the way past the banks of the Pehar stream.

March 2017: Two groups (one headed by Nuri al-Uqbi, the other by Aziz al-Turi), each one also consisting of members of ActiveStills (Oren Ziv, Faiz Abu Rmeleh and Yotam Ronen), MA students from the Centre for Research Architecture and the Princeton University 'Conflict Shoreline' course, repeated the entire previous survey areas, including some areas further to the west.

February 2018: A final survey mapped the al-Turi cemetery area and the adjacent hills where the al-Araqib village used to be.

During each of these surveys, conversations were recorded regarding the names, owners and function of each site, including the type of agriculture that took place on the different plots and the recent effects of the land transformation and afforestation. Subsequently, I set up a systematic database of this information, consolidating all known data about the sites. This database was then expanded through a series of interviews and oral testimonies conducted by Zochrot during early 2018. The entire database was then translated by Zochrot into English and Arabic and prepared for upload onto the Naqab.org platform, which was launched as Beta on 27 July 2018 in al-Araqib and several days later in an exhibition[76] at the Binyamin Gallery[77] in Tel-Aviv. ActiveStills made available its archive of images, photographed between 2009 and the present, to the Ground Truth project, giving an insight (predominantly) into the years surrounding the destruction of the village in 2010.[78] Images such as the 2009 view of the village (fig. 11) and portraits of the residents beside or outside their homes prior to the demolition (fig. 12) give a glimpse into the way of life in the village at the time. Extensive video footage from the day of the demolition in July 2009 was also shared with us, so that we could upload it and make it publicly available on the Naqab.org platform. All images and videos taken by ActiveStills have time and date metadata but are not georeferenced; therefore, once a selection of several hundred images was made, all footage was manually placed geographically by myself and Aziz al-Turi by way of identifying the locations through features inside the images themselves and embedding the location data in the image files. These were then added to the platform and distributed according to space and time metadata.

Stills and video footage from the al-Turi family cell phones, filmed between 2010 and 2018 was transferred to Forensic Architecture through direct downloads from the phones onto a dedicated hard drive. This footage, timestamped and geotagged by the phone itself,

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76 Zochrot. "Ground Truth: Testimonies of Destruction and Return." Accessed April 9, 2019. https://zochrot.org/en/gallery/55872.

77 "We are a group of artists that opened a self-funded, egalitarian, clique-free and non-profit gallery in the heart of the sooty southern Tel-Aviv. The vision of Binyamin Gallery is to offer a chance to visiting curators (well-known as well as young graduates) and guest artists from Israel and abroad. We created a platform for fresh kick-ass exhibitions. Binyamin Gallery is managed as a cooperative by its members, all graduates of Israel's high art institutes in their first decade of artistic activity." In Binyamin Gallery. "About." Zenfolio | Binyamin Gallery. Accessed April 9, 2019. https://www.binyamin-gallery.com/about.

78 ActiveStills. "Archive." Accessed April 9, 2019. https://activestills.org/archive.php.

depicted the acts of demolition and rebuilding, as well as many other moments during the course of the years. All private information and images were reviewed by the family members prior to the transfer of the material; some were removed before consent for the public use of the images on the platform was granted.

Looking at the individual photos in this archive of images with members of the al- Araqib families (predominantly with Aziz, Salim, Sheikh Sayah, Hacma and Sabah al-Turi), those taken by the families and those by ActiveStills, provided an opportunity to understand the transformation of this community over the past nine years more intimately. It also provided them with an opportunity to remember and narrate these events from before 2010 to some of the younger members of the family.

Archival documents from the al-Uqbi, Abu Freih and al-Turi family archives, reproduced for the truth commission by Miki Kratsman, as well as materials collected for the legal proceedings by researchers (predominantly by Yiftachel and Gadi Algazi) and spe-

Figure 21. *The Baika (stone house) and storage cave of Ibn Bari, al-Araqib: point-cloud composite with camera locations. Photo: Ariel Caine, Forensic Architecture, 2017*

cifically for this project by myself and Farber, were collected and sorted according to date and family. Translations for some were provided, although most are yet to be translated and analysed. Documents pertaining to land acquisition, leasing and cultivation wait interpretation before being placed alongside the mapping platform and the aerial images in order to form a visual adaptation of the textual documents to the 3D virtual terrain across time.

Testimony And Forms Of Witnessing

This thesis examines the potential of the spatial photograph to act both as an environment in and of itself as well as operate as a situating device for other media. As the first two chapters argue, the spatial photograph is both an operative environment as well as a record of its own indexical relation to the space and time of creation in the physical world, a record of the camera's movement in space. The indexical properties of photography as a material witness to presence are increased here in two ways. First, each indexed photograph is transcoded through a process of triangulation into a part of the situated operative environment that carries with it the situated-ness of the transcoded place, bearing witness to its surface condition. This expands indefinitely both inwards and outwards as the constellation is open-ended. Second, the environment is not the product of a single author; rather, it is a material witness to the communal movement and actions of this survey. The structural relationship between the node and the constellation extends into this conception of witnessing. Once SFM photogrammetry is converted into an ongoing communal practice, however, the resulting point cloud itself is transformed into a continuously transformable constellation of independent moments and trajectories.

A final form of witnessing, which is tied to the condition of the spatial image as an operative entity that calls for some degree of navigation and embedded experience, is also two fold. First, the spatial image being an operative environment, it enables analysis, data extraction and simulation in ways that can further attest to events on the ground that can no longer be measured. As an example, through iterative scans of the environment over the course of three years, the changes in surface and volume can be analysed to demonstrate the degradation of well structures and topography. Through fluid simulation we cab demonstrate the effects of land transformation by the JNF afforestation project on existing Bedouin water sources and agricultural systems. Secondly, the digital environment serves as an entry point into a form of digital situated testimony, not as virtual reality but through the evocation of the spatial relations between the sites and their physical condition in space and memory. As this entire project is predicated on the notion of the salvage photograph, due to the gradual destruction of its Bedouin history, the digital terrain increasingly acts as a future possible entry point into a narration of the past. (As, for exam-

ple, when in September 2017 I sat with Nuri al-Uqbi[79] at his home outside the township of Hura to speak of his personal and family history, before the Nakba and since. Nuri was displaced from al-Araqib along with his family in 1951 and now is forbidden to approach the land and the remains of the house and wells in the area which he was born.[80]) In doing so, this process also activates an imagination of the future in the present.

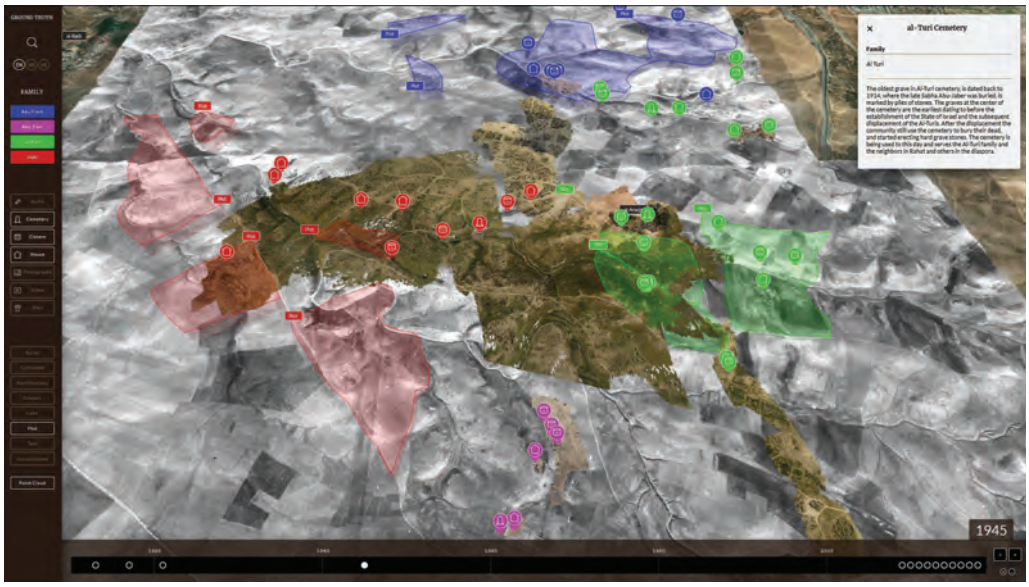

Figure 22. *The plots of land and sites of the four claimant families of al-Araqib. (Naqab.org, 2019)*

Spatial Data Constellations

Given the nature of violence, in territorial, cultural and historical terms, it cannot be overcome simply through better visibility. The destruction of archaeology and the landscape takes place in a three-dimensional context and through many disconnected constellations of data (both analogue and digital). What the 150-year-long history of intense mapping and aerial photography in the area has provided us with today is a material and data repository which, if read against the grain or using a different analytical lens, could reveal a completely different link between Bedouin history and the present day in the region. The mapping effort described in the sections above aims to harness photography in its new forms to operate within these spatial conditions.

With this in mind, we therefore turned our aerial survey into a navigable 3D environment using photogrammetry, a process that produces point clouds – photographic units floating in three-dimensional image-space. On the level of digital-image materiality, the transformation occurs from image to environments, from documentation or representa-

79 Nuri al-Uqbi was born on 20 January 1942 in al-Araqib.
80 See Appendix for chapter 4 Items no. 15 & 18.

tion of space to a transcodng of volume. Thus, we move from grain to pixel to point cloud to a calculated, transcoded, architectural space. In the point cloud, mechanical imaginations form granular realisms. But we do not stay in this calculable, computational space. The space, in turn, becomes a catalyst for memory, re-enactment, narration, navigation and testimony – that is, a form of spatial image-entity through which the accumulating relations of other images and their corresponding spaces can be negotiated and understood anew.

The Naqab.org[81] platform is constructed on the foundation of customised, open-source, web-based graphics libraries. The primary library, Potree,[82] developed at TU Wien (Vienna University of Technology), is a WebGL library for displaying large point clouds in a browser. Display of GIS and three-dimensional surveys is at present possible in side-by-side mode, yet these two modes, the cartographic and the model, are not yet fused into a system with one coordinate space. In current web-based systems, it is not possible to operate the two spatial logics within the same digital space. Some high-end proprietary software solutions, predominantly ArcGIS, have begun over the course of 2018 to offer a 3D GIS solution for combining GIS data and 3D models, but this does not yet include scanned data, and furthermore it still is not available as an affordable web-based proposal. In the field of web-based maps, such as OSM, Google, Apple, Bing and mapbox, there is some integration of 3D terrain and low polygon objects, with photographic textures mapped or draped onto them to give them a semi-realistic appearance. And yet, despite the early integration of some (mostly) terrain data within the global mapping systems, these are at an extremely early stage of integration and they are still separate.

In late 2018, Potree released a version of the Potree code that can be integrated with a mapping server called Cesium.[83] In doing so, it has introduced one of the first open-source solutions for mapping in two and three dimensions simultaneously. Over the last two years, advances in infrastructure speeds and bandwidth, as well as the development of browser coding architecture that increasingly supports complex graphics and real-time computation through java script and python libraries, have created the conditions for an attempt to produce a GIS system that is fully operational in three dimensions. GPS information from each file's metadata is used to position it on the point-cloud terrain, enabling us to view the image not only in its spatial and chronological context but also, for the first time, in relation to the volume and topography of the space. As such, we have incorporated image, sound and video testimonies on the platform.

Over the course of several photographic expeditions, we collectively produced a series of

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81 Forensic Architecture, 'Ground Truth': https://naqab.org/ (accessed 16 February 2019).

82 TU, Wien, 'Potree: http://www.potree.org/ (accessed 16 February 2019).

83 Potree. "Potree Cesium Integration." Accessed April 9, 2019. http://www.potree.org/potree/examples/cesium_sorvilier.html.

image documentation datasets encompassing the majority of the historic area of al-Araqib. From the interiors of wells and underground grain-storage caves to cemeteries, houses and entire regions, now covered by JNF saplings, we recorded a detailed account of the surface features. In our first test-iteration of the Naqab platform, we formed an infrastructure that brings together existing archives, our civic-led survey and situated testimony. To accomplish this, we have worked to create a GIS mapping platform that operates in a three-dimensional environment. Thus, a growing archive of thousands of images dating from before the nineteenth century up to the present, contributed by residents, activists and researchers, can now provide us with a glimpse into the processes of destruction and rebuilding.

Generalising The Code For The Platform And Releasing It As Open-Source

While the Naqab.org platform focuses on the case of al-Araqib, it also serves as proof-of-concept towards application where it will be valuable for future efforts both in the Naqab and beyond. The need to verify facts and validate testimony in the formation of evidence and truth claims necessitates that each item be corroborated by several others. The strength of a claim is derived not only by the number of its supporting sources but, perhaps even more so, by their heterogeneity. When operating from a position fundamentally opposite to that held by the state, the need for a wide range of sources, some of them used or produced by the state itself, is even greater.

As I outlined in chapter two, two foundational paradigms of the present project are those of constellation and navigation. The architecture of public truth lies not only in the assemblages of media and the understandings they can convey through uninterrupted navigation[84] but also in the fact that the imaging media has reshaped itself under this same shared logic of constellation and navigation, and transformed its material and code structures. Therefore, it is important to acknowledge that there is a productive shared logic between the networked-nodal-communal 'DNA' of the spatial image and the heterogeneous network of sources needed to produce a public truth.

While looking for the wells, underground storage caves and ruined stone houses with Aziz al-Turi in al-Araqib, he continuously referred back to his father by phone, asking for guidance on how to recognise their location. While these families' connection to the land is far from a romantic or static one, it is intricately linked to a long, embedded, lived experience of being on the land. In this sense, the rapid afforestation and displacement is not only erasing their past and present existence and heritage but also radically undermining their very ability to orient themselves in their ancestral land or recognise its landmarks.

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84 See the architectural image complex in Eyal Weizman, Forensic Architecture: Violence at the Threshold of Detectability, Brooklyn, NY: Zone Books-MIT, 2017.

However, using Forensic Architecture's collaborative Ground Truth project[85] as an exemplar, I would argue that to overcome or mitigate this erasure, we need a photographic practice that is diffused, collaborative, multiple and architectural – a volumetric palimpsest where space, image, navigation and testimony are collapsed, allowing us to challenge pre-existing thresholds of visibility and of civic participation, and to 'hack' into the current conditions for the production of truth in the context of visual and political colonisation.[86]

85 Forensic Architecture, 'Ground Truth': www.forensic-architecture.org/case/ground-truth/ (accessed 18 December 2017).

86 See Appendix for Chapter 4 Item no. 1 for the names of the Forensic Architecture team and individual collaborators and collaborating agencies. See also Appendix for Chapter 4 Items no. 15-18 for testimonies on the current situation of the Bedouin inhabitants of the Negev.

CONCLUSION

Crisis mapping and Information Communication Technologies (ICT) as well as the use of remote sensing and reality capture, have become prevalent, even dominant modes of practice within the context of heritage preservation and the monitoring and recording of human rights violations. Yet, while this thesis shares this new modality of humanitarian and preservation action, it is in fact in response to an absence of official investigative and juridical action, to limits of remote sensing, scarcity of media traces and a slow, unspectacular continued erasure of material remains, that the community-led practice of spatial testimony at its core emerged

At the opening of this concluding chapter I wish to elaborate on one last project before proceeding to summarise the notions of testimony, witnessing and spatial photographic practice at the heart of the dissertation.

In early 2018, Forensic Architecture and the NGO Yazda's documentation team, based in Dohuk, Iraq[1] set out on a collaborative project aimed at producing a spatial evidential record tracing the destruction of material and intangible Yazidi cultural heritage by ISIL, in the Sinjar region of Northern Iraq and Kurdistan.[2] Four year after the genocide of the Yazidi people by ISIL began, and two years after ISIL have been pushed back and the area liberated, the vast majority of its surviving Yazidi population still reside in Internally Displaced People (IDP) camps along the Syrian border. Sites of heritage and atrocity remain in ruin; some undiscovered, most are unexamined and undocumented, and their evidentiary value diminishing.

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1 Yazda is a multi-national Yazidi global organization established in the aftermath of the Yazidi Genocide in 2014, to support the Yazidi ethno-religious minority and other vulnerable groups.

2 The project was supported and curated by the V&A museum in London, led by Curators Natalie Kane and Brendan Cormier. It was funded by the Arts Council England and British Council.

In this first section of the chapter, I employ this project as a case study, drawing upon its stages of joint formulation, training protocols, bespoke toolkits, and assembling of hybrid forums[3] of local and non-local knowledge. Through this, I examine how this emergent form of computational 3D imaging can generate a socio-techno-political community of practice assisting in the creation of a civic, operational visual record; and demonstrate the joint activist and new cultural institutional frameworks within which expanded photographic practices now play active roles.

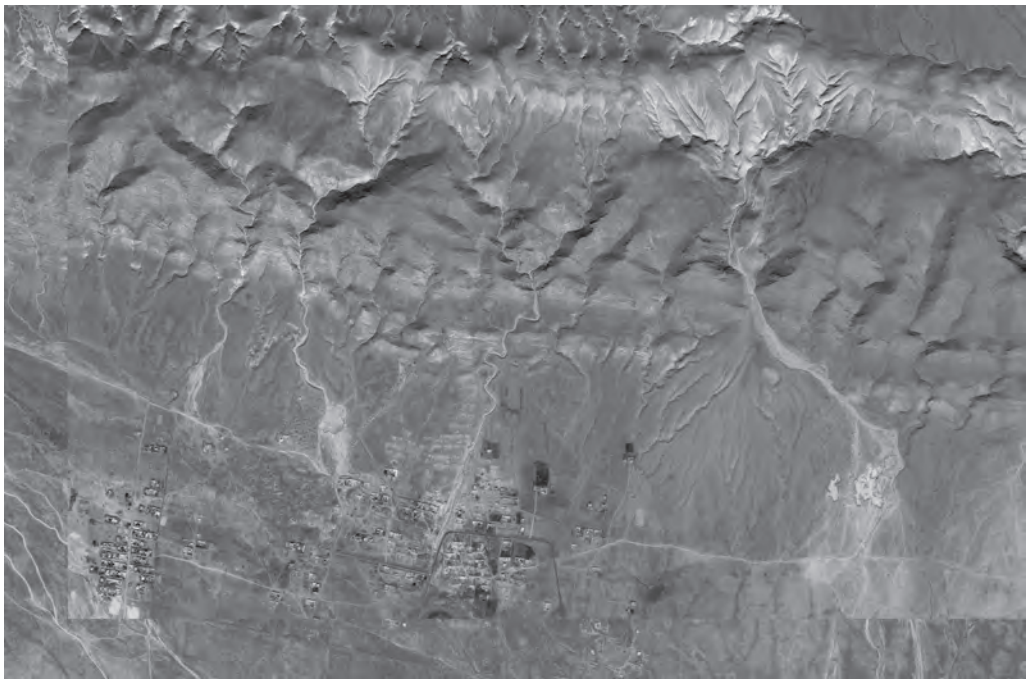

Figure 1: *Village of Majnonia with the two temple structures marked within red rectangle, Sinjar, Nineveh Province, Iraq. Pleiades HR satellite. 10 April 2013*

Introduction to the project

A highly detailed image made by the Pleiades HR satellite on 10 April 2013 (fig. 1) shows a site on the southwestern slopes of Sinjar mountain above the village of Majnonia. Scanning the surface of the image, residential compounds, domestic gardens and small-scale farms are visible. On the eastern boundaries of the village, some plots show ploughing and signs of agricultural work. Moving along the image's upper sections, we can see marks on the ground; archaeological traces of houses, courtyards and gardens that have been neglected and deserted, now only discernible as part of the dense palimpsest of the terrain's surface.

3 Michel Callon, Pierre Lascoumes and Yannick Barthe (translated by Graham Burchell), *Acting in an uncertain world: An Essay on Technical Democracy*, MIT Press, 2009.

At the coordinate point 41.58374, 36.29043 – the north-western edge of Majnonia – there is a semi rectangular compound surrounded by a low fence. Three structures are located at the north-eastern corner of the compound and, in the south centre, an additional small, square-shaped edifice. The triangular shadow cast on the roofs of these structures points to the existence of a cone shaped spire, identifying the site as a Yazidi temple or mausoleum.[4] To the south of the temple, an opening in the compound fence and several faintly visible bright trails mark foot paths, etched into the ground and attesting to the temple's continuous usage. If we compare this image to a later Pleiades satellite image from 27 June 2016 (fig. 2), it is clearly visible that the temple has been completely destroyed. The footbaths too are nearly entirely erased, denoting the site's abandonment and disuse.

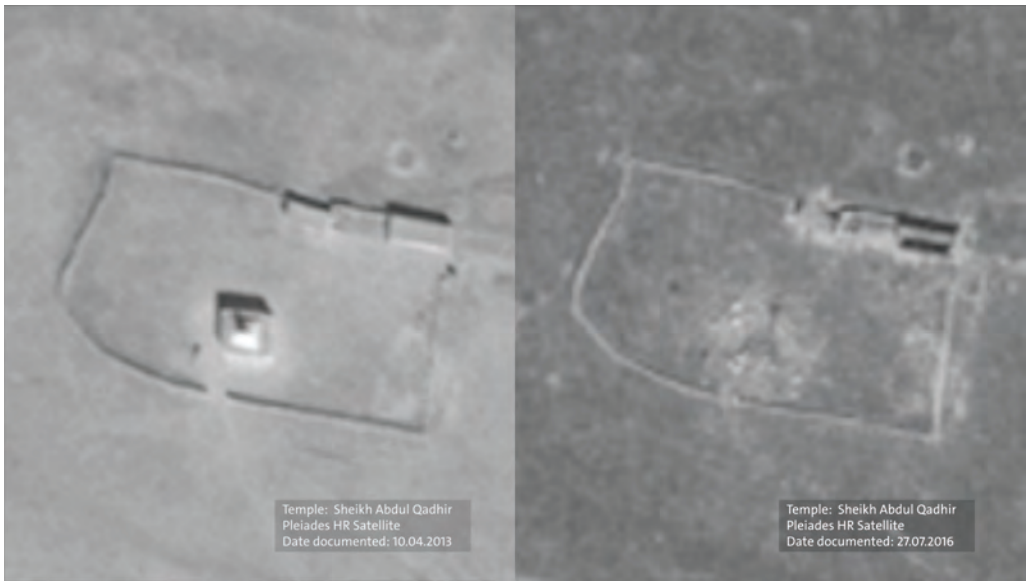

Figure 2: *Sheikh Abdul Qadhir Before and after Destruction. Pleiades HR Satellite. 2013 - 2016.*

The subject of this visual analysis is the temple of Sheikh Abdul Qadhir, located 200 meters south of a similar site related to Sheikh Abdul Aziz. They are two of eight temples and mausoleums along the southern slopes of Sinjar Mountain, which have been the centres of Yazidi cultural and religious presence in the region for centuries.[5] Their destruction by ISIL has been reported and partially recorded,[6] yet it is unclear whether detailed examinations of these sites of violence and crime have been undertaken post-destruction, analysing the way they were detonated and the connection of the destruction to the wider act of Yazidi genocide.

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4 Birgül Açikyildiz, *The Yezidis: The History of a Community, Culture and Religion*. [in English] London: I.B.Tauris, 2014. See also: Bewley, Robert. "Destroying the Soul of the Yazidis" in *Post-Conflict Archaeology and Cultural Heritage* by Paul Newson and Ruth Young (eds.), Routledge, 2017.

5 Açikyildiz 2017 (reference 5).

6 See several Yazda reports into the unfolding genocide dating from 2015 to 2019: https://www.yazda.org/reports-and-publications (29.11.19).

On 3rd of August 2014, Islamic State fighters invaded the Nineveh province of northern Iraq and began a systematic persecution of the Yazidi population. Stationed at 5 different points around Sinjar mountain (fig. 3), ISIL launched a series of massacres targeting Yazidi men, women and children. Thousands of women were enslaved, raped and tortured. The total and deliberate nature of these crimes led the UN to officially recognize the events of 2014 as part of an ongoing genocide waged against the Yazidis in Iraq and Syria.[7]

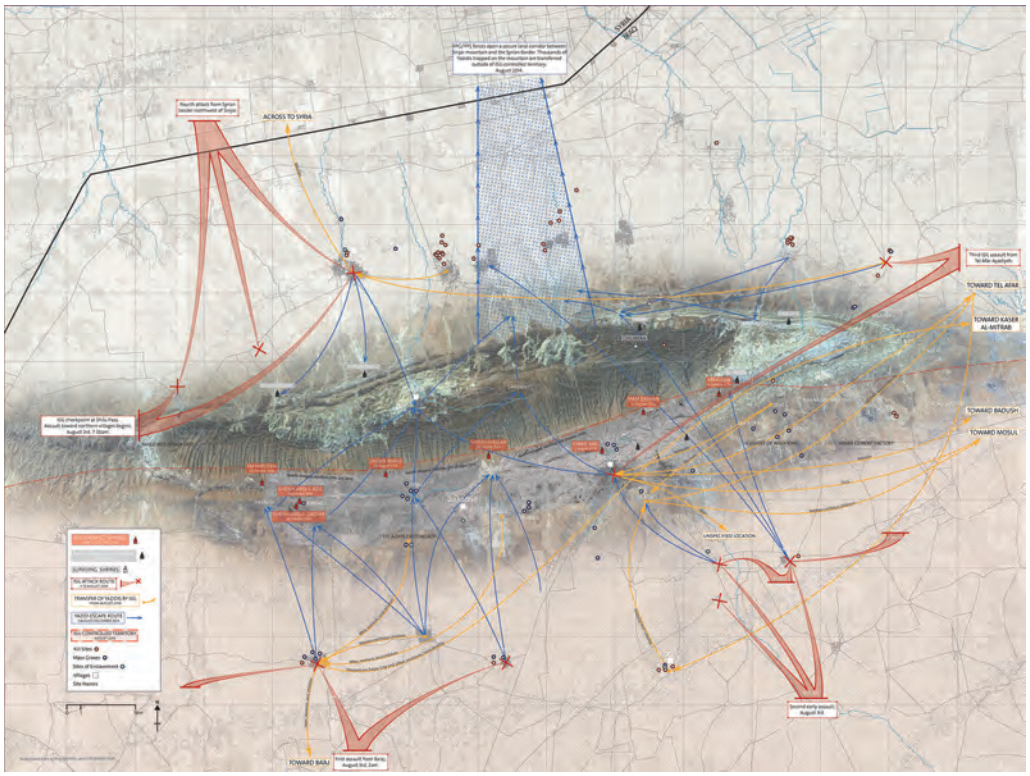

Figure 3: *Forensic Architecture & Yazda. 'Movement Diagram: Mapping the Systematic Nature of ISIS Attacks against the Yazidi Population of Sinjar'. 2018*

Material to this recognition is the systematic and widespread destruction of the physical infrastructure of Yazidi heritage, mainly the traditional shrines and mausoleums identifiable by their unique spires. Temples were detonated, at times, according to some reports, with Yazidi captive men placed inside them.[8] Tens of mass graves throughout the region have been left exposed and uninspected since 2014, and new graves are still being uncovered. Land mines and booby traps surrounded some mass graves, to prevent bringing the

7 Human Rights CouncilHuman Rights. "They Came to Destroy: ISIL Crimes against the Yazidis." 41: UN, 2016.

8 Further reference to this is given by the Baba Sheikh in Yazda's latest report on the destruction of Yazidi shrines, however in his account the Baba sheikh refers to the temple of Amadeen. See: https://354a2745-cd89-499d-8ac2-0340313e364f.filesusr.com/ugd/92f016_b5b-37c3356754ba8b30e0f266e5b58d4.pdf.

murdered to proper burial. Structures within villages were used as incarceration points, locations of torture, sexual abuse and captivity. Others were converted into schools for the religious indoctrination and military training of young captive Yazidi boys.

From the very first days of the attack, communities within Iraq and diaspora regions were organising; trying to mobilise aid to survivors still at risk, while simultaneously starting to collect testimony, survivor accounts, and spatial and material evidence for future prosecution of the perpetrators. However, in 2019, nearly five years since the beginning of this genocide, evidentiary remains of kill sites and mass graves remain mostly unrecorded and large portions of the southern Sinjar region[9] are deserted, still not de-mined or forensically analysed by international or Iraqi juridical and investigative teams.[10]

Enduring political and diplomatic instability in the region has meant an absence of official, international investigative processes and volatile security has led to little evidence being collected on the ground. In this void, civic-led action was mobilised locally in order to prevent the physical disappearance of evidentiary traces as well as the eradication of heritage from cultural memory. Yazda approached Forensic Architecture to support the technical organisation of this process, and three primary work strands were determined to address issues of inaccessibility and augment their researchers' capabilities.

- Enable detailed visual documentation, a 'snapshot' of the sites' present material condition.
- Create a measurable 3D record that could serve as legal evidence and provide the basis for further off-site inspection and analysis in the future absence of the site itself.
- Develop a system to track and cross-reference the survivor testimony interviews undertaken at IDP camps by Yazda with material and media evidence.

Together, these strands aimed to establish a space-time correlation of evidence and intersect both human and material accounts into a nuanced and multiple narrative of the unfolding genocide.

Booby traps and mines along roads and in some ruins limited access by foot to the cultural heritage sites; however, a purely remote sensing methodology of assessment lacked the resolution necessary for provision of sufficient detail. We therefore began a joint participatory process, fusing a methodology for civic-led,[11] 'DIY', ground and low-altitude

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9 Control over the Northern Sinjar was partially regained early on in the campaign and defence of some of the temples such as in Peery Awra, on the northern side of Sinjar as successful.

10 UNITAD investigator Karim Kahn arrived with his forensic team to lead the first forensic investigation in the region during the early months of 2019 with first exhumation works in the village of Kocho starting in march 2019. See: https://www.youtube.com/watch?v=sX4utid3HwI (29.11.19).

11 In this, I was learning from a previous collaboration with Hagit Keysar who developed the framework of the civic view from above. See Keysar, Hagit. 'A Spatial Testimony: The Politics of Do-It-Yourself Aerial Photography in East Jerusalem', Environment and Planning D: Society and

aerial optical survey[12] that utilised a combination of remote sensing, modelling and mapping practices. The project worked across varied scales, from a single ruin and testimony to whole villages or the entire region; relying on a hybrid forum of local and external, and indigenous and foreign expertise to form the basis for this experimental mode of documenting spatial and volumetric evidentiary values. The investigation recorded single events and sites in great spatial detail, yet was equally concerned with their interconnection and tracing of evidence to ISIL's organised campaign of genocidal intent. In order to make these traces both visible and measurable, a new operational articulation of optical media was to be developed as a basis for this survey action.

Discussing several FA methodologies with Yazda's representatives, the model of 'Ground Truth'[13] and its modes of community-led 3D ground and aerial recording emerged as a means through which to start thinking of documenting the sites in Sinjar. A training phase in techniques of spatial photographic documentation was planned to facilitate the implementation of these methods by Yazda's documentation team. The development of what I have termed 'spatial photography' was essential to this approach; the technological grounding upon which it was predicated. The shift towards an expanded, computational constitution of photography has changed the condition of optical imaging, across a great range of institutional and organisational contexts. In this case, it also offered fruitful potential for new modes of collective practice.

Phase 1: Training

In April 2018, I flew to Istanbul alongside Forensic Architecture researcher Tane Kinch, where we met with eight researchers from Yazda's Dohuk documentation team. The following days were dedicated to forming the shared pedagogy and training that would be needed for the project (fig. 4). The technical proficiency in methods of spatial photographic imaging[14] was slowly built through a series of exercises, a technical manual and trips to multiple locations, approximating the types of documentation scenarios the team might encounter in Sinjar.

Space vol. 37, no. 3 (June 2019): 523–41.

12 Public Lab. 'Kite Mapping': https://publiclab.org/wiki/kite-mapping (29.11.19).

13 'Ground Truth' is an ongoing project that aims to provide historical and juridical evidence on behalf of communities in the illegalised Palestinian Bedouin villages in the northern threshold of the Negev/Naqab desert, Israel. For further detail see Forensic Architecture, 'Destruction And Return In Al-Araqib': https://forensic-architecture.org/investigation/destruction-and-return-in-al-araqib (29.11.19).

14 This training included aspects of photogrammetry, GIS, measurement and survey techniques and image-based 3D modelling.

Detailed conversations were devoted to unpacking the process of testimony collection of survivors, undertaken by Yazda in the IDP camps and in Dohuk. While FA did not aim to take part in the actual processes of interviewing and testimony collection, it was essential to understanding the place of material and spatial descriptions and they part they played in Yazda's testimony collection process. This involved listening to the descriptions of sites of violence, tracking details pertaining to the modes of incarceration, and examining the ways by which architecture played a part in the course of captivity as well as its role in ISIL's systematic takeover of villages and their infrastructure. Elements such as lines of sight from one room or building to another, or angles of sunlight as they enter a structure at specific times of day, allowed for the beginnings of fine-tuning that would later assimilate into the wider processes of visual narration, and preparation for potential additional modelling and digital situated testimony.

A final set work module was dedicated to starting work on a detailed map unfolding the early stages of ISIL's attacks and charting the main distinct routes of transport through which men women and children were taken. All but one of the Yazda members of the team were from villages south of the mountain. all escaped the genocide but were either related or closely acquainted to those who were killed or disappeared by ISIL. Building this cartography of Sinjar together with the documentation team members was a way to implement intimate knowledge of topography and architecture as well as the hundreds of testimonies in order to begin linking individual stories and recollections, identifying within them the patterns of systematic, directed violence that could then support legal claims for genocide.

Figure 4: *Farhan Dakheel Haje (Yazda) and Ariel Caine (FA) during photogrammetry training, Istanbul 2018*

Civic-led Ground and Aerial Photography

Employing the conceptual understandings of constellation and navigation[15], combining the use of both volume, palimpsest and communal practice as they have been articulated through chapters Two and Three of the thesis, helped form a conceptual and participatory framework for the training based documentation project.

This method, communicated via a manual during training (fig. 5), was important in reconnecting the body of documenters with the act of aerial photography, which is usually a disconnected experience. Use of drones is not possible in many sites of conflict as these aircraft are directly associated with monitoring and survey (surveillance). As such, at the start of the project, for several reasons, in addition to instruction on the use of drones for 3D scanning, our choice of approach for low-altitude aerial survey was that of kite aerial photography.

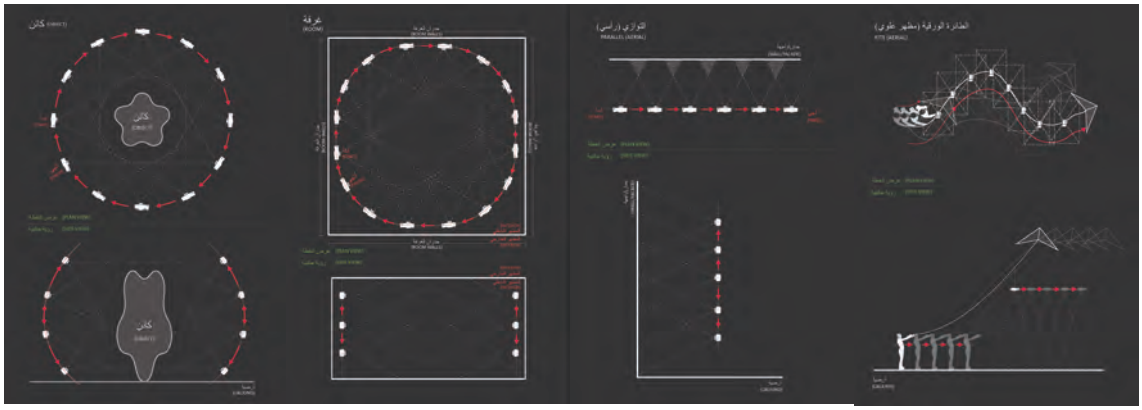


Figure 5: *As part of the training process, an aerial and ground photogrammetry manual was produced by Forensic Architecture, 2018.*

This simple DIY method provided materials of incredible detail and use through the most rudimentary of means. In all cases, whether successful or unsuccessful from an imaging perspective, the group walks and the collective effort and attention around the process of image making and survey comprised the heart of the training and documentation project and emphasised the unorthodox socio-communal character of photography in this particular institutional implementation; heightened by attention not only being paid to the operation of the kites and drones but also to the conditions of the terrain, the condition of each site, its history and the effects of the transformation of the land.

15 Articulated in pages 18-19

Following the training in Turkey, a second training period ensued, this time remotely, (fig. 6 & fig. 7), with Yazda in Dohuk and Forensic architecture members in London. We set up file transferring systems and started a series of mapping and scanning exercises to test out the preparedness of both teams before documentation commenced in Sinjar where conditions would not allow for multiple tries. As both weather and security conditions were extremely harsh and unpredictable, it was decided that documentation would be carried out through a series of expeditions, starting with the eight destroyed shrines along the southern slopes of Sinjar mountain. Subsequent expeditions were set to continue documentation of mass graves, kill sites and sites of incarceration and military training according to region. Beginning from the village of Kocho, subsequent surveys slowly followed the different lines of movement taken by ISIL as they moved westwards to Mosul.

Figure 6*: Photogrammetry target on a hilltop outside of Dohuk, Iraq, 2018.* **Figure 7:** *Faris Mishko and Zaid Salim Hassa of Yazda's documentation team during photogrammetry training with drone outside of Dohuk, 2018.*

Phase 2: Preliminary Analysis

Little exists by way of historic record of the architecture of Yazidi shrines and mausoleums. Our first steps into joint research of their present and past form aims to serve a double purpose; to present a cultural record and provide an operative model through which to derive evidence of the crime inflicted on and within these sites. As the violence we aimed to record was taking place in three dimensions, transforming the volume of the material of the temples and their environment, our recording too had to be three-dimensional. Hundreds of photographs taken from multiple angles at each site, from the air and from the ground provided us with visual information from which we could computationally reconstruct the volume of the ruin (fig. 8).

Eight shrines and mausoleums line the southern slopes of mount Sinjar; Malak

Fakhardeen, Sheikh Abdul Qadhir, Sheikh Abdul Aziz, Sheikh Mand, Sheikh Hassan, Ismail Bag, Mam Rashan and Amadeen (refer to fig. 3 for shrine locations). All were detonated and destroyed by ISIL fighters as they took control of the region in the summer of 2014, and all remain in state of ruin today. In June 2018, Yazda researchers set out on the project's first expedition to begin a detailed survey of these eight sites. Given that the area was still volatile, they were escorted by a local military unit as well as the temple caretakers. Stopping at a safe distance from the temples they used kites and drones,[16] recording the ruins from low altitude.

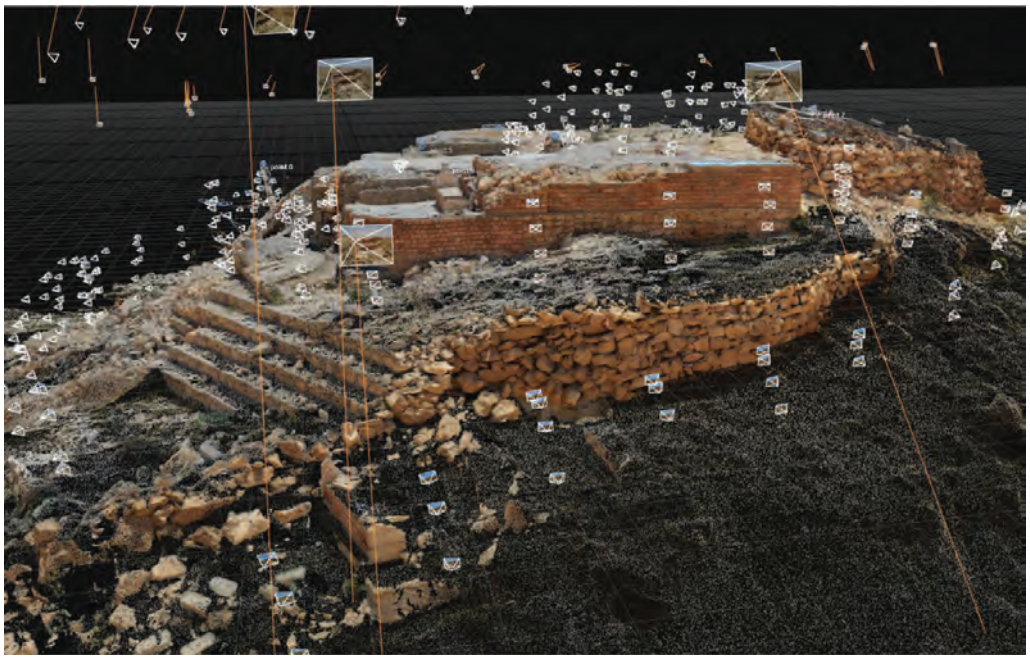


Figure 8*: Screenshot from Photogrammetry processing of the ruins of Mam Rashaan, Forensic Architecture. 2018*

When access on the ground was possible and safe, images were taken systematically, documenting up-close the material remains from the shrines. From these aerial, ground and satellite photographs, it was possible to unpack layers of historic inhabitation that were gently written into the topography of the terrain; old agricultural traces damming the runoff water to form small gardens, or small cemeteries located around the temples with narrow roads leading from there up into the mountains. Around the temple of Sheikh-Abdul-Aziz, there were identifiable traces of defence lines and artillery potholes, most probably dug by villagers and Peshmerga forces. Not all of these such structures were destroyed, as Islamic State fighters concentrated the destruction on the most identifiable symbols of Yazidi presence: the mausoleums and the spires.

Interpretation of the images and models was carried out using further sources of data

16 Having escort from the local military, the researchers could use a Drone for the aerial documentation.

and knowledge. Historic imagery, personal image archives and architectural floorplans, aural accounts, songs and situated testimony were combined with still images, computationally produced photogrammetric models, video footage, satellite and aerial imagery. All were brought together to help analyse what could be seen in the ruins. Spatial imaging was integral in this process; the georeferenced and scaled photogrammetry model provided accurate forms and scales from which to start analysis.

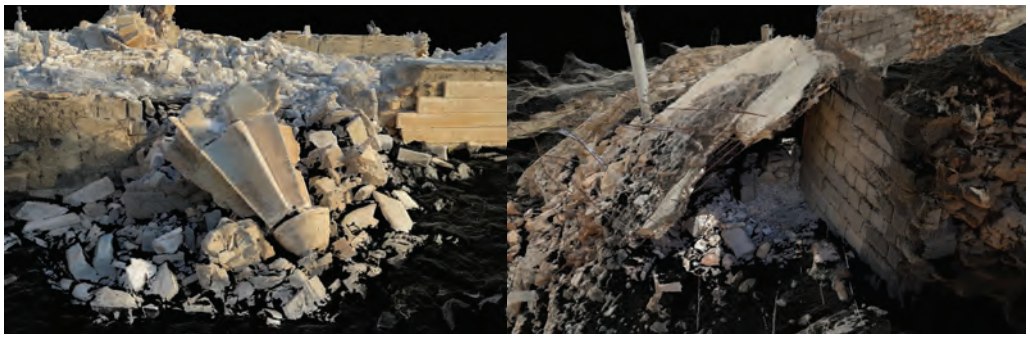


Figure 9*: Screenshot from Photogrammetry processing of the Temple Ruins at Ismail Bag (left) and Mam Rashan (Right). Forensic Architecture. 2018*

In some cases, such as with the temples of Ismaeel Bag, Mam Rashan (fig. 9) and Amadeen, the outline of concrete bases upon which the renovated temples stood could still be discerned within the wreckage. In other cases, such as Sheikh Mand and Malak Fakhardeen, no such traces remained, and a close estimate positioning had to be derived using pre-destruction satellite imagery. Camera projection techniques enabled us to match-up historic images depicting the temples intact with the virtual terrain of the digital point-cloud model. Once aligned, reconstructive modelling began, using fractions from the ruin, the terrain and the projected archive images to reconstruct an estimate model of the temple's shape and orientation on the ground. (fig. 10)

The architectural plan of these mausoleums and shrines is extremely simple, comprised of two rooms, a public front area and inner room where the remains of the sheikh are buried. Above this inner room, an octagonal raised roof from which the sun-like cone rises. Cross-referencing the image-based model and the photogrammetry facilitated calculation of the exact size of each section of the cone. It was then possible to identify specific fragments in the ruins. At Sheikh Mand, the explosives placed inside the shrine hurled the spire to a distance of 3.10 meters from its original position. Examined from above, the sites of Sheikh Abdul Qadhir and Sheikh Abdul Aziz (fig. 11) reveal a similar pattern of scattered wreckage, revealing that explosives were placed inside each of the temples that detonated from the centre outwards and produced a circular scattering pattern around the base of the temple.

Figure 10*: Series of Screenshots from Photogrammetry and reconstruction 3D modelling of the Amadeen Temple, Forensic Architecture. 2018*

Further information was discovered in that one corner of a stone fence surrounding Ismail Bag temple (fig. 12) had separated stone cladding, caused by the blast impact; whilst, within the temple compound, multiple smaller spire fragments were located. These were remains from smaller shrines placed within the larger temple room, used as part of Yazidi religious ritual. At Mam Rashan, Sheikh Hassan and Sheikh Mand temples, slabs of reinforced steel concrete – part of the roof structure – were detached and hurled several meters. Once all reconstruction material is processed, consultation with blast and materials experts will assist in estimating the amounts and exact positioning of explosives used by ISIL to detonate these sites.

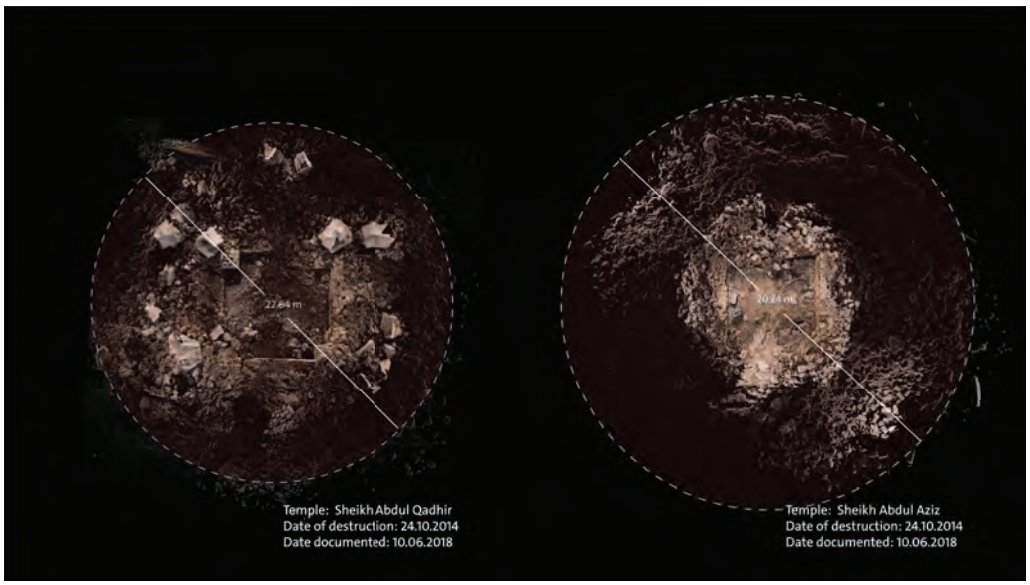


Figure 11*: Series of Screenshots from Photogrammetry and reconstruction 3D modelling of the Amadeen Temple, Forensic Architecture. 2018*

Figure 11*: Series of Screenshots from Photogrammetry and reconstruction 3D modelling of the Amadeen Temple, Forensic Architecture. 2018*

Responding to Digitally Mediated Iconoclasm

One central tenet of the violent policy executed by ISIL was what José Antonio González Zarandona termed as 'Digitally Mediated Iconoclasm' (DMI).[17] Under this articulation, ISIL's production and dissemination of 'images of destruction' were made an inherent part of the iconoclastic process. However, in the context of this discussion, an inversion of this term is useful; instead of DMI, a participatory practice of image making is inherently set within the process of evidence production.

Each imaged location is a transcoded material witness tied to a human testimonial counterpart. Combined, the spatial, material and human testimonies are brought together to form a photography based evidentiary terrain. As the fundamental constitution and reach of this image space changes, it is still necessary to understand the social and political implications. As such, this paper claims that spatial photography and its practices need to be reframed within social, political and epistemological sets of relations. Spatial photography is not simply a changed mode of mechanical production; it must be a vehicle for the creation of relation between various human and machinic systems, taking, analysing and producing spaces that, together, add up to a socio-techno-political community of practice.

17 González Zarandona, José Antonio, César Albarrán-Torres, and Benjamin Isakhan. "Digitally Mediated Iconoclasm: The Islamic State and the War on Cultural Heritage." International Journal of Heritage Studies 24, no. 6 (2018/07/03 2018): 649-71.

Destruction of the temples was part of a genocidal project in which iconoclasm operated not only to erase the Yazidi's past and present existence, but to radically undermine their very ability to orient themselves in their ancestral land or recognise it as their own. In addition to the collaborative premise underpinning this project, in order to overcome or mitigate this attempted erasure and erosion of evidence, a diffused, collaborative, multiple and architectural photographic practice is required: a volumetric optical record where space, image, navigation and testimony are fused. This facilitates challenge of pre-existing thresholds of visibility and of civic participation, and of photography's potential role in these institutionalised processes; as well as the formation of conditions for a common evidentiary infrastructure.

Towards a Common Evidentiary Infrastructure

Testimony has become increasingly central to this thesis as it formed around the reconfigured relations between spatial imaging and the recording of politically and ideologically driven acts of violence. The thesis aims to demonstrate in what ways this new ontological photographic state and its set of spatial practices can also offer new modes of witnessing and testimony.

In her 2011 text "Witnessing / Testimony" Michal Givoni ascribes Testimony with "… the unending task of expanding the political imagination that indifference depletes and retying the social bonds it has undone. It is first and foremost an act of moral weaving, an attempt to (re)establish a human relation where one is denied or presumed to be non-existent".[18] Spanning several geographic scales, material ontologies, spatial conditions and political typologies, the thesis chapters attempt this weaving and (re)establishment of relations that Givoni writes of, through the techno-social practices of spatial photography. It is not merely the spatialization of testimony[19] but rather the affording of testimonial agency to media and digitally mediated material environments. As it unfolds through media registration in two and three dimensions, a computational environment can be considered as a material witness[20] to the process of slow, violent transformation as it is written on the earth's surface and embedded in its soil structure and its contours. But this disser-

18 Givoni, Michal. "Witnessing / Testimony." Mafte'akh 2e, (2011) pg. 150

19 The positioning in space and time the unfolding sequence and nature of an event according to a human narrator

20 An operative concept developed by Susan Schuppli, the 'material witness' is 'an entity (object or unit) whose physical properties or technical configuration records evidence of passing events to which it can bear witness. Whether these events register as a by-product of an unintentional encounter or as an expression of direct action, history and by extension politics is registered at these junctures of ontological intensity. Moreover, in disclosing these encoded events, the material witness makes 'evident' the very conditions and practices that convert such eventful materials into matters of evidence.' See Susan Schuppli, 'Material Witness': http://susanschuppli.com/research/materialwitness/.

tation proposes that the spatial photograph should be considered as a testimonial entity simultaneously on three fronts, attesting the transformation of the material environment, to the processes of its own manipulation and to the social practices formed around its production. I develop the discussion around these multiple forms of registration of space-time-media in Chapters Two and Three through an analysis of the archaeological/architectural reconstruction of Silwan/'City of David' and the Forensic Architecture participatory mapping project in the Negev. Each of these cases starts from a standpoint where life, physical space and image space are in the process of violent transformation according to an ethnic religious and political agenda.

Navigating the point clouds of al-Araqib, Silwan and Sinjar, each formed in a different way, under different political contexts yet all, results of a communal physical act of witnessing that has then been computationally coalesced into the spatial photograph it is important to think of this act in the context of both official and transitional juridical processes. Juridical processes do not only seek to establish facts but to transmit, "transmit truth as event and as the shock of an encounter with events, transmit history as an experience".[21] While in all cases some form of official juridical process is ongoing, one could say that what is really at stake is the possibility of forming a testimony that will transcend the current limits of discourse, chip at its lines of reasonable defence until breaking through to form the basis for a new epistemology at its core. In her discussion of fragile evidence, that evidence that is the unspoken, irrational and inconsistent, that which is a gap or a collapse in all that would otherwise be considered acceptable testimony Shoshana Felman recognised the true evidentiary materialisation / manifestation of the traumatic event. As she writes; "The language of the lawyer and that of artist meet across the witness stand only to concretize within the trial their misunderstanding and their missed encounter".[22] We need to think of the act of forming the point cloud, it's densities showing persistence of vision and attention, its voids, manifesting a break in the chain of vision or the access to vision, in terms of the witnessing and attesting to the conditions of vision and movement under political and ideological violence. The act of walking with the camera, producing structure from motion can be read through that framework of the fragile testimony of a spatial photograph.

21 Felman, Shoshana. The Juridical Unconscious : Trials and Traumas in the Twentieth Century. Harvard University Press, 2002.pg. 133
22 Ibid.143-4

In Simply visualising volume or surface, awareness alone is not enough. Visibility in cases pertaining to communities living in precarious conditions, such as the Palestinian residents of east Jerusalem or the Naqab Palestinian Bedouin, even if well intended, is more often than not easily repurposed and used against the oppressed populations in the courts or on the ground. Hence, in terms of these practical projects and their theoretical analysis, it is not only crucial to incorporate and develop notions of wilful opacity and self-censorship but also to develop methods of image making, analysis, editing and multiple authorship so that control over visibility and presentation could continuously be negotiated and controlled by those most at stake by their content. The media in and of itself provides testimony to that which is unfolding through it; however, it also functions as a device through which the testimony of others can be given or understood. Thus, other media or other people can use the transcoded environment to provide a digital situated testimony. In this way, media, documents and models can be understood in their full spatial context and chronology.

Point cloud images retain their 'chain of custody' on a granular level, allowing the origin of each point to be accounted for. Being an operative mode of photography that also captures volume from afar it was put into use through the movement of Yazda's researchers along the southern Sinjar, recording destroyed temples, houses, training grounds and mass graves. Ongoing consultation was conducted through WhatsApp (text and a/v conversations) between Sinjar/Dohuk and London in relation to cultural and religious content, account detail, the narrative of the unfolding ISIL attacks as well as technical difficulties in the scanning and documentation.

Each imaged location is a transcoded material witness tied to a human testimonial counterpart. Combined, the spatial, material and human testimonies are brought together to form a photography based evidentiary terrain. Civic and community practice fuse with more established fields of expertise such as ballistics and explosives experts, archaeologists and anthropologists to truly form a hybrid forum dedicated to what is now referred to at Forensic Architecture as 'Open Verification'.[23]

New technologies of vision and survey have emerged in the wake of a cybernetic and computational turn. These are technologies that have been diffused, the same way as media and cameras have been diffused in the 1980's and 1990's, we can see now a kind of proliferation, a citizens practice because they have also simultaneously became a new kind of language through which governmentality operates. As we witness a dissemination and popularization of mapping and spatial imaging There's a new type of grammar that we

23 Weizman, Eyal. 'Open Verification', Becoming Digital, e-Flux 2019

need to develop in order to meet the emergent political reality in their wake. The thesis attempted to always work towards the formation of different kind of photographic, imaging process, adhering to the particular political demands and maintaining the possibility for wilful grades of opacity.

Practice of spatial photography by state and corporations as well as by civic society and artists has been on an exponential increase over the 4 years of writing this dissertation. Every week I encounter new projects utilizing this form of optical computational imaging, embedding it deeper as a ubiquitous form of record and expression. Photogrammetry as a method of what is now increasingly termed 'Reality Capture' has truly 'exploded' as a field of engagement for architects, game developers, and film as much as it is for industry, survey and archaeologists. Depth sensing and computation of optical data input are increasingly augmenting the one to one relations between reality and simulation in VR AR and mixed reality content platforms across industries and use, shifting the situatedness of the end user from cartographic space to a situated volume.

The trajectory I set for this thesis moved from the core definition of the photographic condition itself, through the spatialization of a single stereo pair, to an entangled, aggregated volume image environment demonstrated in chapter 3. In chapter 4 and the project in the Naqab dessert the contained volume was expanded into a practice that is communal, collaborative and tied closely to the fusion between image and survey, demonstrating they way in which photographic, optical imaging has moved from the single view perspective into a multi viewpoint-scale-chronal-authorship medium. Basic properties of photography such as the boundaries of the frame, time of photography, focus and flatness change completely within this spatialized mode of computational optical imaging. Lastly, with the Documentation project of Yazidi Destroyed Heritage, described earlier in this concluding chapter, spatial photography and its communal practices become a methodology that can be disseminated, adopted and adapted outside of my own (or Forensic Architectures) practice.

While these technologies have been developed and implemented by state led institutions and incorporated into the larger systems of control and governmentality, they also open new possibilities for civic led counter practices. Through the two projects in this thesis I tested ways by which the available technologies and data sets could combine with civic action and practices of testimony and narration in order to make visible, knowable and actionable, that which at the moment is being negated or driven into opacity. In Silwan / City of David the project (at this stage) set out to form a visible and spatial connection within the stratified and segregated physical and political volume of the site. In the next phase of the project, one which builds on the current Spatial photographic map-

ping (learning from the Ground Truth project) I will be using the image to conduct the negative archaeological readings alongside Emek Shave archaeologists in order to provide visual corroboration to the claims that are brought forward concerning destruction of cultural heritage layers of the larger site.

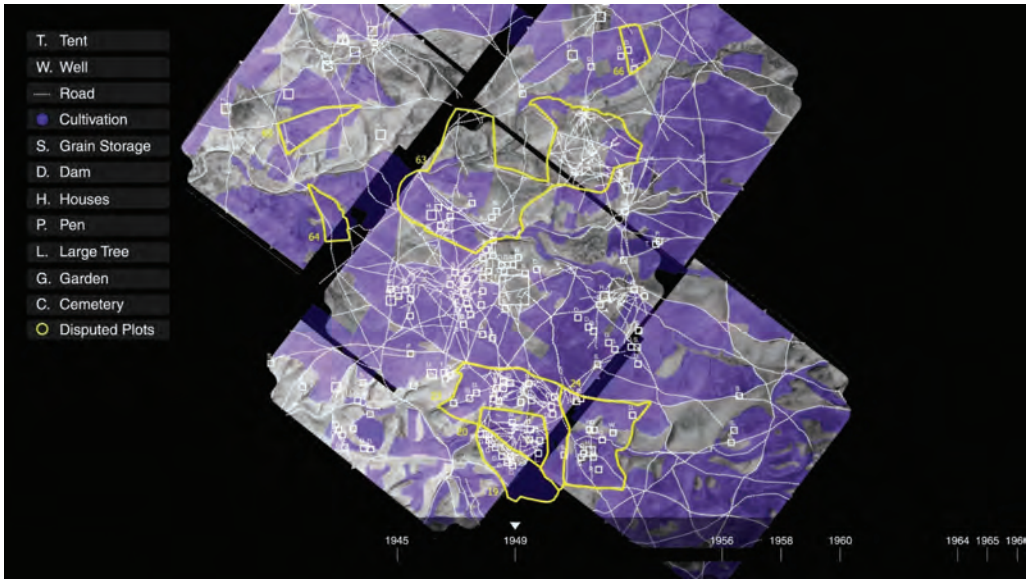


Figure 12*: Aerial interpretation of Palestinian Bedouin sedentary inhabitation patterns in al-Araqib, 1949. Forensic Architecture. 2019*

In Ground Truth, spatial photographic practice expanded into a mode of communal practice of survey. Developing the project as part of Forensic Architecture meant that the image was not only part of a collaborative effort but that the end for which this imaging was conducted was directly tied to the production of evidence, driving constantly for direct intervention into the ongoing juridical processes and horizon of this long struggle. In the spring of 2020 we will be presenting part of our new analysis corroborating the continuity of Bedouin presence on the land plots of al-Araqib in the Israeli regional court of Beersheba on behalf of the al-Turi and Abu Freih families. (fig.12) Taking part in this historic trial, a first time since Israel's foundation where Bedouin families are allowed to bring forward expert testimony to challenge the states doctrine of land appropriation, negating the very possibility of Bedouin sedentary modes of life. A central tenet of our contribution to these claims draws on the fundamental challenge to the mode of knowledge production and a proposal of Ground Truth, with its basic demand for a departure from the disconnection between ground and aerial perspective, between expert and lived knowledge and between different cultural modes of knowledge.

Today photographic reality is both spatial and navigational. Navigating through optically generated computational constellations, in many ways we who live under the influence of western capitalist society, are immersed in an image space. Yet, as the fundamental

constitution and reach of this image space changes we still need to understand the social and political implications. What this thesis claims for is that spatial photography and its practices need to be reframed within social political and epistemological sets of relations. It is not simply a changed mode of mechanical production but must be a vehicle for the continued creation of relation between different people and machinic systems, taking, analysing and producing spaces, that together add up to a socio-techno-political community of practice.

APPENDIX

Appendix For Chapter 1

Item No 1 /
Environs, 2015 (Videoart)

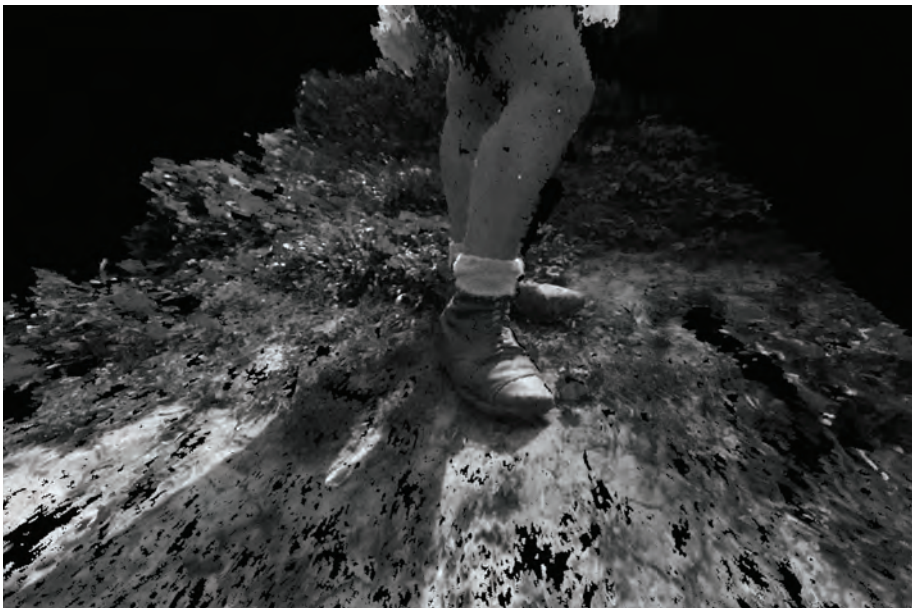
Sanctity at the intersection of photographic 3-D imaging, Archeology and the conflicting religious conceptions of the land. With materials ranging from original to manipulated archive photographs, predominantly of Jerusalem a line is drawn linking views by 19th century protestant pilgrims and those of the present day messianic Judaism. This work was exhibited in late 2015 at the Petach Tikva Museum, Israel.

https://youtu.be/osN-6AW0hVg

Item No 2 /
Point Cloud spatial reconstructions from stereoscopes

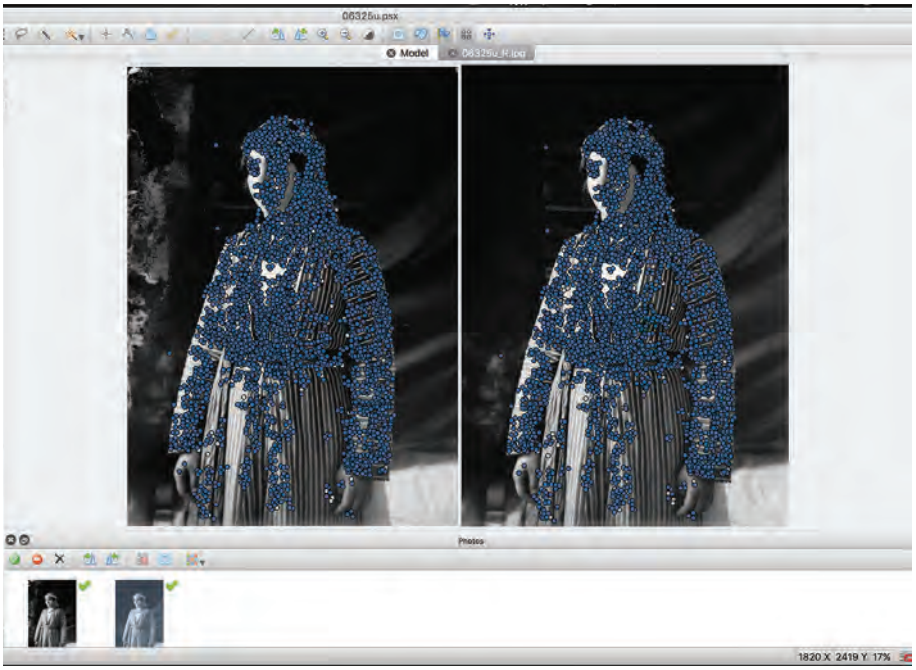
A

American Colony. Photo Dept, photographer. Zionist colonies on Sharon. Borochov. Girls' farm, Polish girl immigrant. Israel 1920', photograph. (Library of Congress, retrieved 2 June 2017 http://www.loc.gov/pictures/item/mpc2004002011/PP/



Screenshot of the point cloud spatial reconstruction. By printing the point cloud as a full digital hologram it is possible to view the digitally decompressed encapsulated space in optical three dimentions. A video of the hologram can be accessed here: https://vimeo.com/110939252

Woman of Nazareth', photograph, circa. 1898. Library of Congress: https://www.loc.gov/item/mpc2004006402/PP/ (accessed 4 June 2017)



The first process performed as part of the photogrammetry is one of shared-feature detection between the images. From these shared features triangulation and camera position reconstruction begins. Here, identified tie points are displayed within the Agisoft software on the stereoscopic image.

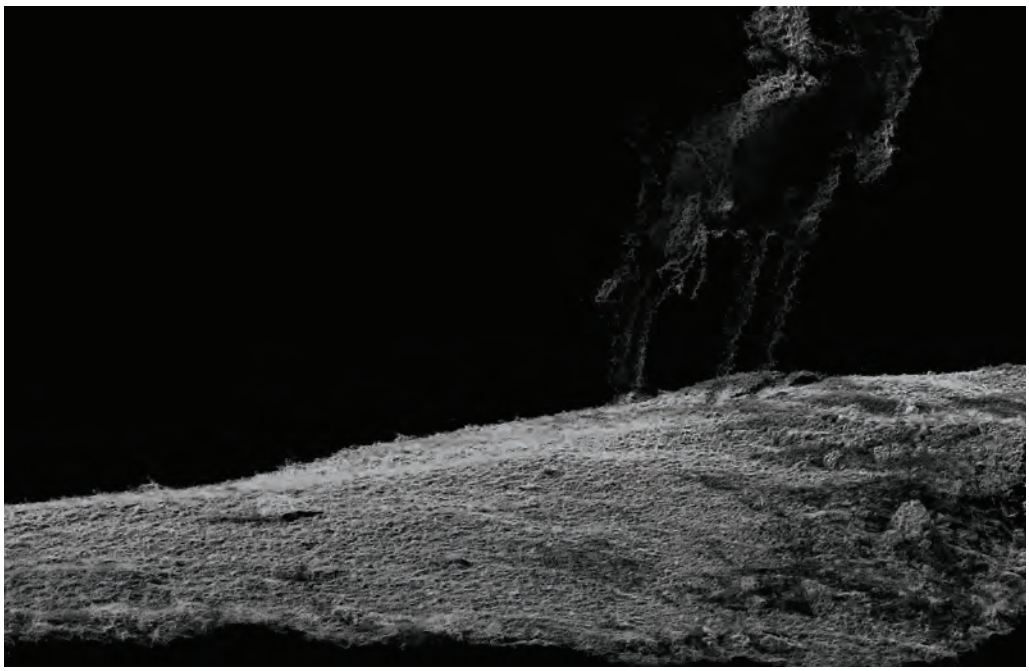
B

American Colony. Photo Dept, photographer. Temple area, Mosque of Omar i.e., Dome of the Rock, etc. Olivet and Mosque el-Aksa i.e., al-Aqsa from Zion. Jerusalem, 1900. [Approximately to 1920] Photograph. https://www.loc.gov/item/mpc2004000997/PP/.

Front and side angles of the spatial reconstructed point cloud.

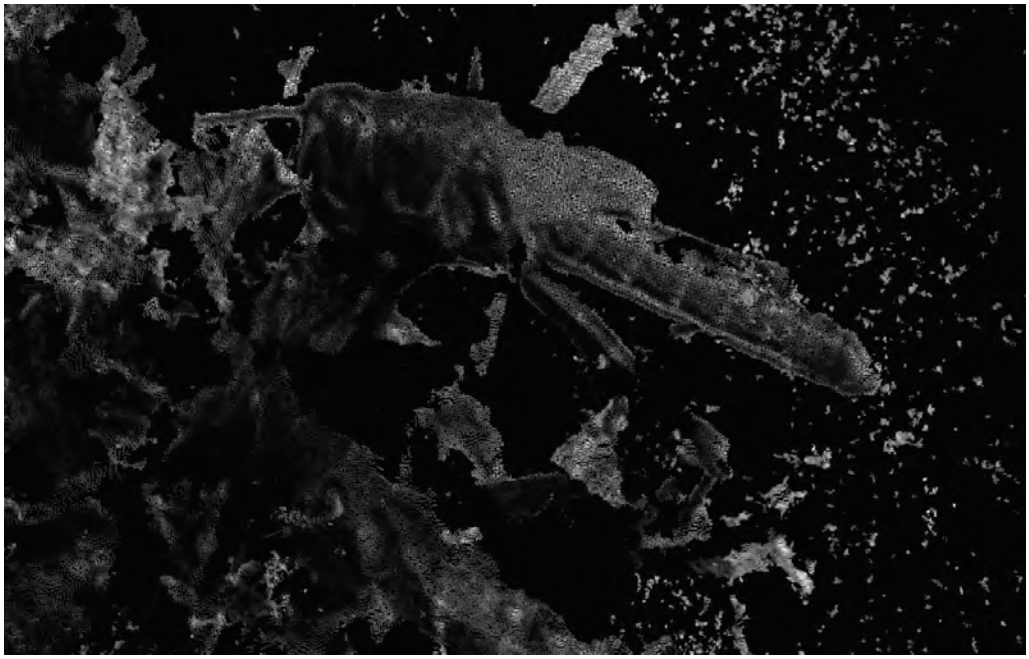
C

American Colony . Photo Dept, photographer. Jerusalem. Jerusalem, None. [Between 1898 and 1946] Photograph. *https://www.loc.gov/item/mpc2004006050/PP/*



D

The terrible plague of locusts in Palestine, March-June 1915. Locusts devouring a thistle (Scolymus Hispanicus). Creator: American Colony (Jerusalem). Photo Dept., photographer Original Date Created/ Published: 1915. http://www.loc.gov/pictures/item/mpc2004004236/PP/



3D point cloud model can be accessed here: https://skfb.ly/6JEy7

Item No 3 /
Aim Luski's Omni Horizontal Camera

North-South-East-West camera, Aim Luski, 1993

Item No 4 /
Use Of Lidar In Atmospheric Mapping

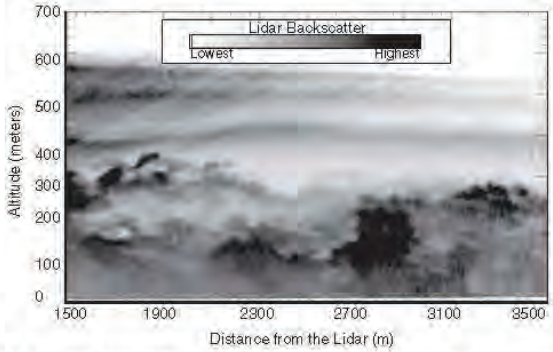


Fig. 1.3. A vertical (RHI) lidar scan showing convective plumes rising in a convective boundary layer. Structures containing high concentrations of particulates are shown as darker areas. Cleaner air penetrating from the free atmosphere above is lighter. Undulations in the CBL top are clearly visible.

region, drier air from the free atmosphere above penetrates down into the PBL, replacing rising air parcels.

1.1.2. Convective and Stable Boundary Layers

Convective Boundary Layers. A fair-weather convective boundary layer is characterized by rising thermal plumes (often containing high concentrations of particulates and water vapor) and sinking flows of cooler, cleaner air. Convective boundary layers occur during daylight hours when the sun warms the surface, which in turn warms the air, producing strong vertical gradients of temperature. Convective plumes transport emissions from the surface higher into the atmosphere. Thus as convection begins in the morning, the concentrations of particulates and contaminants decrease. Conversely, when evening falls, concentrations rise as the mixing effects of convection diminish. These effects can be seen in the time-height indicator in Fig. 1.2. The vertical motion of the thermal plumes causes them to overshoot the thermal inversion. As a plume rises above the level of the thermal inversion, the area surrounding the plume is depressed as cleaner air from above is entrained into the boundary layer below. This leads to an irregular surface at the top of the boundary layer that can be observed in the vertical scans (also known as range-height indicator or RHI scans) in Figs. 1.3 and 1.4. This interface stretches from the top of the thermal plumes to the lowest altitude where air entrained from above can be found. The top of a convective boundary layer is thus more of a region

TABLE 1.1. Gaseous Composition of Unpolluted Wet Air

	Concentration, ppm	Concentration, $\mu g/m^3$
Nitrogen	756,500	8.67×10^8
Oxygen	202,900	2.65×10^8
Water	31,200	2.30×10^7
Argon	9,000	1.47×10^7
Carbon dioxide	305	5.49×10^5
Neon	17.4	1.44×10^4
Helium	5.0	8.25×10^2
Methane	1.16	7.63×10^3
Krypton	0.97	3.32×10^3
Nitrous oxide	0.49	8.73×10^2
Hydrogen	0.49	4.00×10^1
Xenon	0.08	4.17×10^2
Organic vapors	0.02	—

Bouble et al. (1994).

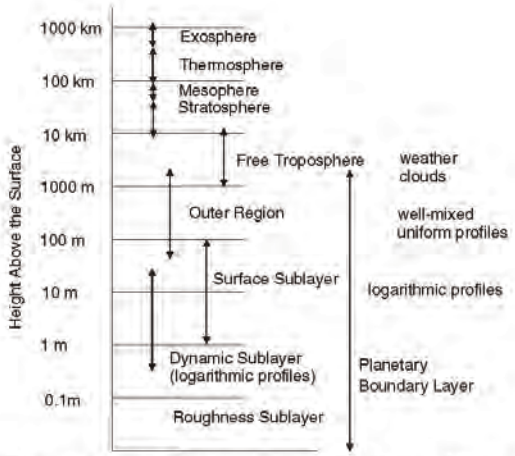


Fig. 1.1. The various layers in the atmosphere of importance to lidar researchers.

from top to bottom, the exosphere, the thermosphere, the mesosphere, the stratosphere, and the troposphere. Within the troposphere, the planetary boundary layer (PBL) is an important sublayer. The PBL is that part of the atmosphere which is directly affected by interaction with the surface.

Item No 5 /
Diagram For The Method Of Photography In Photogrammetry

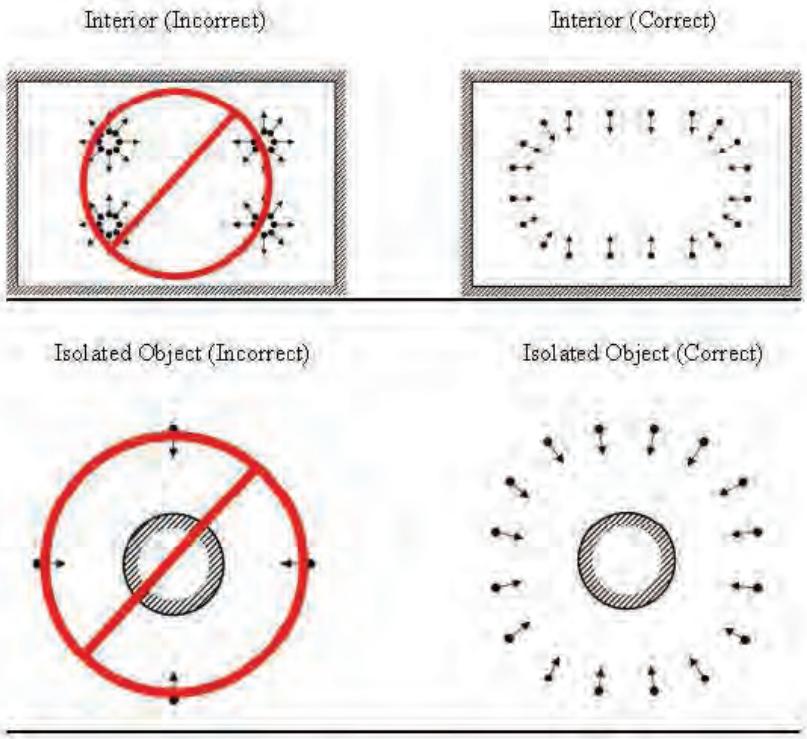
Useful Tips on Image Capture: How to Get an Image Dataset that Meets PhotoScan Requirements?

I. Equipment

1. Agisoft PhotoScan allows to process images shot with both metric and non-metric cameras. It means that, in fact, today you can carry out a true photogrammetric research with the help of an ordinary ***digital consumer-level camera***. No special photogrammetry equipment required!
2. Agisoft PhotoScan does not set any requirements concerning the image resolution neither. However, it is reasonable to remember that the resolution of the input data influences the quality of the processing results. That is why it is strongly recommended to employ a camera with ***5Mpx resolution*** at least. While to produce professional quality orthophotomaps, it is better to opt for ***12Mpx resolution*** photography.
3. Agisoft PhotoScan estimates camera calibration parameters automatically; consequently, generally there is ***no need to run precalibration procedure*** manually.
   However, since the software applies Brown model to simulate lens assembly, automatic calibration works perfectly well for "standard" optics (that is with 50 mm focal length (35 mm film equivalent)). To process data collected with "fish eye" lenses, you need to indicate corresponding camera type in the program settings*. The software is also capable of spherical camera data processing, providing that it implements equirectangular projection. If the source data was captured with ultra-wide angle lenses, the operation is likely to fail. In this case, one should enter calibration data to the program to achieve good reconstruction results.

II. Shooting Process Planning

1. Figures below illustrate the basic ideas about proper shooting scenarios.



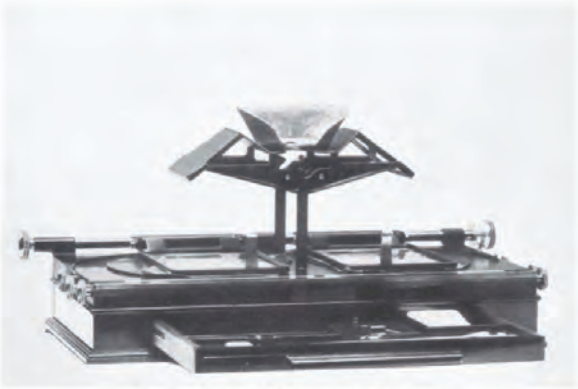
2. For the successful completion of the reconstruction task it is crucial to guarantee enough image overlap across the input dataset. In case of aerial photography the requirement can be put in the following figures: ***60% of side overlap + 80% of forward overlap*** at least.
3. Care about ***object texture*** and invent tricks to ***avoid plain/monotonous and glittering surfaces***. For example, in case you are to shoot a human leg, put a finely textured sock on it before; if you target object is a car, spread some talc over it to change from glittering to dull surface.
4. If you are to build a texture map of the object, that you had to "specially prepare" before shooting like in the examples above, you need, in fact, to capture two sets of images of the same object: one of the "natural" texture of the object and the other of the talc/etc. covered. Key point here is that you need to take both sets of images from the same camera positions, which, actually, forces you to organize ***fixed set of cameras*** for such shooting scenario to prove successful.

Reproduced from the Agisoft PhotoScan user manual: professional edition

Item No 6 /
Application of Stereoscopic Photography to Mapping

5. The Barr and Stroud Photogrammetric Plotter

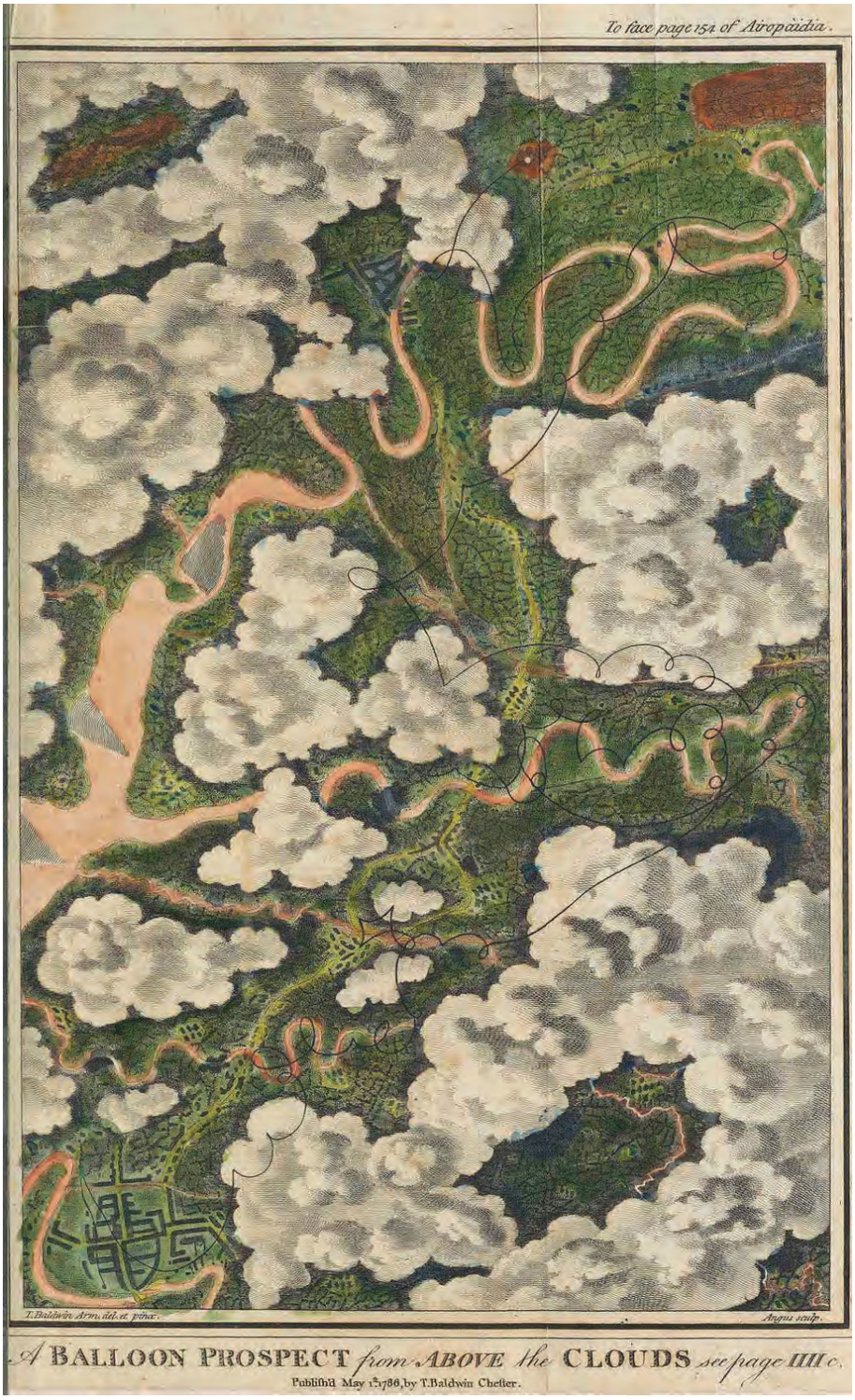
1. Fourcade's Stereocomparator



2. Barr and Stroud Topographical Stereoscope

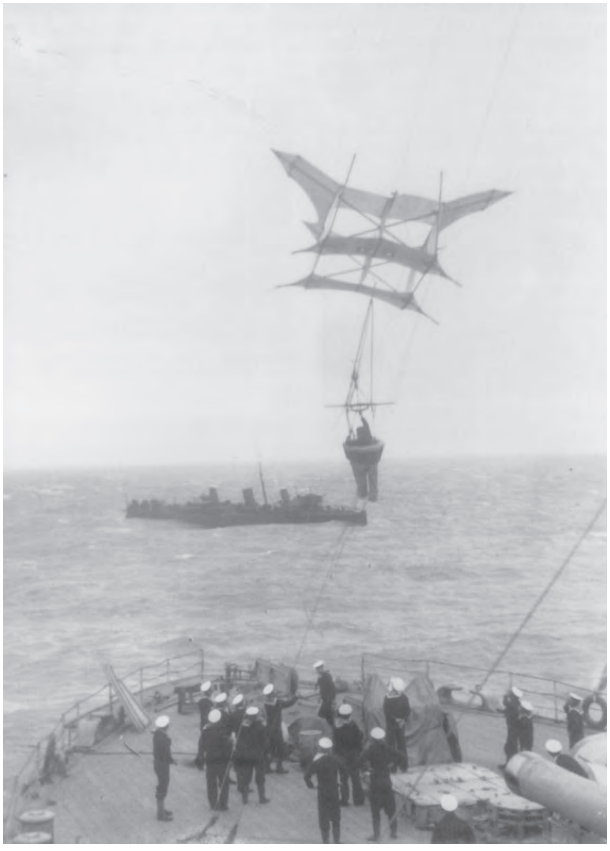
Hotine, M. "The Application of Stereoscopic Photography to Mapping." The Geographical Journal 75, no. 2 (February 1930): 157 (above) 149 (below).

Item No 7 /
Application of Stereoscopic Photography to Mapping



Thomas Baldwin. Airopaidia; Containing the Narrative of a Balloon Excursion from Chester ... Hints on the Improvement of Balloons, Means to Prevent Their Descent over Water ... with Various Philosophical Observations, to Which Is Subjoined, Mensuration of Heights by the Barometer, with Extensive Tables. Chester : The Author, 1786.

Item No 8 /
Royal Engineers Balloonists



The officer sitting on the edge of the basket is Lieutenant H B Jones. The unidentified man in the netting above would be responsible for piloting the balloon lleaving his superior free to study the landscape.
Reproduced from: Martyn Barber. A History of Aerial Photography and Archaeology: Mata Hari's Glass Eye and Other Stories. London: English Heritage, 2011.

Item No 9 /
Military Uses Of Aerial Photography

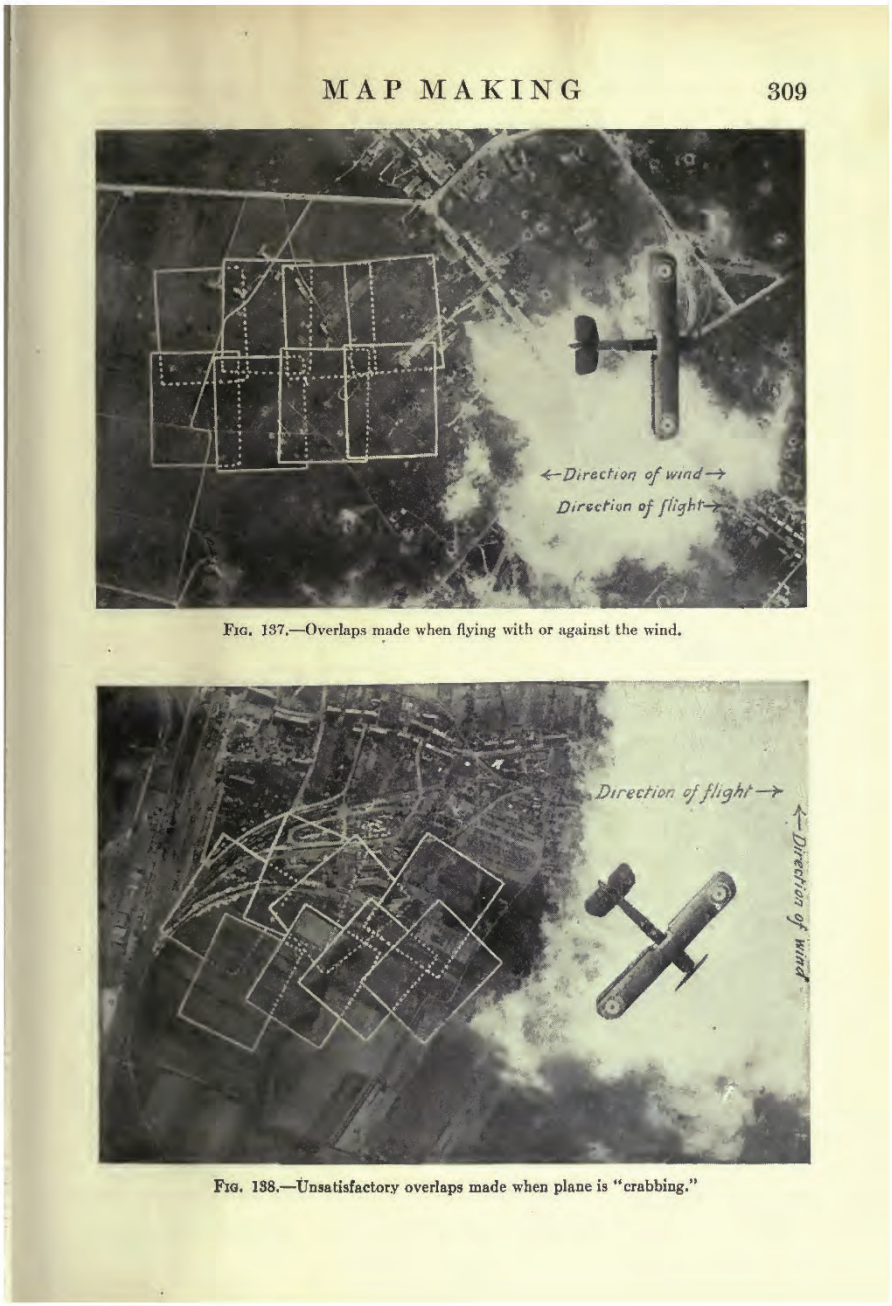
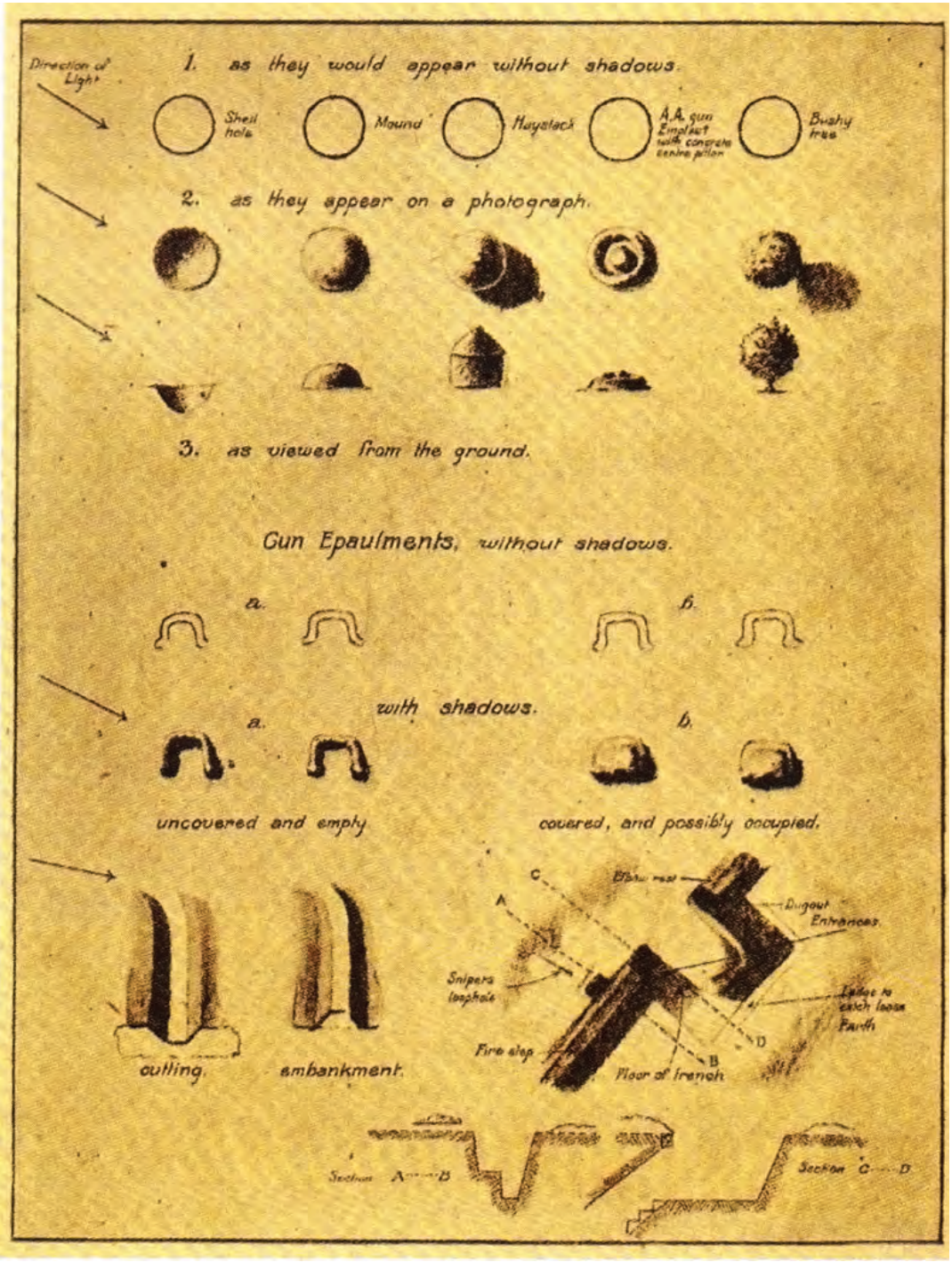


Fig. 137.—Overlaps made when flying with or against the wind.

Fig. 138.—Unsatisfactory overlaps made when plane is "crabbing."

Ives, Herbert E. Airplane Photography. London: Philadelphia Lippincott, 1920. https://archive.org/details/airplanephotogra00ivesuoft/page/274, p. 309

Item No 10 /
Diagram Illustrating The Reconstruction, From Their Shadows, Of Five Circular Objects Seen Vertically From Above



This diagram, extracted from the General Staff, Notes on the Interpretation of Aeroplane Photographs, rev edn, 1917 illustrates some of the difficulties likely to be faced when trying to understand aerial views of features that are easily distinguishable when seen on the ground (and in colour). Assistance in the interpretation is given by the shadows.

Appendix For Chapter 2

Item No 1 /
Spatial Photographic survey

Platform Web-address: *http://arielcaine.net/pcv/SilwanB/SilwanB.html*
Code base: Potree & Cesium
Background map: OpenStreetMap
Tunnel reconstruction video: *https://youtu.be/a8gEkTpNNNA*

Item No 2 /
Material list & Credits for 3D Point Cloud:

Photographic Source Materials:

Ariel Caine - Ground & Underground level photography
Publiclab & Silwan residents – Kite Aerial Photography
American Colony (Jerusalem). Photo Dept. - Stereoscopic photographs
Silwanic silwanic. مسوم الانهاياراتفي سلوان *Collapse Season in Silwan*. Accessed April 17, 2019. *https://www.youtube.com/watch?v=SeFyUraYM9k*.
Emek Shave
Peace Now *The Collapse in Silwan, 2/3/10*. Accessed March 31, 2019. *https://www.youtube.com/watch?v=QbESX5K5sWc*.
Galyn Wiemers – video of Herodian tunnel section (youtube)
Wiemers, Galyn. *Running Around Jerusalem's Walls (Part One)*. Accessed April 16, 2019. *https://www.youtube.com/watch?v=1AD0ENDX95I&t=99s*.
Ir David Foundation
Ministry of Tourism

Silwan / City of David project additional credits:

Hagit Keysar, Jeffry Warren, Shai Effrati, Children from Silwan Wadi Hilwe neighbourhood: Kite aerial photography images of Silwan and city of David. 2011.

Yonatan Mizrahi & Gideon Sulimani (Emek Shave): Counter archaeological reading of the 3D site mapping

Referenced Organisation:

Emek Shave is an Israeli NGO working to defend cultural heritage rights and to protect ancient sites as public assets that belong to members of all communities, faiths and peoples. We object to the fact that the ruins of the past have become a political tool in the Israeli-Palestinian conflict and work to challenge those who use archaeological sites to dispossess disenfranchised communities. We view heritage site as resources for building bridges and strengthening bonds between peoples and cultures and believe that archaeological sites cannot constitute proof of precedence or ownership by any one nation, ethnic group or religion over a given place.[1]

Wadi Hilweh Information Center was established in 2009, named after the area where it is located. The center aims at revealing the facts and history of the village of Silwan. It also revealed the occupation's violations in terms of its various institutions and settlement organizations in Silwan in particular and Jerusalem in general.[2]

1 Emek Shaveh. "About Us." Emek Shave (blog). Accessed April 17, 2019. https://alt-arch.org/en/about-us/.
2 Silwanic. "Wadi Hilweh Information Center - Silwan." Accessed April 17, 2019. *http://www.silwanic.net/index.php/about*.

Bimkom – Planners for Planning Rights is an Israeli NGO that was established in 1999 by planners and architects sharing a vision of strengthening the connection between planning and human rights. Drawing on values of equality, good governance, and community participation, Bimkom assists communities that are disadvantaged by economic, social, or civil circumstances, in exercising their planning rights, and strives to advance planning policies and practices that are more just and responsive to the needs of local communities.[3]

Ir Amim ("City of Nations" or "City of Peoples") was founded in 2000 and active as an NGO since 2004. It focuses on Jerusalem within the context of the Israeli-Palestinian conflict. The mission of Ir Amim is to render Jerusalem a more equitable and sustainable city for the Israelis and Palestinians who share it and to help secure a negotiated resolution on the city through sustained monitoring, reporting, public and legal advocacy, public education and outreach to re-orient the public discourse on Jerusalem.[4]

Archives

- Yad Ben Zvi - Aerial photography in Palestine
- National Jewish & University Library, Jerusalem. The Eran Laor Cartographic Collection
- Library of Congress. Matson Collection
- Bavarian aerial image archive:
- British Library – Photography and Maps collections
- Palestine Exploration Fund
- Hebrew University Geography Department
- Computational Archaeology Laboratory (Institute of Archaeology, Hebrew University, Jerusalem)

3 Bimkom. "Home | Bimkom.Org." Accessed April 17, 2019. https://bimkom.org/eng/home-mobile/.
4 Ir Amim. "About Ir Amim." Ir Amim. Accessed April 17, 2019. http://www.ir-amim.org.il/en/about.

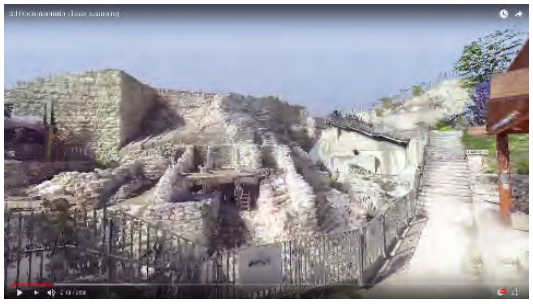
Item No 3 /
Reference Media:

Recording of David Beeri - the Head of Elad Association: https://youtu.be/t4OzNc9Hz_E

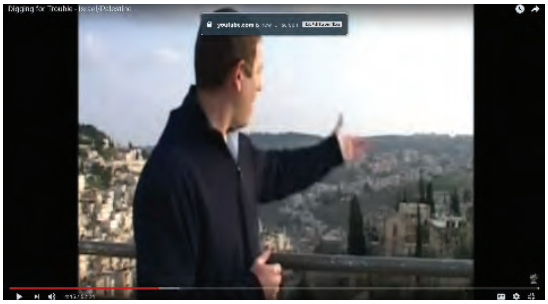
City of David 360: https://youtube/1i87fjczIuY

City of David in 90 Seconds: https://youtu.be/NZhFteuv9Is

CBS 60 Minutes: https://youtu.be/vvOVvu1S0s0

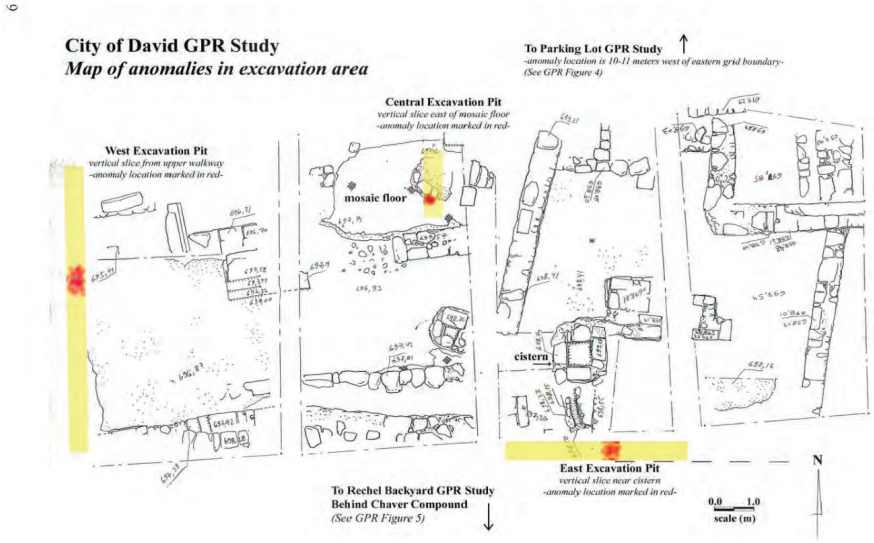


Journeyman Pictures: https://www.youtube.com/watch?v=aRNAJCHxa7w&feature=youtu.be



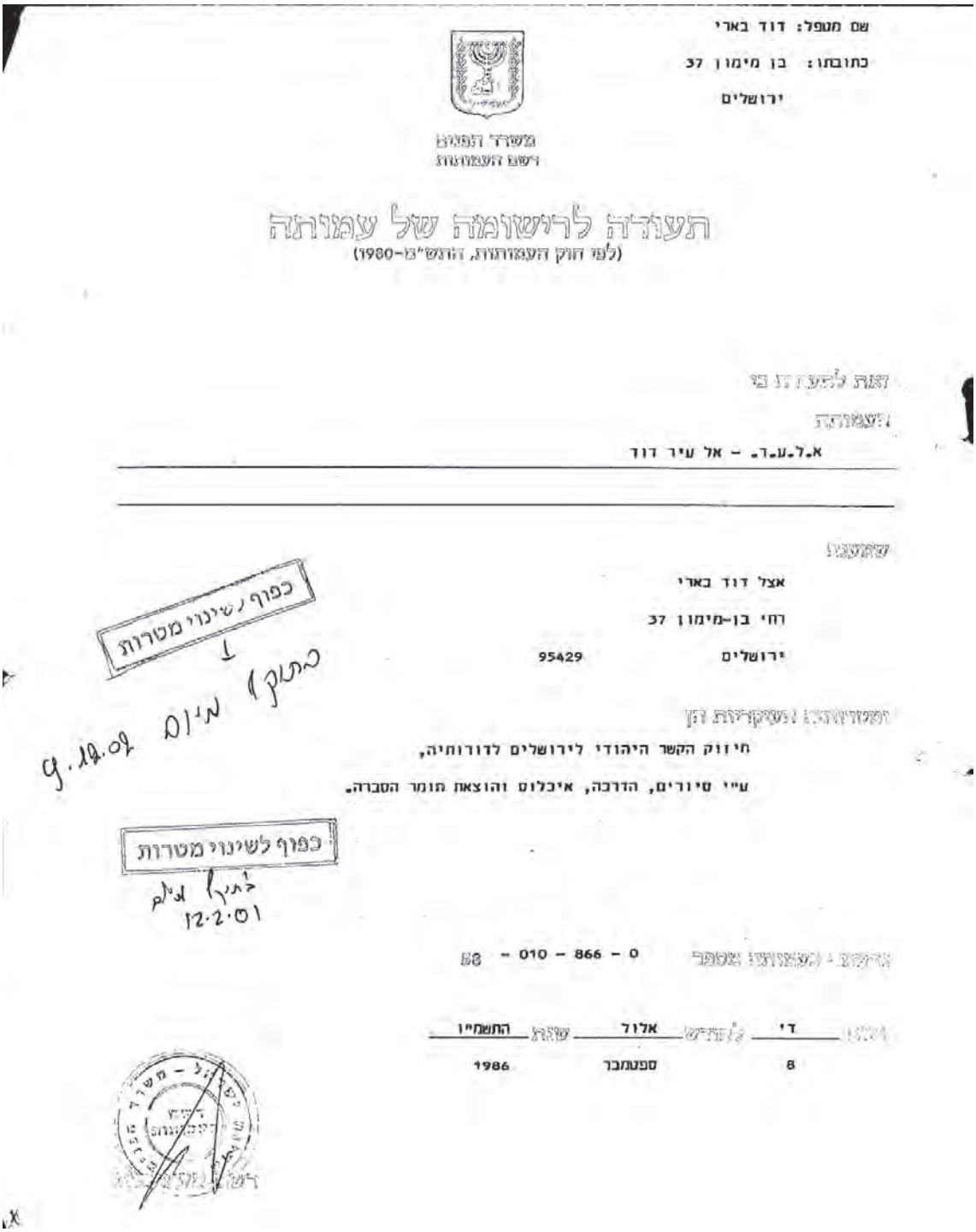
Scan3D Lidar scan of Sloped Structure (comissioned by ELAD organisation): https://youtu.be/exXhLumjdNw

Item No 4 /
Ground Penetrating Radar in the Givati Parking Lot Area.



mnemotrix. "Ground Penetrating Radar Survey Report." City of David, 2003. *http://www.mnemotrix.com/geo/irdavid/irdavid.pdf.*

Item No 5 /
Registration of Elad NGO by David Beeri. 1986



שם מטפל: דוד בארי
כתובתו: בן מימון 37
ירושלים

משרד המשפטים
רשם העמותות

תעודה לרישומה של עמותה
(לפי חוק העמותות, התש"מ-1980)

א.ל.ע.ד. - אל עיר דוד

אצל דוד בארי
רחי בן-מימון 37
ירושלים 95429

חיזוק הקשר היהודי לירושלים לדורותיה,
ע"י סיורים, הדרכה, איכלוס והוצאת חומר הסברה.

כפוף לשינוי מטרות
1

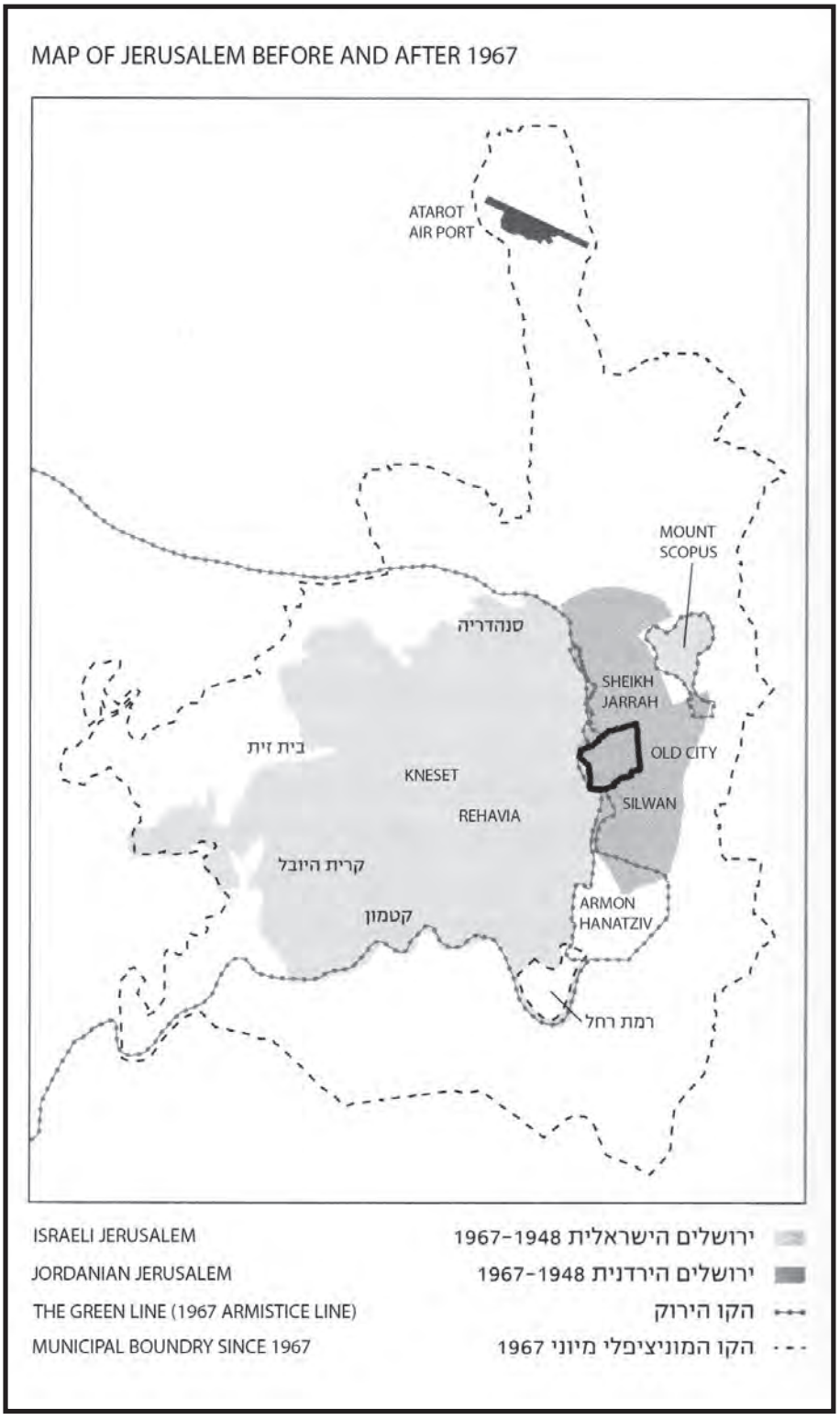
כפוף לשינוי מטרות
12.2.01

58 - 010 - 866 - 0

ה' אלול התשמ"ו
8 ספטמבר 1986

Ministry of Justice. "א.ל.ע.ד - אל עיר דוד | גיידסטאר - אתר העמותות של ישראל." Accessed February 26, 2019. *https://www.guidestar.org.il/organization/580108660.*

Item no 6 /
Map of the expansion of Jerusalem's municipal boundries after the 1967 war.



Map of Jerusalem before and after 1967. reproduced and translated from the book Urshalim by Nir Hasson, 2017.

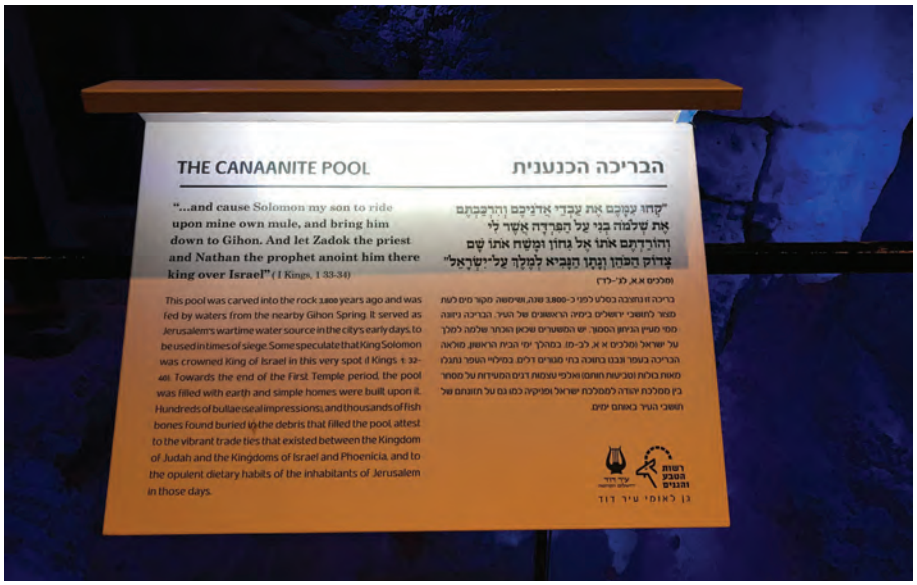
Item no 7 /
The sewage tunnel leading from the pool of Siloam towards the Temple Mount.

Item No 8 / **(**Next page)

The pilgrims underground walkway (near) and sewage tunnel (distant) leading towards the Temple Mount.

Item No 9 /
The pilgrims underground walkway (near) and sewage tunnel (distant) leading towards the Temple Mount.

Still image from the semi holographic video at the 'fountain house'. A film narrating the story of the large structure, wall and fountain connecting it to the destruction of ancient Jewish Jerusalem and the second temple (in the above frame). Below is one of the explanation plaques on-site explaining the pools history. Photos: Ariel Caine.



Item No 10 /
Upper Area G (below the visitor center) overlooking Silwan.

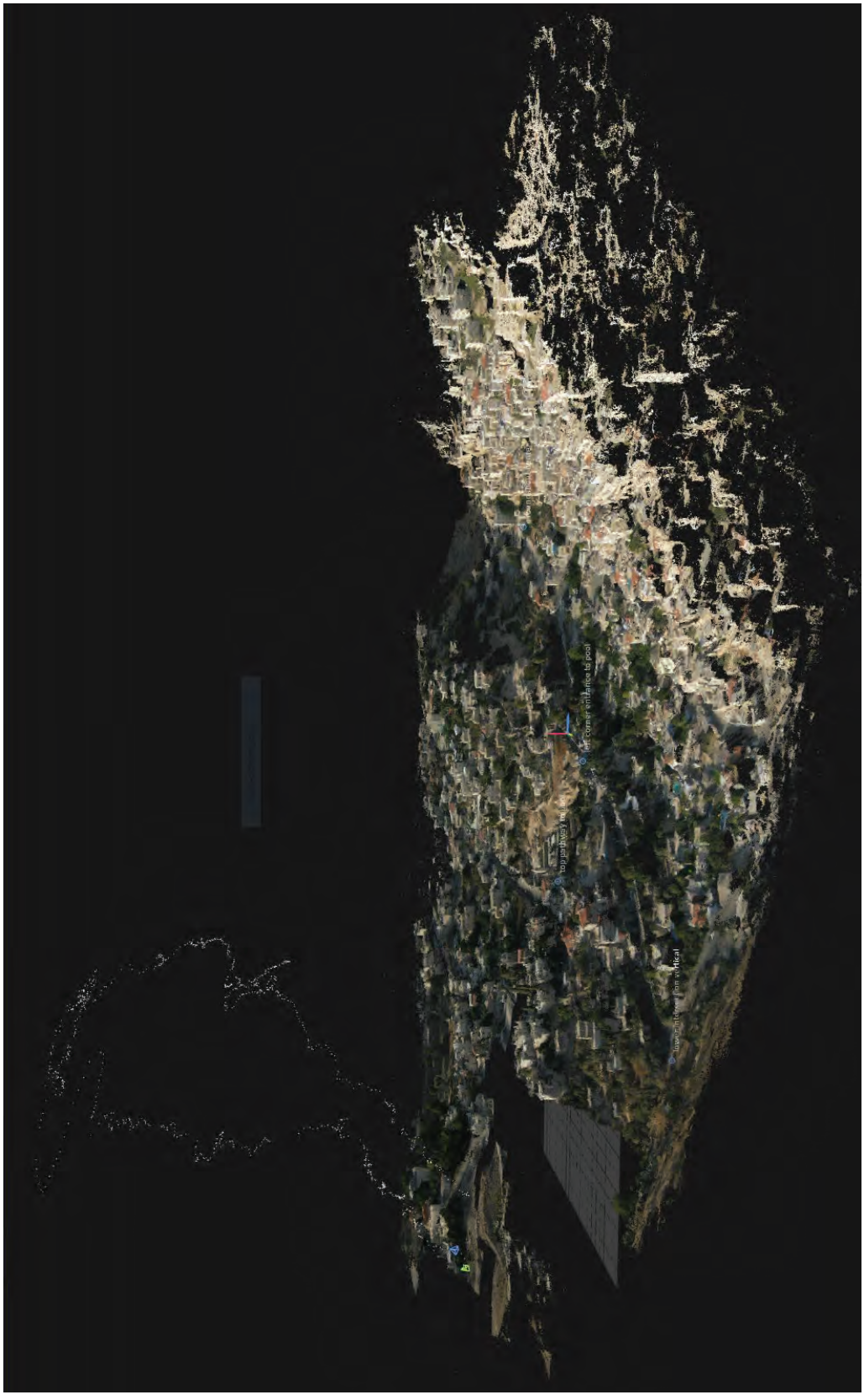
Item No 11 /
The Burnt Room & House of Bullae

Item No 12 /
Model of Area G and 1st Temple Residential Quarter

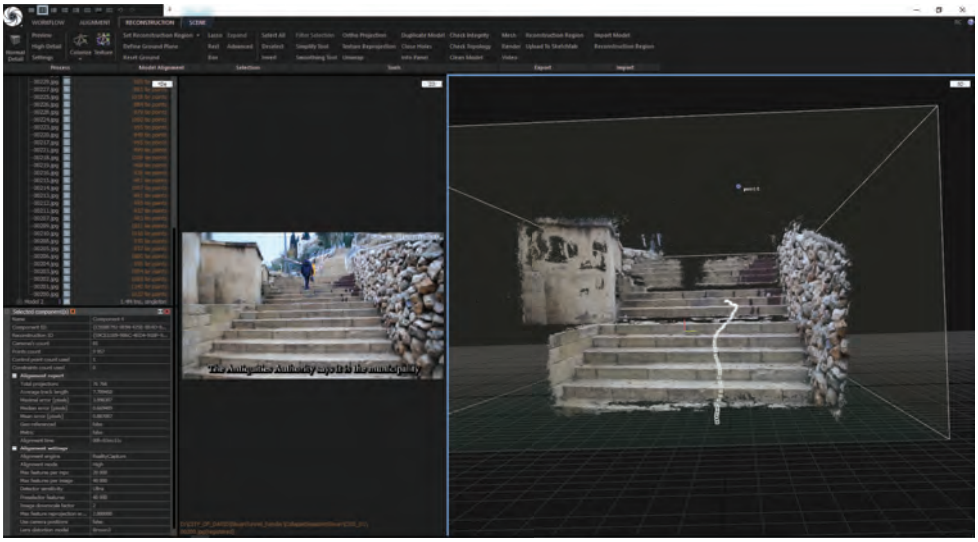
Item No 13 /
Meyuhas House with the Batan al-Hawa neighbourhood behind it.

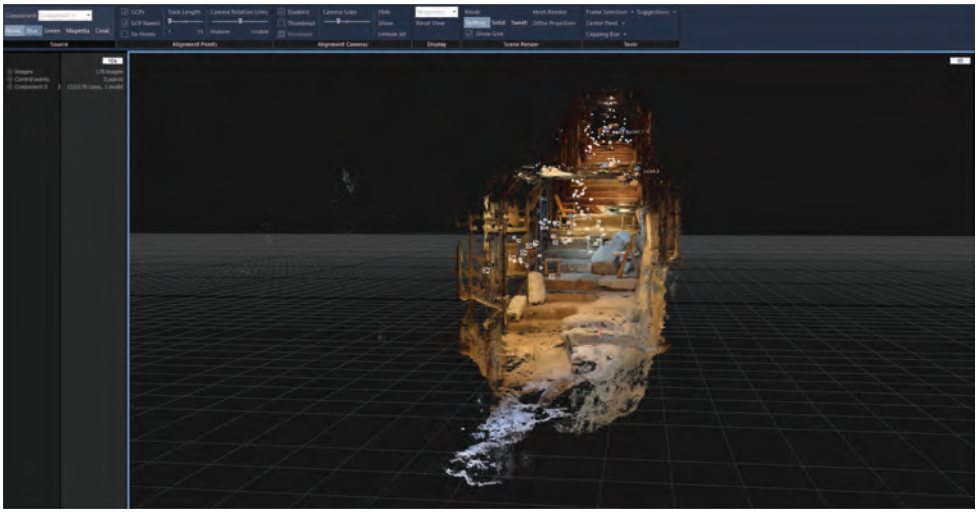
Item No 14 /
Still image from the underground tunnel leading towards the Givati Parking Lot area

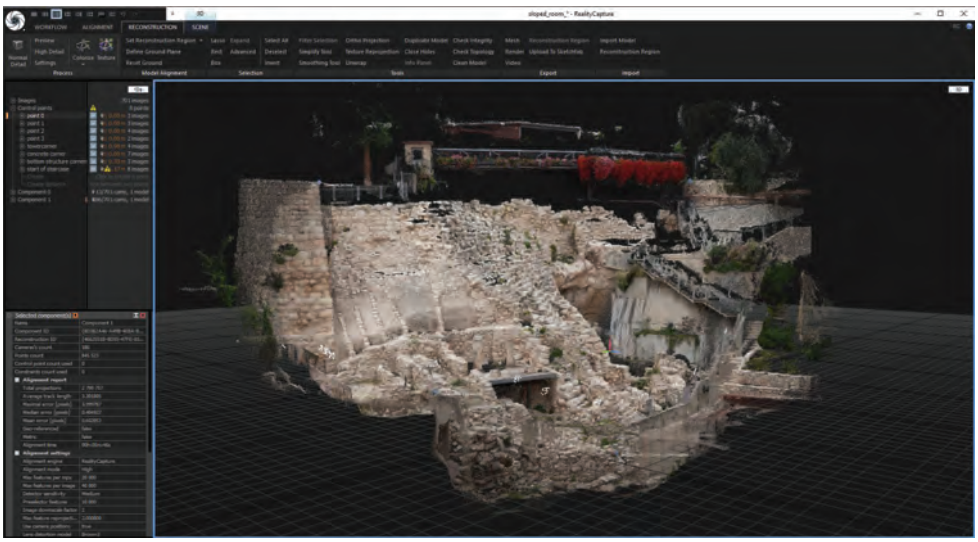
Item No 15 /
Point Cloud of Silwan with Kite camera images and trajectory, 2011/2019



Item No 16 /
Point Cloud reconstructions from stills and video, 2019



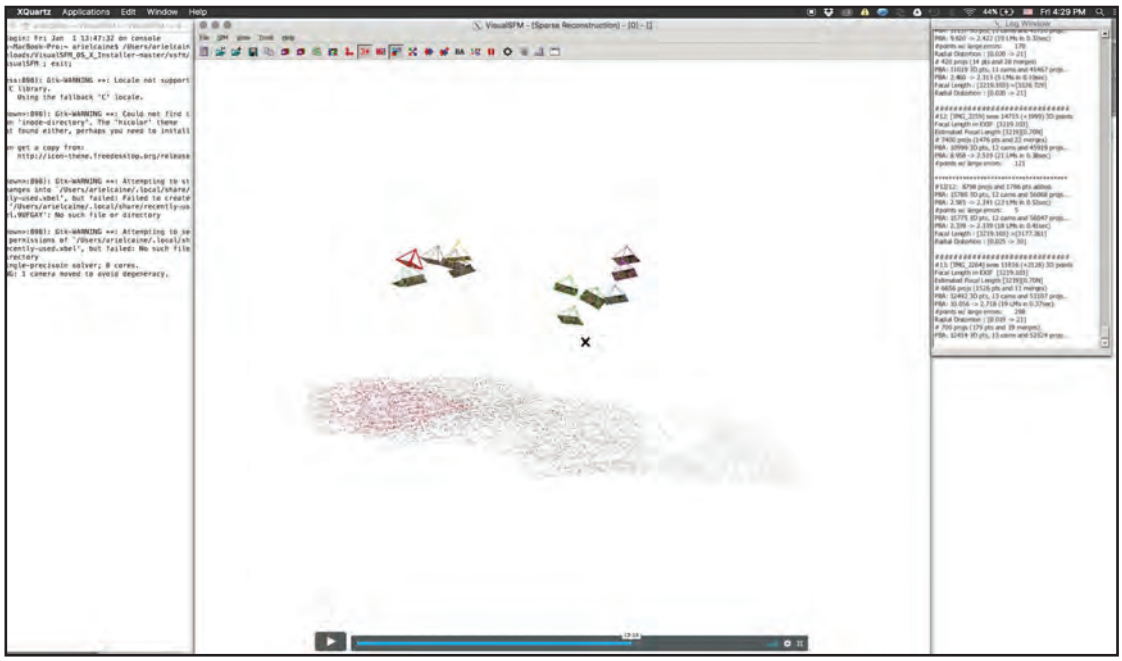




Appendix For Chapter 3

Item No 1 /
Ground Truth Project Credits

Naqab Platform web Address: www.naqab.org



Project Video: Destruction and Return in al-Araqib https://vimeo.com/223268224

Forensic Architecture Team:

Eyal Weizman (Principal Investigator)
Ariel Caine (Project Coordinator and Lead Researcher, Photography & Photogrammetry, GIS, Field Research & Interviews, Film)
Franc Camps-Febrer (Platform Design and Development)
Lachie Kermode ((Platform Design and Development)
Samaneh Moafi (Film)
Guillaime De Vore (Researcher assistance)
Note: the introduction of photogrammetry to this project, and the technical social and communal coordination of its production, has been undertaken by the author.

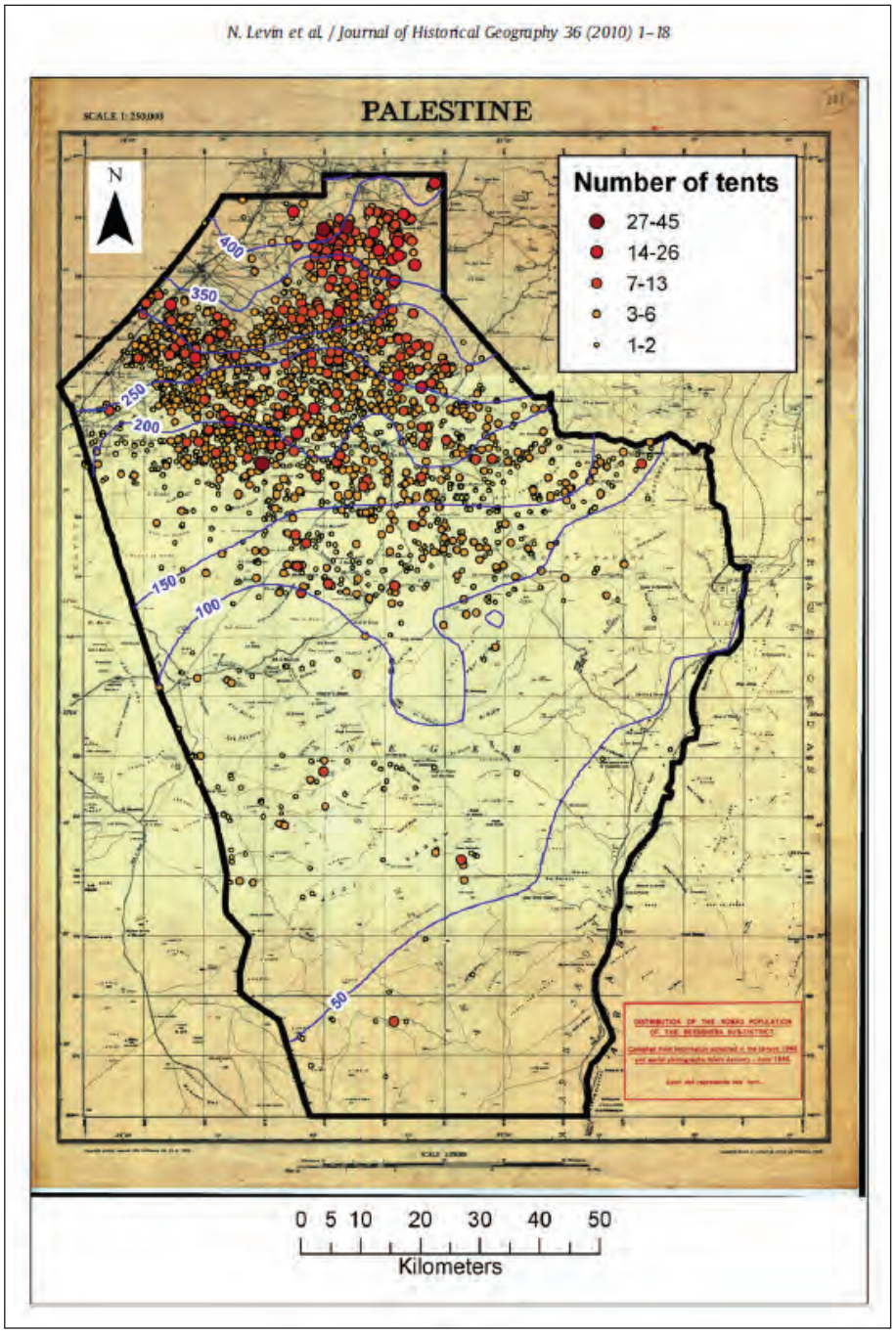
Collaborators:

Debbie Farber / Zochrot
Umar al-Ghubari / Zochrot
Rana Gnayem / Zochrot
Lotte Bjerg Thomsen / Zochrot
Nuri al-Uqbi / Al Araqib
Aziz al-Turi / Al Araqib
Sayakh al-Turi / Al Araqib
Hagit Keysar / Public Lab
Prof. Oren Yiftachel
Miki Kratsman / Bedouin Visual Archive Project
Princeton University Conflict Shoreline Course
Forensic Architecture MA (MAFA) at the Centre for Research Architecture, Goldsmiths

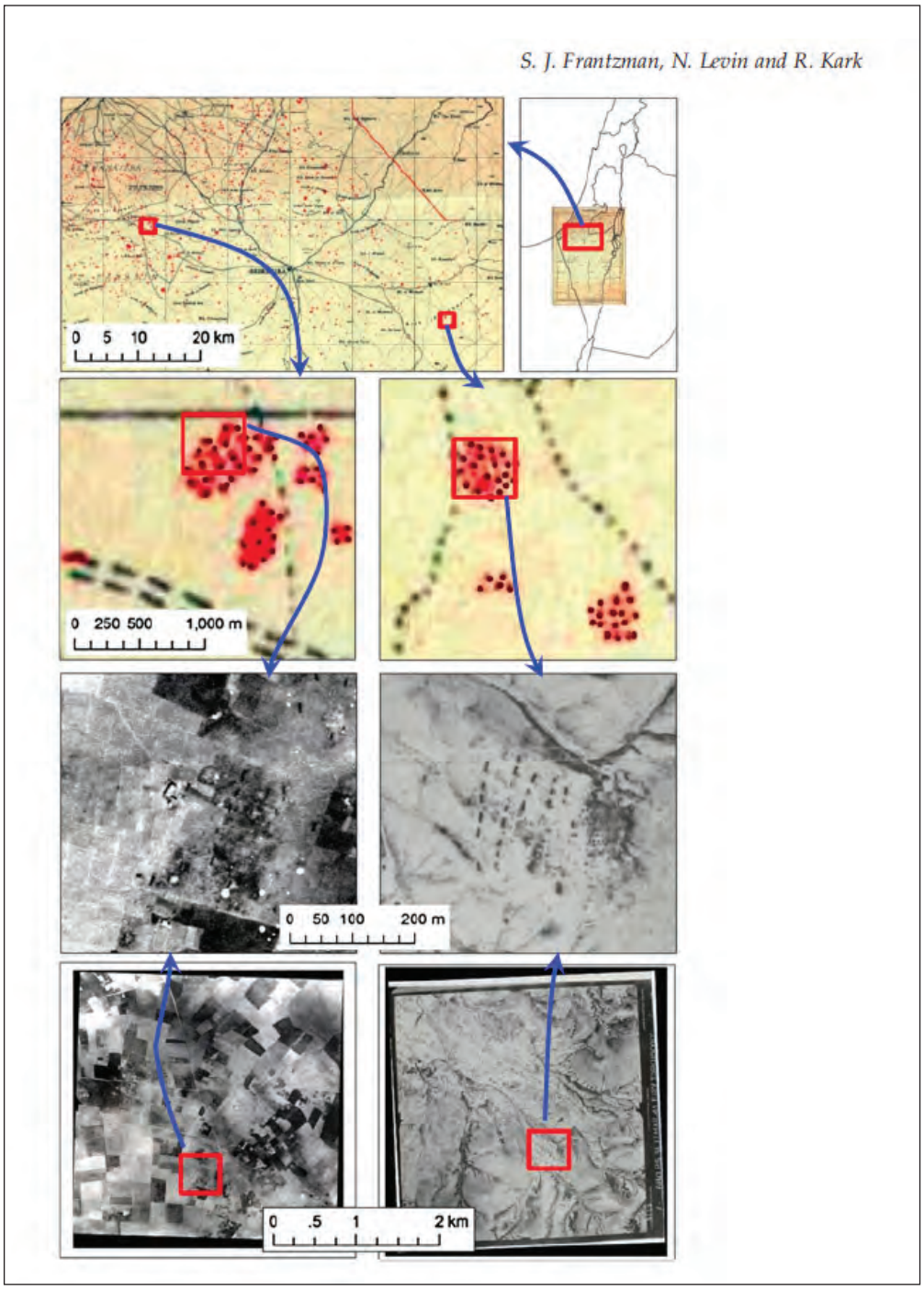
Collaborating organisations:

Zochrot
Public Lab
ActiveStills
Negev Coexistence Forum for Civil Equality (NCF)
Regional Council of Unrecognised Villages (RCUV)
The law office of Michael Sfard
Adv. Carmel Pomerantz

Item No 2 /
Distribution of nomad population in the Beersheba sub-district.

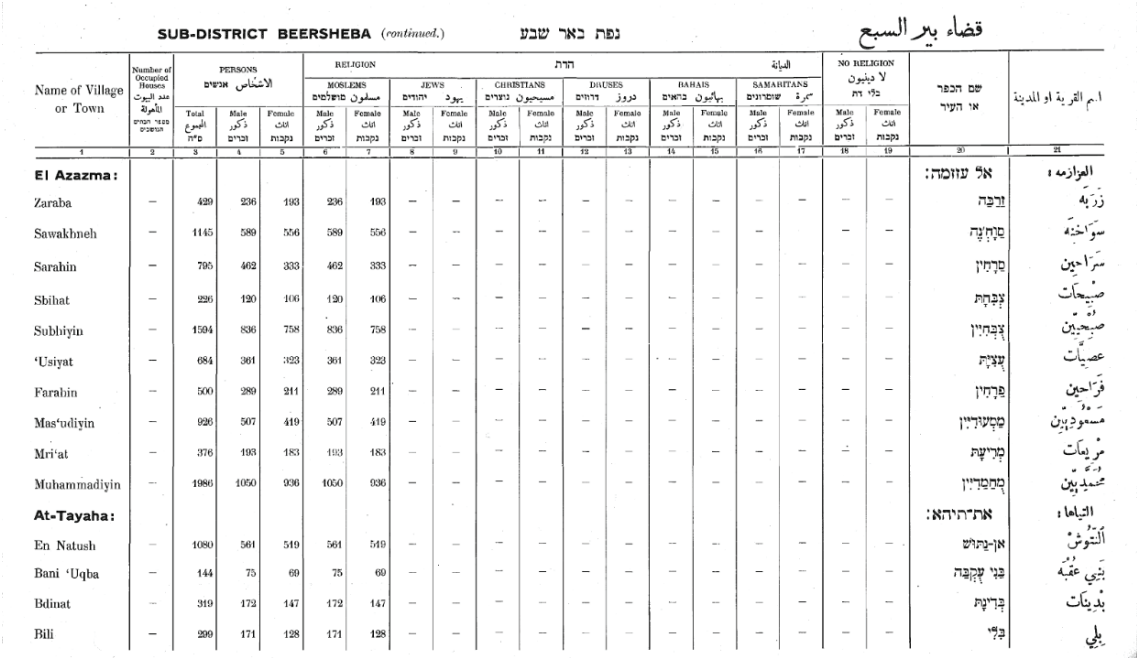


Distribution of the nomad population of the Beersheba sub-district, based on the Survey of Palestine map of 1947. The thick black line represents the Bedouin census limits. Ovelaying the map are equal rainfall isohyets of 50mm/year (shown in blue). This interpretation was conducted by Noam Levin, Ruth Kark and Emir Galilee in: "Maps and the Settlement of Southern Palestine, 1799–1948: An Historical/GIS Analysis." Journal of Historical Geography 36, no. 1 (January 1, 2010): 1–18.



Levin, Kark and Galilee's comparison between the 1946 tent map (where tents are shown in red) and 1945 aerial photos. The digitally identified tents (machine learning training) are highlighted as dark red coloured points

Item No 3 /
1931 Cencus of the Beersheba sub-district, Palestine.



SUB-DISTRICT BEERSHEBA (*continued.*) נפת באר שבע قضاء بير السبع

Name of Village or Town	Number of Occupied Houses عدد البيوت المأهولة מספר הבתים המושכים	PERSONS الاشخاص אנשים			RELIGION הדת الديانة												NO RELIGION لا دينيون בלי דת		שם הכפר או העיר	اسم القرية او المدينة
					MOSLEMS مسلمون מוסלמים		JEWS יהודים יהוד		CHRISTIANS مسيحيون נוצרים		DRUSES دروز דרוזים		BAHAIS بهائيون בהאים		SAMARITANS سمرة שומרונים					
		Total المجموع סה"כ	Male ذكور זכרים	Female اناث נקבות	Male ذكور זכרים	Female اناث נקבות	Male ذكور זכרים	Female اناث נקבות	Male ذكور זכרים	Female اناث נקבות	Male ذكور זכרים	Female اناث נקבות	Male ذكور זכרים	Female اناث נקבות	Male ذكور זכרים	Female اناث נקבות	Male ذكور זכרים	Female اناث נקבות		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
El Azazma:																			אל עזזמה:	العزازمه :
Zaraba	–	429	236	193	236	193	–	–	–	–	–	–	–	–	–	–	–	–	זַרְבָּה	زَرَبَه
Sawakhneh	–	1145	589	556	589	556	–	–	–	–	–	–	–	–	–		–	–	סַוָּחְנֶה	سَوَاخْنَه
Sarahin	–	795	462	333	462	333	–	–	–	–	–	–	–	–	–	–	–	–	סַרָחִין	سَرَاحِين
Sbihat	–	226	120	106	120	106	–	–	–	–	–	–	–	–	–	–	–	–	צְבִיחָת	صْبِيحَات
Subhiyin	–	1594	836	758	836	758	–	–	–	–	–	–	–	–	–	–	–	–	צְבְחִין	صْبِحِيِّين
'Usiyat	–	684	361	323	361	323	–	–	–	–	–	–	–	–	–	–	–	–	עְצִיָּת	عْصِيَّات
Farahin	–	500	289	211	289	211	–	–	–	–	–	–	–	–	–	–	–	–	פַּרָחִין	فَرَاحِين
Mas'udiyin	–	926	507	419	507	419	–	–	–	–	–	–	–	–	–	–	–	–	מַסְעוּדִיִּין	مَسْعُودِيِّين
Mri'at	–	376	193	183	193	183	–	–	–	–	–	–	–	–	–	–	–	–	מְרִיעָת	مْرِيعَات
Muhammadiyin	–	1986	1050	936	1050	936	–	–	–	–	–	–	–	–	–	–	–	–	מְחַמְּדִיִּין	مُحَمَّدِيِّين
At-Tayaha:																			אתתיהא:	التياها :
En Natush	–	1080	561	519	561	519	–	–	–	–	–	–	–	–	–	–	–	–	אן־נַתּוּשׁ	أَلنَّتُوشْ
Bani 'Uqba	–	144	75	69	75	69	–	–	–	–	–	–	–	–	–	–	–	–	בְּנִי עֻקְבָּה	بَنِي عُقْبَه
Bdinat	–	319	172	147	172	147	–	–	–	–	–	–	–	–	–	–	–	–	בְּדִינָת	بْدِينَات
Bili	–	299	171	128	171	128	–	–	–	–	–	–	–	–	–	–	–	–	בִּלִּי	بِلِي

Item No 4 /
Main Negev Land-Use Plans with Key Recomendations for Bedouin Localities.

s

Year	Regional District Plans	National/Statewide Plans	Indigenous Plans
1951		**National Plan 1: Physical Plan for Israel (Sharon Plan)** • Keeps Bedouins invisible • Uses pre-1948 Bedouin lands for Jewish towns and rural settlement	
1966		**Negev Physical Plan** • Concentrates Bedouins in siyaj region • Creates three dormitory towns • Ignores villages	
1975		**National Plan 6** • Reduces percentage of Negev Arabs • Steers Bedouin development to towns • Ignores villages	
1982	**District Plan 4** • Moves all Bedouins to seven dormitory towns		
1991		**National Plan 31** • Considers Bedouins as part of new metro region • Urbanizes Bedouins • Ignores villages	
1999			**RCUV Regional Plan for Municipal Development of Negev Bedouin Villages** • Creates regional council for Bedouin localities • Develops municipal facilities • Recognizes all unrecognized villages • Introduces the villages' historical names
2000	**District Plan 4/14** • Treats Bedouins as part of new metro region • Includes five Bedouin villages • Ignores all others		
2005		**National Plan 35** • Treats Bedouins as integral part of new metro region • Opens limited possibilities for recognition of five villages. • Ignores most villages	
2006	**District Plan 4/14/23** • Treats Bedouins as part of new metro region • Includes nine existing Bedouin villages • Recognizes two new villages • Ignores thirty-five villages		• Same RCUV Plan as in 1999
2008		**Goldberg Commission** • Recognizes villages "as much as possible" • Resolves land issue • Enters a gradual process of recognition and development	
2014			**RCUV Master Plan for Unrecognized Bedouin Villages** • Performs comprehensive survey and analysis • Fully recognizes Bedouin localities and communities on their ancestors' land • Integrates Bedouin localities into metropolitan economy through transport and employment areas • In planning, recognizes Bedouin localities as distinct type • Equalizes land allocation and development with Jewish rural sector to reach Tama 35 standards
2012–2017		**Prawer-Begin (Shamir-Ariel) Strategy** • Avoids new recognition in foreseeable future • Implements new and harsh land rules (legislation halted) • Uses economic incentives to urbanize • Provides large-scale suburban housing in towns • Plans for future Bedouin housing in towns or expands recognized localities • Recognizes a few localities as (uncertain) possibility for	

Table reproduced from: Yiftachel, Oren, Alexandre Kedar, and Ahmad Amara. Emptied Lands: A Legal Geography of Bedouin Rights in the Negev. [in English] Stanford, California: Stanford University Press, 2018.

Item No 5 /
Letter from Sheikhs to the military governor requesting a return to their land, 1951

Letter from Sheikhs

His Excellency the Military Governor of the Negev,
via the Representative of the Military Governor to the Eastern Area
From:
1. Sheikh Suliman al-'Uqbi, sheikh Bani Uqba tribe
2. Sheikh Amir al-Talalqa, sheikh of the Talalqa tribe
3. Sheikh Muhammad al-Finish

We, the sheikhs of the above listed tribes, present before you that the government compelled us to move from the northern area to the eastern area. On the one hand, we moved as we were forced to, and on the other, we trusted the promises of your government, as the order was carried out by all tribes who moved from the northern area to the eastern area. You promised us orally to return to our lands and villages. All moved except for Sheikh Suliman al-Huzzail and 600 of his tribe. And you know that the tribes that remained in the northern area remained without doubt on their own lands. The tribe of Sheikh Salman, about 2,000 people, remained on their lands. Hence, what is the reason for violating our rights and the rights of our tribes in contrast with the rest of the tribes? Why should they live on land that is not theirs, when the original owners plowed and improved these lands and lost money? As other tribes remained in the northern area, we hereby write our request, and it is important to stress that our rights should be preserved like the rights of other tribes. It is clear to you that, like all citizens under your government, we ask for equal rights with our fellow citizens: Why not treat us equally with our tribal fellows in the northern area? We notify you that we feel that our rights are violated and that we do not feel equal with other tribes. We feel deeply hurt in our souls for this discrimination and ask to be treated equally. We inform you that we refused to plow the land in the eastern region and not cultivate even a single *dunum*, preferring to lose our main source of income only because we are not treated equally to other tribes.

Finally, we ask for your government's mercy to allow our return to our place, and to link our destiny with the other tribes, and if this is impossible, we ask that you notify us with a written statement that asks us to leave Israel. And if this is impossible, we inform you that we will leave the eastern area to the north as soon as possible based on your oral promises to us. The decision is in your hands to do as you wish.

We are hoping that you accept our request and guarantee our equality

With appreciation

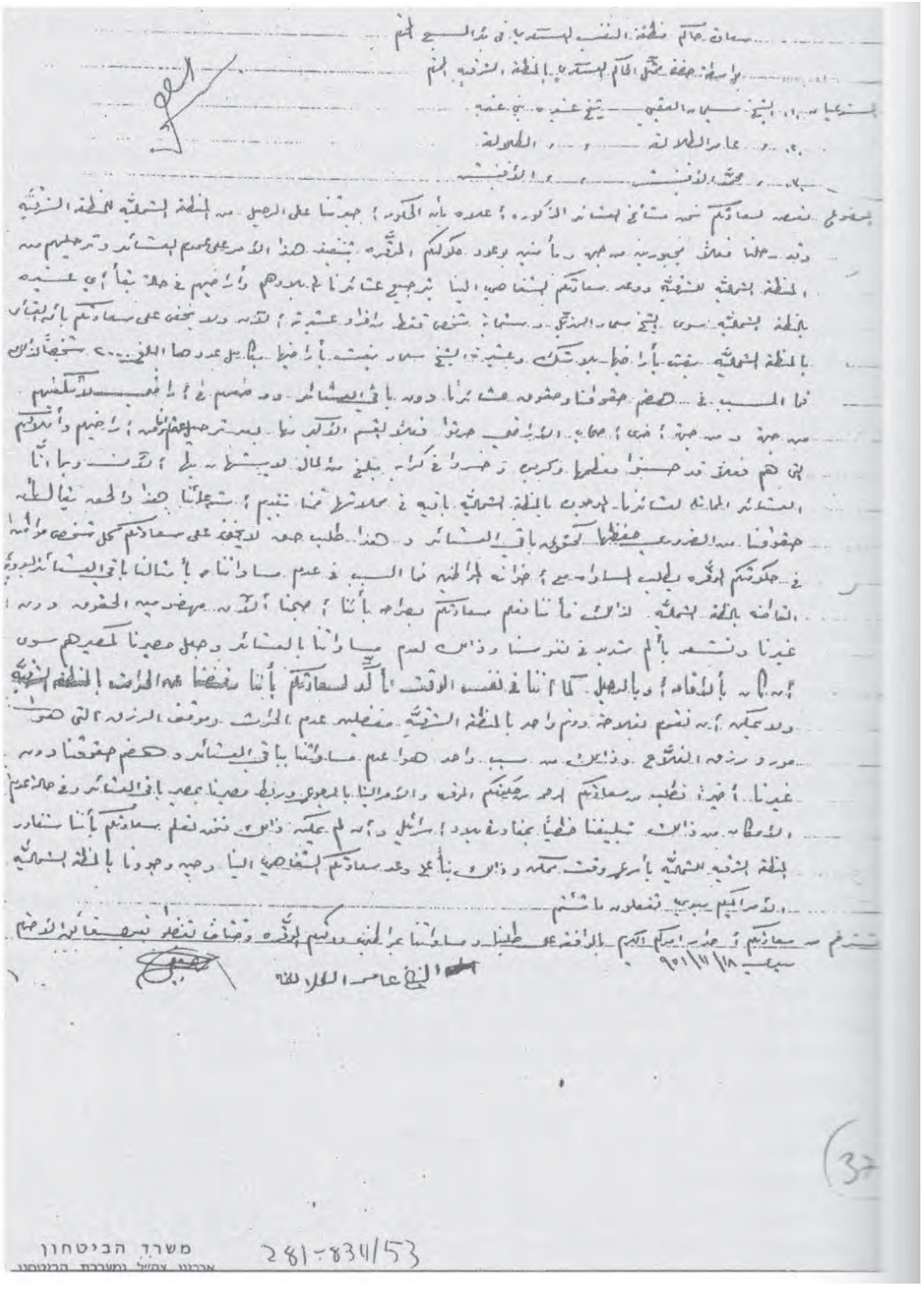
Signed	Signed
Sheikh Suliman al-'Uqbi	Sheikh Omar al-Talalqa

November 18, 1951

[Comments by the military government clerk]
Muhamad al-Finish did not sign it.

They are ready to graze their lands. With the replacement of Sheik al-'Uqbi it will be fine. They claim it was kind of a threat [unreadable] only because of the seeds.

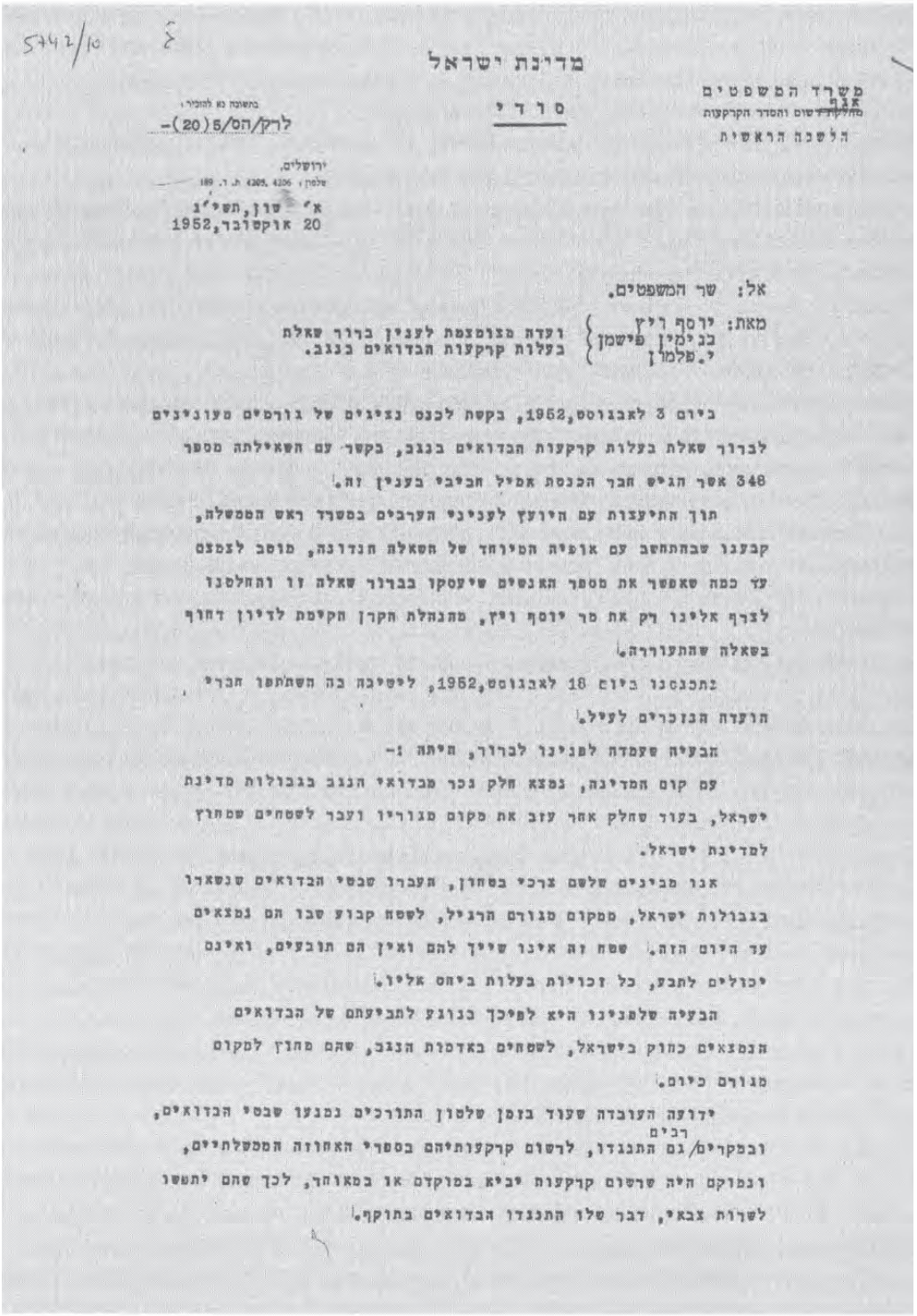
[Signature]
November 22, 1951



משרד הביטחון
281-834/53

Source: Israeli Defense Forces Archive, 281-834/53

Item No 6 /
Original minutes and decision of the "committee of three"
to recognize Bedouin land ownership, 1951



5742/10

מדינת ישראל

משרד המשפטים
אגף
מחלקת רישום והסדר הקרקעות
הלשכה הראשית

ס ו ד י

בתשובה נא להזכיר:
לרק/הס/5(20)-

ירושלים,
שלמון 4205, 4206 ת. ד. 189

א' שון, תשי"ג
20 אוקטובר, 1952

אל: שר המשפטים.

מאת: יוסף ריץ
בנימין פישמן
י. שלמון
} ועדה מוסמכת לענין ברור שאלת בעלות קרקעות הבדואים בנגב.

ביום 3 לאבגוסט, 1952, בקשת לכנס נציגים של גורמים מעוניינים לברור שאלת בעלות קרקעות הבדואים בנגב, בקשר עם השאילתה מספר 348 אשר הגיש חבר הכנסת אמיל תביבי בענין זה.

תוך התיעצות עם היועץ לענייני הערבים במשרד ראש הממשלה, קבענו שבהתחשב עם אופיה המיוחד של השאלה הנדונה, מוסב לצמצם עד כמה שאפשר את מספר האנשים שיעסקו בברור שאלה זו והחלטנו לצרף אלינו רק את מר יוסף ויץ, מהנהלת הקרן הקיימת לדיון דחוף בשאלה שהתעוררה.

נתכנסנו ביום 18 לאבגוסט, 1952, לישיבה בה השתתפו חברי הועדה הנזכרים לעיל.

הבעיה שעמדה לפנינו לברור, היתה זו-

עם קום המדינה, נמצא חלק נכר מבדואי הנגב בגבולות מדינת ישראל, בעוד שחלק אחר עזב את מקום מגוריו ועבר לשטחים שמחוץ למדינת ישראל.

אנו מביניים שלשם צרכי בטחון, הועברו שבטי הבדואים שנשארו בגבולות ישראל, ממקום מגורם הרגיל, לשטח קבוע שבו הם נמצאים עד היום הזה. שטח זה אינו שייך להם ואין הם תובעים, ואינם יכולים לתבע, כל זכויות בעלות ביחס אליו.

הבעיה שלפנינו היא לפיכך בנוגע לתביעתם של הבדואים הנמצאים כחוק בישראל, לשטחים באדמות הנגב, שהם מחוץ למקום מגורם כיום.

ידועה העובדה שעוד בזמן שלטון התורכים נמנעו שבטי הבדואים, ובמקרים רבים/גם התנגדו, לרשום קרקעותיהם בספרי האחוזה הממשלתיים, ונמוקם היה שרשום קרקעות יביא במוקדם או במאוחר, לכך שהם יתשבו לשרות צבאי, דבר שלו התנגדו הבדואים בתוקף.

-2-

עם כבוש הארץ על ידי הבריטים, נמצאו - מלבד אקרים בודדים - כל אדמות הבדואים בלתי רשומות בספרי האחוזה.

אף על פי כן, ראו הבדואים את כל השטחים המעובדים על ידם כשטחים שבבעלותם, למרות שלא היו בידם תעודות רשום, השלטונות, הן התורכים והן הבריטים, הכירו בעובדה זו.

כיום יש כמובן להוציא מדיוננו את כל השטחים שהיו מעובדים על ידי הבדואים שעזבו את גבולות ישראל, שהם בגדר נפקדים לפי חוק נכסי נפקדים תש"י - 1950.

נכסיהם "כנכסי נפקדים" מוקנים לאפוטרופוס לנכסי נפקדים, ולו השליטה עליהם לפי הוראות החוק הנ"ל.

דיוננו מצטמצם רק לאותם השטחים שעבדו על ידי הבדואים הנמצאים כחוק בישראל, ובקשר לכך עמדו בפנינו שתי שאלות :-

(א) האם העבוד האקסטנסיבי שעבדו הבדואים את אדמות הנגב, במשך תקופת התישנות, יכולה להקנות להם זכות חוקית לבעלות.

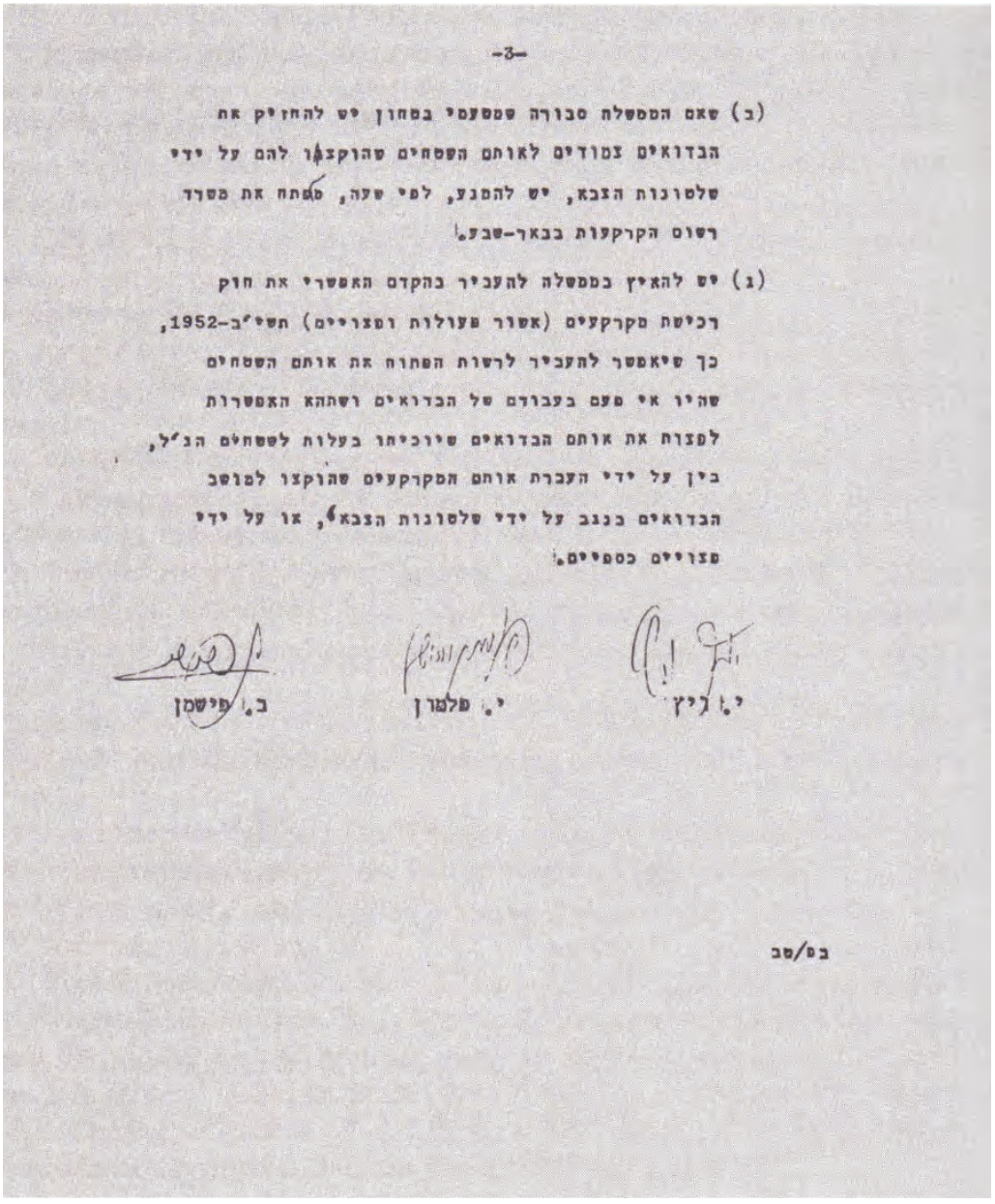
(ב) האם יש בידי הבדואים התוכחות הדרושות להוכחת עבוד האדמות הנדונות.

אשר לשאלה הראשונה, הרי ידועה העובדה שבתקופת שלטון המנדט, גרשמו שטחים נכרים מאד בשטח של הבדואים, על יסוד הוכחות שטחים אלה היו נעבדים על ידם במשך תקופת התישנות, וחלק חשוב של אדמות אלה העברו, לאחר רשומן, לקרן קימת, לחברות יהודיות אחרות, וכן ליהודים פרטיים. כך שבענין זה ישנם מאות תקדימים, ואנו סבורים שממשלת ישראל לא תוכל, ואינה צריכה, להתעלם מהם.

ואשר לשאלה השניה : אנו סבורים, שמלבד תעודות הרשום שנתנו בתקופת המנדט לשבטי הבדואים, שיוגשו בודאי כהוכחות רשום חלק מאדמותיהם, הרי לא מן הנמנע שיש בידי הבדואים הוכחות חזקה גם לשטחים רבים אחרים, כגון : קבלות תשלום ורקו ועושר, שישמשו כהוכחת עבוד שטחים נרחבים יותר מאדמות הרשום.

כתוצאה מדיוננו, באנו לידי הסכום הבא :-

(א) אנו סבורים שאין למנוע מלהכיר בזכויות הבדואים לבעלות אותם השטחים שיוכיחו שהיו בעבודם, תקופה ארוכה (תקופת התישנות).



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(ב) שאם הסמשלה סבורה שמסעמי בסחון יש להחזיק את
הבדואים צמודים לאותם השטחים שהוקצו להם על ידי
שלטונות הצבא, יש להמנע, לפי שעה, מפתח את מסרד
רשום הקרקעות בבאר-שבע.

(ג) יש להאיץ בממשלה להעביר בהקדם האפשרי את חוק
רכישת מקרקעים (אשור פעולות ומצויים) תשי"ב-1952,
כך שיאפשר להעביר לרשות השתוה את אותם השטחים
שהיו אי פעם בעבודם של הבדואים ושתהא האפשרות
לפצות את אותם הבדואים שיוכיחו בעלות לשטחים הנ"ל,
בין על ידי העברת אותם המקרקעים שהוקצו למושב
הבדואים בנגב על ידי שלטונות הצבא, או על ידי
פצויים כספיים.

ב. פישמן י. פלמון י. לין

בם/סב

Original minutes and decision of the "committee of three@ to recognize Bedouin land ownership, 1951. Source: "Hitkatvut Be'Inyanei Misrad Rishum Karkaot Be'Beer-Sheva, Dokh Ha'Va'ada Ha'Metsumetsemet Le'Berur She'elsat Ba'alut Karka'ot HaBeduim Ba'Negev," Israel Satte Archives, ISA - Justice-Justice-000rb9h..
Translated and reproduced in: Yiftachel, Oren, Alexandre Kedar, and Ahmad Amara. Emptied Lands: A Legal Geography of Bedouin Rights in the Negev. 1 edition. Stanford, California: Stanford University Press, 2018.

"Committee of Three" Minutes and Decision

State of Israel
Ministry of Justice
Secret

In response please refer to:
Department of Land Registration and Settlement LRK/HS/5/(20)
Main Office: Jerusalem
Phone: 4206, 4205, P.O. Box 189
A Heshvan, Taf Shin Yod Gimel

October 20, 1952
To: Minister of Justice
From: Yossef Weitz
Benjamin Fishman
Y. Palmon
Core committee for the question of ownership of Bedouin Negev lands

On August 3, 1952, you asked to convene representatives of interested parties to clarify the question of ownership of Bedouin lands in the Negev, in relation to interpellation 348 that Member of the Knesset Emil Habibi asked in this issue.

In consultation with the Adviser on Arab Affairs in the Prime Minister's Office, we determined that, taking into account the special character of the above question, it would be best to limit as much as possible the number of persons who would deal with elucidating this question, and we decided to add to us only Mr. Yossef Weitz, from the directorship of the [Jewish] National Fund for an urgent discussion on the question raised.

We convened on August 18, 1952, for a meeting in which participated the above mentioned members.

The problem we had to clarify was:

With the establishment of the state, a meaningful part of the Negev Bedouins were present within the borders of the State of Israel, while another part left its dwelling place and moved to areas outside the State of Israel.

We understand that for security needs, the Bedouin tribes that remained within Israeli borders were transferred from their regular dwelling place to a fixed area, where they are situated until today. This area does not belong to them, and they do not claim, and cannot claim, any property rights in relation to it.

Therefore the problem before us is in regard to the claims of the Bedouins who are legally present in Israel, to areas in the Negev lands, which are outside their current dwelling place.

The fact is known that, even at the time of the Turkish rule, the Bedouin tribes avoided, and in many cases also resisted, registering their land in the governmental land registries, and their argument was that the land registration will lead sooner or later to their drafting into military service, a thing they vehemently opposed.

With the conquest of the country by the British, it was found—except in isolated cases—that all Bedouin lands were unregistered in the land registry.

Nevertheless, the Bedouins saw all the lands cultivated by them as land in their ownership, even though they did not have land registration certificates. The authorities, both the Turkish and the British, recognized this fact.

Today, we should of course exclude from our discussion all the areas that were cultivated by the Bedouins that left the borders of Israel, since they are considered absentees according to the Absentee Property Act of 1950.

Their property, as "absentee property," is vested in the Custodian of Absentee Property, and he has control over it according to the stipulations of the above-mentioned statute.

Our discussion is limited only to those areas *that were cultivated by the Bedouins who are legally present in Israel*, and in relation to this, two questions stand before us:

(A) Did the extensive cultivation of the Negev Land that the Bedouins cultivated, throughout the limitation period, bestow upon them a legal right to ownership?

(B) Do the Bedouins have the needed evidence to prove cultivation of the above-mentioned lands?

As to the first question, the fact is known that during the Mandate period, very considerable areas were registered in the Bedouins' name, on the basis of evidence that these lands were cultivated by them for the extent of the limitation period, and an important part of these lands was transferred, after their registration, to the [Jewish] National Fund, to other Jewish corporations, and to private Jews. So in this issue there are hundreds of precedents, and we are of the opinion that the government of Israel cannot and should not ignore them.

As to the second question, we think that, in addition to the registration certificates that were given during the Mandate period to the Bedouin tribes, which would certainly be submitted as proof of registration of part of their lands, it is quite possible that the Bedouins have evidence of possession also to many other areas, such as receipts for payment of Warko and Tithe, that would serve them as proof of cultivation of other large areas.

As a result of our discussion, we reached the following conclusion:

(A) We are of the opinion that one should not avoid recognizing the rights of the Bedouins to ownership of those areas that they could prove were under their cultivation for a long period (limitation period).

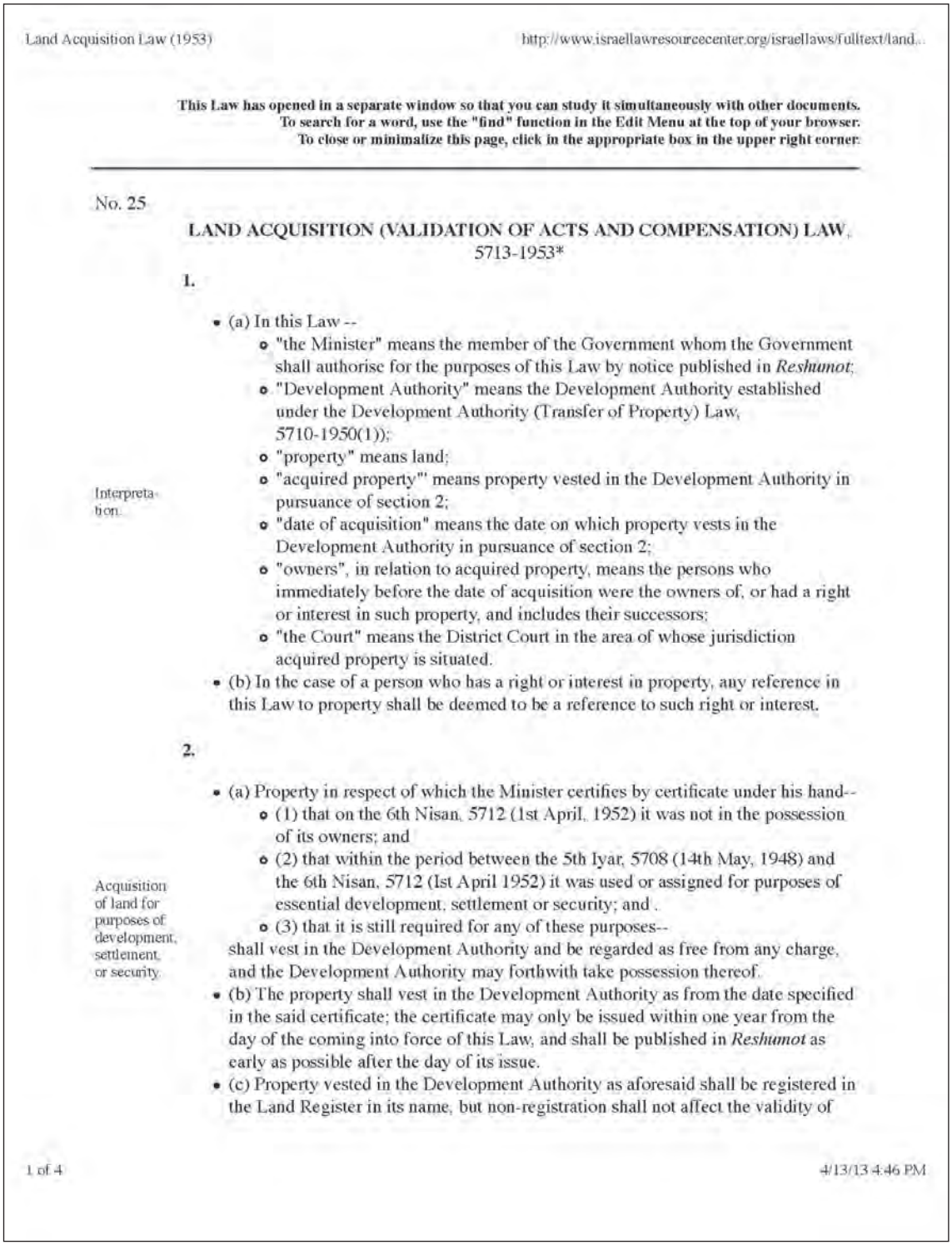
(B) That if the government is of the opinion that for security reasons the Bedouins should be kept attached to those lands that were allocated to them by the military authorities, one should avoid, for the time being, from opening the Land Registration Office in Beersheba.

(C) The government should be urged to enact as soon as possible the Land Acquisition (Validation of Acts and Compensation) Law (1952), so that it would enable transferring to the Development Authority those areas that were ever in the cultivation of the Bedouins, and that there would be a possibility to compensate those Bedouins who could prove ownership of those areas, either by transferring those lands that were allocated for the Bedouins in the Negev by the military authorities, or by monetary compensation.

Y. Weitz Y. Palmon B. Fishman

BP/TV

Item No 7 /
Ministry of Justice: Land Acquisition Law, 1953



This Law has opened in a separate window so that you can study it simultaneously with other documents.
To search for a word, use the "find" function in the Edit Menu at the top of your browser.
To close or minimalize this page, click in the appropriate box in the upper right corner.

No. 25

LAND ACQUISITION (VALIDATION OF ACTS AND COMPENSATION) LAW, 5713-1953*

1.

Interpretation.

- (a) In this Law --
  - "the Minister" means the member of the Government whom the Government shall authorise for the purposes of this Law by notice published in *Reshumot*;
  - "Development Authority" means the Development Authority established under the Development Authority (Transfer of Property) Law, 5710-1950(1));
  - "property" means land;
  - "acquired property"' means property vested in the Development Authority in pursuance of section 2;
  - "date of acquisition" means the date on which property vests in the Development Authority in pursuance of section 2;
  - "owners", in relation to acquired property, means the persons who immediately before the date of acquisition were the owners of, or had a right or interest in such property, and includes their successors;
  - "the Court" means the District Court in the area of whose jurisdiction acquired property is situated.
- (b) In the case of a person who has a right or interest in property, any reference in this Law to property shall be deemed to be a reference to such right or interest.

2.

Acquisition of land for purposes of development, settlement, or security.

- (a) Property in respect of which the Minister certifies by certificate under his hand--
  - (1) that on the 6th Nisan, 5712 (1st April, 1952) it was not in the possession of its owners; and
  - (2) that within the period between the 5th Iyar, 5708 (14th May, 1948) and the 6th Nisan, 5712 (lst April 1952) it was used or assigned for purposes of essential development, settlement or security; and .
  - (3) that it is still required for any of these purposes--

  shall vest in the Development Authority and be regarded as free from any charge, and the Development Authority may forthwith take possession thereof.
- (b) The property shall vest in the Development Authority as from the date specified in the said certificate; the certificate may only be issued within one year from the day of the coming into force of this Law, and shall be published in *Reshumot* as early as possible after the day of its issue.
- (c) Property vested in the Development Authority as aforesaid shall be registered in the Land Register in its name, but non-registration shall not affect the validity of

the vesting of the property in the Development Authority.

- (d) A certificate under this section shall not constitute an admission that acquired property is not or was not State property or that the State has not or had not a right or interest therein.

3.

Right to Compensation.

- (a) The owners of acquired property are entitled to compensation therefore from the Development Authority. The compensation shall be given in money, unless otherwise agreed between the owners and the Development Authority. The amount of compensation shall be fixed by agreement between the Development Authority and the owners or, in the absence of agreement, by the Court, as hereinafter provided.
- (b) Where the acquired property was used for agriculture and was the main source of livelihood of its owner, and he has no other land sufficient for his livelihood, the Development Authority shall, on his demand, offer him other property, either for ownership or for lease, as full or partial compensation. A competent authority, to be appointed for this purpose by the Minister, shall, in accordance with rules to be prescribed by regulations, determine the category, location, area, and, in the case of lease, period of lease (not less than 49 years) and the value of the offered property, both for the purpose of calculating the compensation and for determination of the sufficiency of such property for a livelihood.
- (c) The provisions of subsection (b) shall add to, and not derogate from, the provisions of subsection (a).

4. In the following cases, the right to and amount of compensation shall, on the application of the Development Authority or the owner of the acquired property, be determined by the Court:

Determination of compensation by the court.

- (1) in the absence of agreement between the Development Authority and the owner of the acquired property as to the grant or amount of compensation;
- (2) where the owner of the acquired property did not file a claim for compensation with the Development Authority within one year from the day of publication of a certificate under section 2;
- (3) where a claim as aforesaid was filed but was not supported by sufficient evidence;
- (4) where different or conflicting claims were filed in relation to the acquired property.

5.

Rules for determining compensation.

- (a) In fixing the amount of compensation, the Court shall follow *mutatis mutandis* the rules laid down in section 12 of the Land (Acquisition for Public Purposes) Ordinance, 1943(2); provided that the 12th Tevet, 5710 (Ist January, 1950) shall be regarded as the day on which notice of the intended acquisition was published for the purposes of the said section.

- (b) Any amount fixed by the Court as aforesaid shall be increased by an addition of three per centum per annum as from the 12th Tevet 5710 (1st January, 1950).

6.

- (a) The decision of the Court or, in the case of appeal, of the Court of Civil Appeal shall be final with regard to all parties to whom notices of an application under section 4 have been sent or who have attended and claimed compensation either personally or by attorney.
- (b) A person to whom notice as aforesaid has not been sent or who has not attended and claimed as aforesaid may file a claim within one year from the date of the final decision.
- (c) Where the Court has awarded compensation, but has not issued directions as to the mode of payment thereof, the compensation shall be deposited with the Court, and the Court shall pay it only upon the expiration of one year, or such shorter period as it may decide, from the date of the final decision, and after application has been made to it by a person claiming the compensation; and the compensation shall be paid as the Court may direct.
- (d) Deposit of the compensation with the Court has the effect of full discharge, and relieves the Development Authority from liability as to any claim in relation to the property, unless the Court otherwise orders in connection with a claim under subsection (b).
- (e) A person who alleges that he has a right to compensation deposited with the Court and the whole or any part of which has not been paid, may, within three years from the date of the final decision, apply to the Court for payment of the whole or any part thereof; and any person who alleges that he has a better right to the whole or any part of the compensation, may file a claim against the person to whom compensation has been paid.

Decision of the Court in the case of deposit of compensation.

Relief from liability for use of compensation.

7. The giving of compensation, whether in money or in land, and whether by agreement or under a decision of the Court, or the deposit of compensation under section 6, relieves the Development Authority from any liability for the manner in which such compensation is used or for the misuse thereof.

Inapplicability.

8. Section 3(4)(a) of the Development Authority (Transfer of Property) Law, 5710-1950, shall not apply to property of the Development Authority offered or given to the owner of acquired property as full or partial compensation for the acquired property.

Immunity.

9. Where the Minister certifies by certificate under his hand that an act done on behalf of the State or the Development Authority in respect of any property was done after such property had first been used or assigned for purposes of essential development, settlement or security, and before it became acquired property, such act shall not serve as cause for an action on the part of the owner of the property or of his predecessor in title, or as basis for a charge.

Regulations.

10. The Minister may make regulations as to any matter relating to the implementation of this Law.

DAVID BEN-GURION
Prime Minister

YITZCHAK BEN-ZVI
President of the State

* Passed by the Knesset on the 23rd Adar, 5713 (10th March, 1953) and published in *Sefer Ha-Chukkim* No. 122 of the 4th Nisan, 5713 (20th March, 1953), p. 58; the Bill and an Explanatory Note were published in *Hatza'ot Chok* No. 118 of the 2nd Sivan, 5712 (26th May, 1952), p. 232.

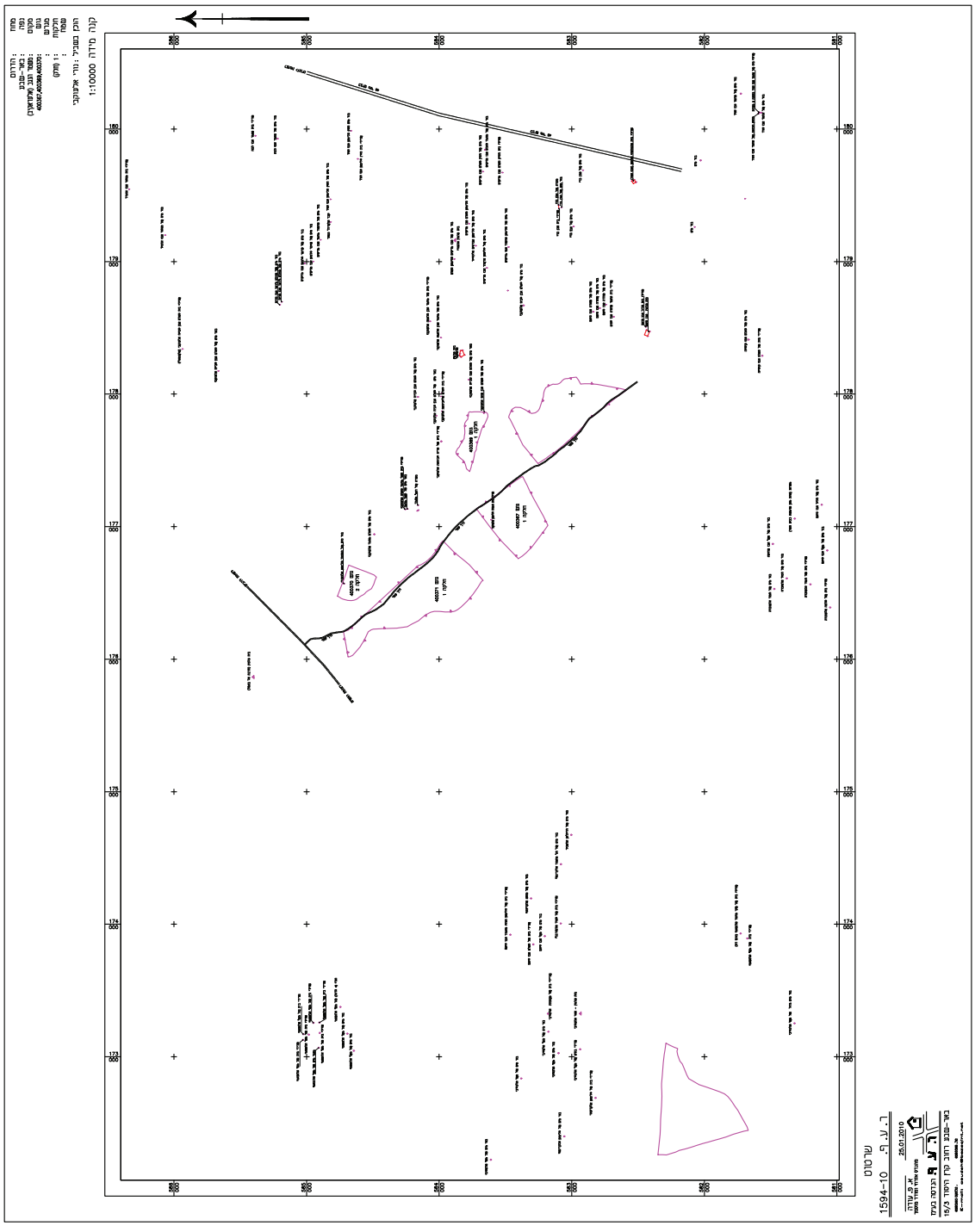
(1)*Sefer Ha-Chukkim* No. 57 of the 26tb Av; 5710 (9th August, 1950), p. 278.

(2) *P.G*. No. 1305 of the 10th December, 1943, Suppl. 1, p. 44 (English Edition).

Return: to the TOP of this Law.

SOURCE: "*Laws of the State of Israel: Authorized Translation from the Hebrew, Volume 7*". Government Printer, Jerusalem, Israel (1948-1987), p. 43-45.

Item No 8 /
Locations of Bedouin settlement remnant sites near al-Araqib



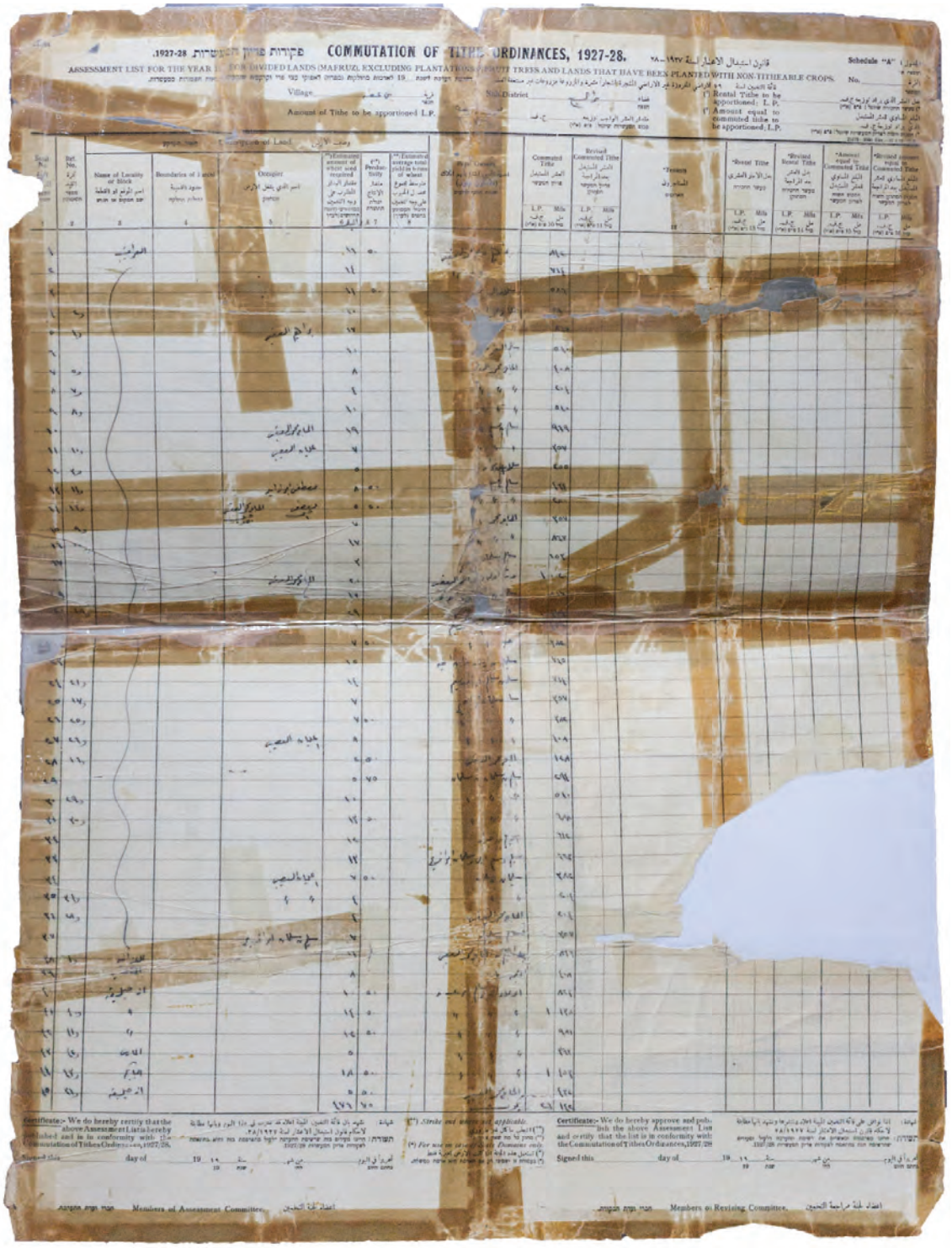
Locations of settlement remnant sites near claimed land in the 'Araqib area, 2011' in the survey by Odeh Abu-Friha, independent surveyor, Beersheba, submitted to the al-Uqbi land claim CC (BS) 7161/16

Item No 9 /
Bedouin Land Transaction Documents

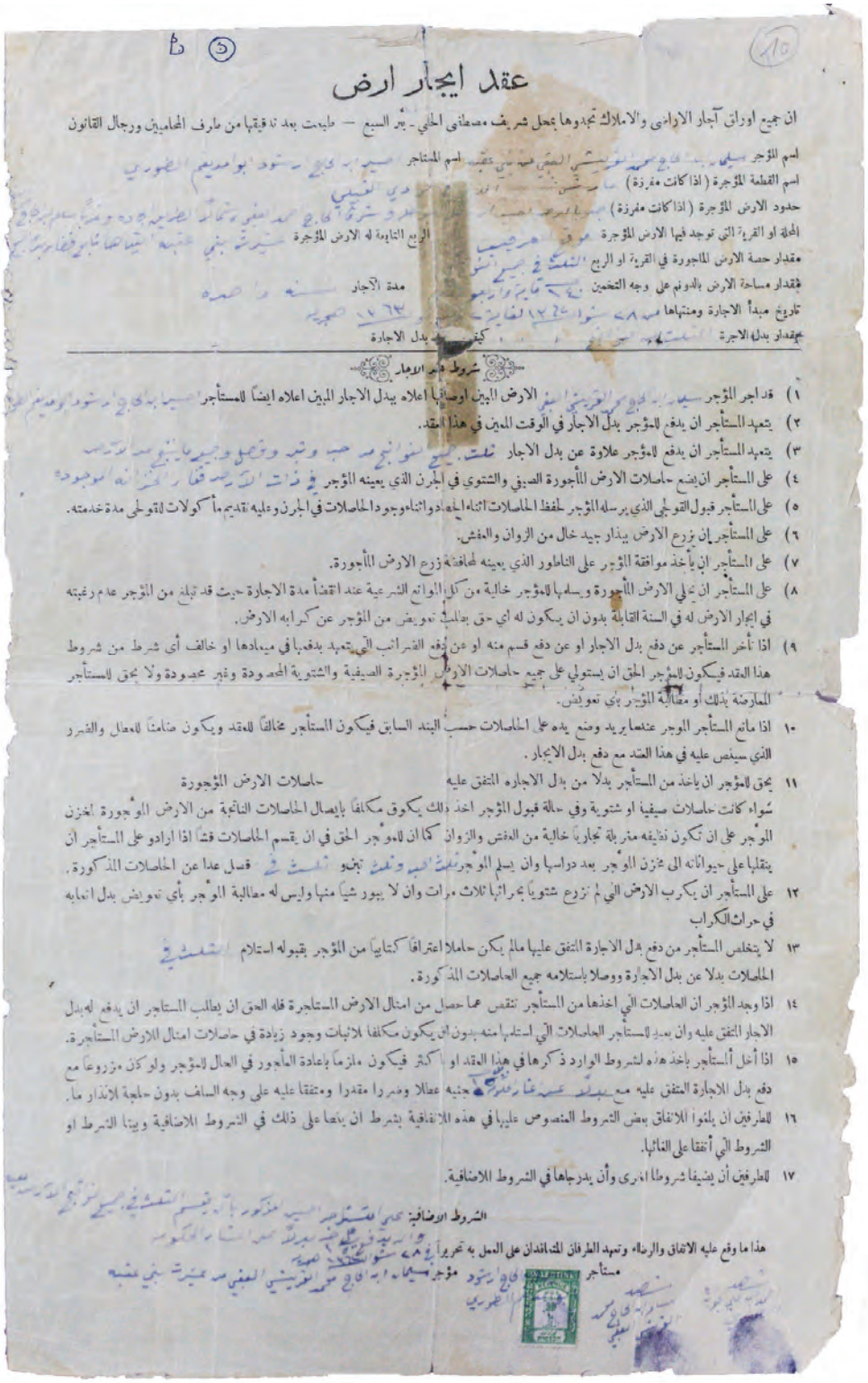
A land sale agreement between al-Turi and al-Uqbi families in the al-Araqib area, 1905, confirms the purchase of the area in which the al-Turi cemetery was established. (al-Turi family archive)

Item No 10 /
Renewal of Land transaction contract between the al-Uqbi and al-Turi families, 1929. (al-Turi family archive)

Item No 11 /
Registry of known land owners, al-Araqib. 1927, 1928. (al-Uqbi family archive).



Item No 12 /
Leasing of Uqbi lands in Araqib to the al-Tu´ri family



عقد ايجار ارض

ان جميع اوراق آجار الاراضي والاملاك تجدوها بمحل شريف مصطفى الحلبي - بئر السبع — طبعت بعد تدقيقها من عارف المحامين ورجال القانون

اسم المؤجر ... اسم المستأجر ...
اسم القطعة المؤجرة (اذا كانت مفرزة) ...
حدود الارض المؤجرة (اذا كانت مفرزة) ...
المحلة او القرية التي توجد فيها الارض المؤجرة ... الربع التابعة له الارض المؤجرة ...
مقدار حصة الارض المأجورة في القرية او الربع ...
فمقدار مساحة الارض بالدونم على وجه التخمين ... مدة الآجار ...
تاريخ مبدأ الاجارة ومنتهاها ...
ومقدار بدل الاجرة ... كيفية بدل الاجارة ...

شروط عقد الايجار

١) قد اجر المؤجر ... الارض المبين اوصافها اعلاه ببدل الاجار المبين اعلاه ايضاً للمستأجر ...
٢) يتعهد المستأجر ان يدفع للمؤجر بدل الاجار في الوقت المعين في هذا العقد.
٣) يتعهد المستأجر ان يدفع للمؤجر علاوة عن بدل الاجار ...
٤) على المستأجر ان يضع حاصلات الارض المأجورة الصيفي والشتوي في الجرن الذي يعينه المؤجر ...
٥) على المستأجر قبول القولجي الذي يرسله المؤجر لحفظ الحاصلات اثناء الحصاد واثناء وجود الحاصلات في الجرن وعليه تقديم ما كولات للقولجي مدة خدمته.
٦) على المستأجر ان يزرع الارض ببذار جيد خال من الزوان والعفش.
٧) على المستأجر ان يأخذ مواقفة المؤجر على الناطور الذي يعينه لحافظة زرع الارض المأجورة.
٨) على المستأجر ان يخلي الارض المأجورة ويسلمها للمؤجر خالية من كل الموانع الشرعية عند انقضاء مدة الاجارة حيث قد تبلغ من المؤجر عدم رغبته في ايجار الارض له في السنة القابلة بدون ان يكون له اي حق بطلب تعويض من المؤجر عن كرابه الارض.
٩) اذا تأخر المستأجر عن دفع بدل الاجار او عن دفع قسم منه او عن دفع الفرائب التي يتعهد بدفعها في ميعادها او خالف أي شرط من شروط هذا العقد فيكون للمؤجر الحق ان يستولي على جميع حاصلات الارض المؤجرة الصيفية والشتوية المحصودة وغير محصودة ولا يحق للمستأجر المعارضة بذلك أو مطالبة المؤجر بأي تعويض.
١٠ اذا مانع المستأجر الموجر عنعما يريد وضع يده على الحاصلات حسب البند السابق فيكون المستأجر مخالفاً للعقد ويكون ضامناً للعطل والضرر الذي سيلحق عليه في هذا العقد مع دفع بدل الايجار.
١١ يحق للمؤجر ان يأخذ من المستأجر بدلا من بدل الاجاره المتفق عليه حاصلات الارض المؤجورة
سواء كانت حاصلات صيفية او شتوية وفي حالة قبول المؤجر اخذ ذلك يكلوف مكلفاً بايصال الحاصلات الناتجة من الارض المؤجورة لمخزن المؤجر على ان تكون نظيفه مغربلة تجاريا خالية من العفش والزوان كما ان للمؤجر الحق في ان يقسم الحاصلات قسمة اذا ارادو على المستأجر ان ينقلها على حيواناته الى مخزن المؤجر بعد دراسها وان يسلم المؤجر ... قسم عدا عن الحاصلات المذكورة.
١٢ على المستأجر ان يكرب الارض التي لم تزرع شتويا بحراثها ثلاث مرات وان لا يمور شيأ منها وليس له مطالبة المؤجر بأي تعويض بدل اتعابه في حراث الكراب
١٣ لا يتخلص المستأجر من دفع بدل الاجارة المتفق عليها مالم يكن حاملا اعترافا كتابيا من المؤجر بقبوله استلام الحاصلات بدلا عن بدل الاجارة ووصلا باستلامه جميع الحاصلات المذكورة.
١٤ اذا وجد المؤجر ان الحاصلات التي اخذها من المستأجر تنقص عما حصل من امثال الارض المستاجرة فله الحق ان يطلب المستاجر ان يدفع له بدل الاجار المتفق عليه وان يعيد للمستأجر الحاصلات التي استلمها منه بدون ان يكون مكلفا لاثبات وجود زيادة في حاصلات امثال الارض المستأجرة.
١٥ اذا أخل المستأجر باخذ هذه الشروط الوارد ذكرها في هذا العقد او اكثر فيكون ملزما باعادة المأجور في الحال للمؤجر ولو كان مزروعا مع دفع بدل الاجارة المتفق عليه مع ... جنيه عطلا وضررا مقدرا ومتفقا عليه على وجه السلف بدون حاجة لانذار ما.
١٦ للطرفين ان يلتزموا الاتفاق ببعض الشروط المنصوص عليها في هذه الاتفاقية بشرط ان ينصا على ذلك في الشروط الاضافية ويبينا الشرط او الشروط التي أتفقا على الغائها.
١٧ للطرفين أن يضيفا شروطا اخرى وأن يدرجاها في الشروط الاضافية.

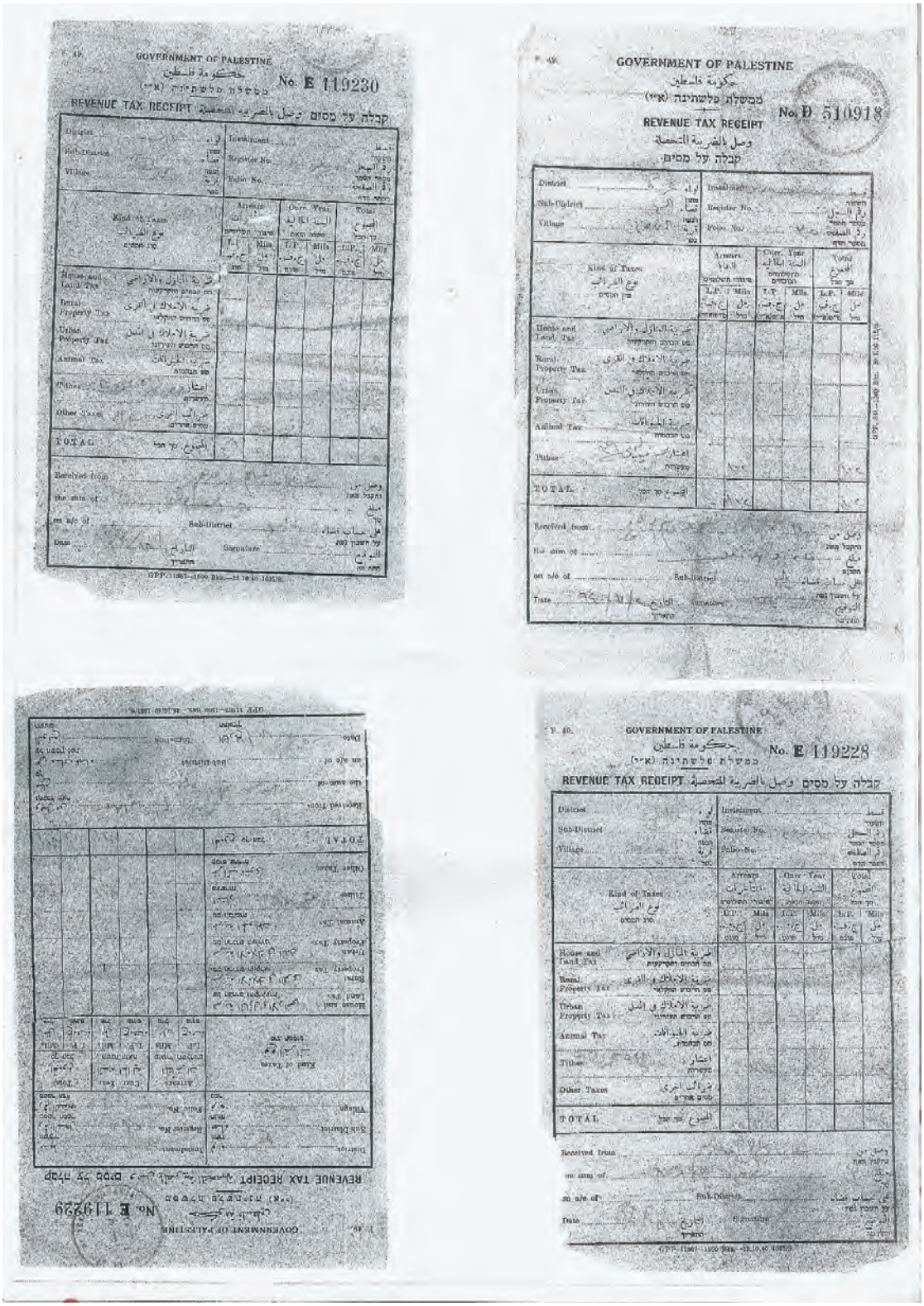
الشروط الاضافية ...

هذا ما وقع عليه الاتفاق والرضاء وتعهد الطرفان المتعاقدان على العمل به تحريراً في ... سنة ١٩٤٣

مستأجر ... مؤجر ...

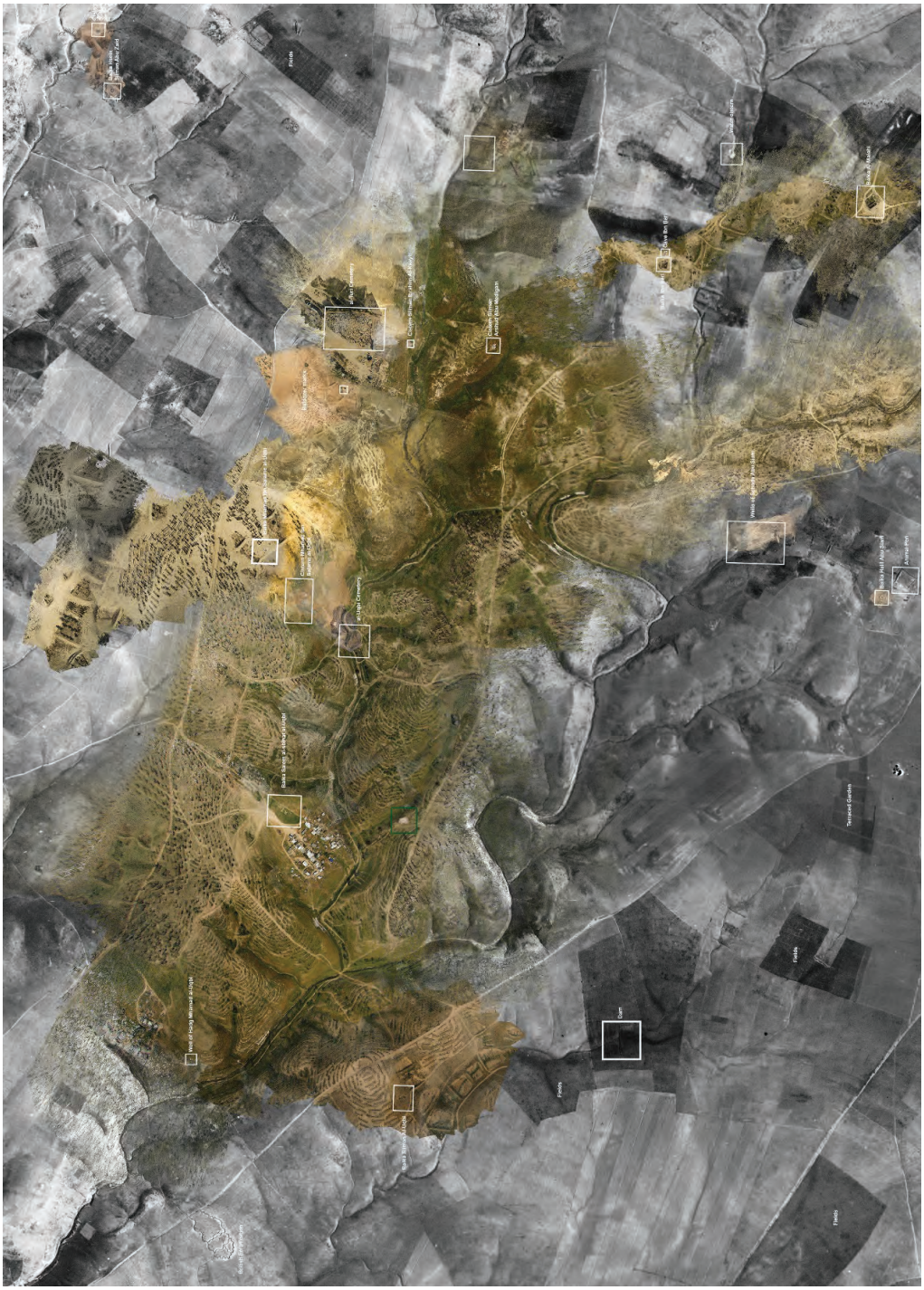
Signed by Husein al-Hadj Rashud al-Tu´ri for the duration of one year. 1362-3 Higra (1943-4)

Item No 13 /
Reciept of tax payment to government of Palestine



Payed by Sliman abu-Medigam 1940, 1942. (al-Turi family archive)

Item No 14 /
Ground Truth continuity of Bedouin presence 1945-2017



al-Araqib 1945/2017 (composite of Royal Air Force aerial photograph and 'Community Satellite' Point-clouds). Ariel Caine / Forensic Architecture / Aziz al-Turi / Nuri al-Uqbi / Debby Ferber: Zochrot / Hagit Keysar: PublicLab, 2017

Item No 15 /
Testimonies and Interviews

Speeches given by Sheik Sayach al-Turi & Nuri al-Uqbi during the 'Ground Truth' commission organised by the Villagers of al-Araqib, Zochrot and Forensic Architecture.

Date: 01 January 2016
Sheik Shayah al-Turi

4:50 hello everyone, you are here today, Monday January 2016, in the village of Al-araqib with the family of al-Turi and you see for you selves that the living here, sleep with the dead during the hard time of winter.

5:36 I want to congratulate the organizer who thought to do this project in the village of Al-araqib and I thank each and every one who thought about this project in the village of al-Araqib I send him thanks and wish of good health.

6:04 my friends, we suffered and still suffer

6:10 our ancestors and their grandmothers lived on this land from 1905, during the Turks, after the Turks in 1917 was the British conquest. After the British conquest in 48 of the State of Israel

6:39 from '54 until 2010 the Directors of the State of Israel

6:52 thought how to push al-Araqib tribe al-Turi after nearly 67 years considered how to push al-Araqib. Shamelessly, Inspector and Director of the Israel Lands Administration last week said without shame to the Court, he thought also to push, erase, the cemetery from the map and unfortunately said that without shame in court, he said, adding if there was no sayach , they would have a long time ago erased the cemetery.

I expect judge and the Court to say you are saying acceptable things to know in the State of Israel.

On the one hand they are saying that there is rule of law and equality, on the other hand say justice and truth, where's the truth is I don't know

08:33 If I am speaking these things, and a inspector says he opposes and we delete also the cemetery

08:42 Not only the village but also the cemetery.

08:46 good, although we know there's no justice, I said several

times to several judges.

08:57 unless there's justice in this Court there's no existence for the State of Israel.

09:04 I said this a few times after all that was. the spilling of the water, spilling the kids milk, destroy the trees, destroy our future and our children believe there is no justice in the State of Israel has no law but the law is law the Arabs only, after that I sawand endured the law only covers for Jews.

09:57 There's no law for Arabs in the country and they who say there is, under what right are they doing these acts?.

10:08 they come with 1700 officers with a mobile hospital detention cell.

10:19 with commando forces with planes in the air, apache's, apache's , apache's landed here in the village of Al-araqib, what are we? another country they are coming to fight? we are citizens

10:38 until now, after all the crimes we believe and say.

10:46 we are citizens of the State of Israel,

10:51 gentlemen, prime minister, existing government leaders, let the Arab and Jewish people to live together.

11:09 let their children live together.

11:16 such actions can't be pushing things forward, only push us backwards

11:28 our fathers and their grandmothers who suffered in 48

11:36 have forgotten of what was in 48

11:44 you put us and our children. Who do not know what was then and force us to remember 48

11:59 and think we're in that period only more complicated then the 48 period.

12:10 I remember well one of the commanders at Beersheba in 2009

12:19 said those words told to inspector and told us

12:27 the same time Sheik Ahmed Abu Srir, Ibrahim's father, MK Talib alsana and I with a few others

12:37 after hearing what we were saying he said, and I thank him very much , I don't know what his job now, but I think he understands

12:56 he said that for a wound to heal, you don't put on it salt.

13:07 on a wound you put cream and iodine to heal, but don't put salt in the wound.

13:19 and what he said was true. We here aren't looking for money for land, we want the Arab and the Jew to live in peace without a civil war.

13:48 but there can be no such thing, to push us from Al-araqib village or any Bedouin in the Negev, and instead to bring a farm for the Jewish people.

14:07 to uproot the Bedouin from his land and to plant a JNF tree. On whos account for uprooting the olive tree of Al araqib and plant JNF. who said that Jewish religion the religion of the Christians said that the religion of the Muslims said it wasn't. Everyone's religion says you have to think of a person as a person and to give each person what he deserves.

14:54 and not let the person who lives at the expense of someone else

15:00 I think this is not acceptable and it can not be accepted. and if it is accepted, it is only temporary here only temporary and I say it without shame.

15:21 There is no such thing: because I have a home in Rahat I give up my rights to the land

15:33 I want to ask the country, if they gave me the House in Rahat free of chargeor or for a fee, if they gave me this House for free that might be a sign of play beneath the table.

15:53 but I paid. I Paid. not because I'm going to be modern in rahat.

It's 12 Rahat camp you think rahat rahat rahat is a refugee camp exactly

16:15 and rahat the city is better than other places, recognized villages and... recognized and unrecognized villages, what are these lies? What does that mean?

16:27 unrecognised villages in the Negev, have they landed from the sky? I don't know, they don't have ID's? So I say yes, they have an identity card.

16:42 where Is the ID for each of those, there isn't a tribe in the Negev that has no foundation.

16:54 for example they have al-alamat
tribe, six cemeteries that are not alamat alamat just one percent in the country.

17:14 in my opinion the cemeteries are the ID card. let's get al-Uqbi they have this cemetery of al-Uqbi as a certificate.

17:29 Abu Siam have cemeteries, this is Abu Siams document

17:35 al Ubra have theirs, al-Telalga they have their cemeteries predating the state. It's true,

17:47 it's their certificate.

17:50 there isn't a tribe that has no cemeteries and that has not one or two or ten stone houses.

18:00 there's no tribe that has no wells , then at that time there were'nt water line pipes and not bring the water in the tank rather than anything else, so gentlemen, let's talk. If they don't think the Bedouins have rights they are mistaken.

18:30 but the best for the country I think, maybe I am wrong, is to say to the Bedouin streight.

18:44 transfer, goodbye.

18:56 if they should say this word, in my opinion, that's what they should do.

On the other hand: why pay lawyers, why to make more work for the Yoav unit, why to do and why to do and why to do.

19:13 in Israel I haven't heard from our elderly Jews and Arabs, that on the one hand, a criminal court judge and his wife is working at yoav.

She says, he gets what she offers is going to be to do no such thing.

19:52 we will stay with the demolitions every 20 days each month and unfortunately, and I say to the Bedouin also, shame on all the bedouins who demolish their own structure but shame shame

20:16 55. some criminal cases and some 50 cases for me.

20:29 what I is so criminal? If I'm such a criminal with so many cases why let me drive on the road.

20:43 why let me wander? 50 and a few more cases at the end of last Wednesday, two days ago. Offer for lawyers

21:01 compromise with those close to them all, and pay each weight 13000

21:16 we sued total 8 so why 34- Well we refused everything they said. So we gave him a new offer you know what new offer talk with your friend if we close them all compensated money bags and leave.

21:59 pm what do we say? What should we say? We don't have one thing to say.

22:09 to tell the Jewish people come together stand against racism,

22:20 against discrimination, to raise our children facing each other and I want to finish here and we leave from here.

22:38 and I say to all the Negev Bedouin sit, sleep and die on every meter of land of their ancestors and I want to conclude. Goodby to everyone and thank you.

Nuri al-Uqbi

24:33 Hello, I might want to save time and go straight to talk in Hebrew assuming everyone understands Hebrew, Bedouins too. And I want to welcome you all here today under the tent of Zochrot, the days blessing come upon you, and may peace and justice come to this country.

25:05 I want to tell a little about myself I was born on 20 January 1942

25:14 in Al araqib in house maybe 1 kilimeter away

25:22 and I remember as a child learned more I started school to learn until the end of 1951.

25:32 after that came the military Governor Michael Hanegbi, Lieutenant Colonel Michael Hanegbi, but it's not just his decision but the decision of the leaders of Israel, the Zionist State

25:46 to move us from here to the Siyag, the Siyagis East of Hebron road Beersheba Hirbat Hura and we sat as citizens of Israel and my parents even participated in elections that may first in late January 1949. Anyway.

26:20 not helpful to us as citizens that we non-Jewish Arab citizens planned how to uproot us from our village Al-araqib.

26:29 alapinsh and El-okbi tribe telalga tribe sitting according of the military Governor of 100000 hectares soils. In their place to seat jews. To uproot the Bedouin Arabs and to put in place a Jewish settlements Jewish residents so as not to disturb the development of.

27:06 said, we keep hair rather than disturb the development of Jewish settlements. He didn't say the Jews, said communities

27:16 but when the hills and bruises every bar we went to court and was there.

27:26 I really wrote a booklet translating it into Hebrew and translated into English,some friends of mine wrote that waiting for justice but justice has not arrived and I think that comes under Zioist rule. Sure we don't reach this day be justice, apparent however we get justice in this time and in the future.

27:57 my dad was born in 1914 in Al araqib, my grandfather was born in 1845 and passed away in 1945, lived for a century in Al araqib.

28:10 he requested to be buried in the cemetery of Sheikh Saleh al-Uqbi in Zhalika, it was fertile soils, that is today "Talmey Bilu" (name of Jewish settlement) today.

28:21 and Professor Oren Yiftachel, was with me and saw the bones of the dead, of my grandfather, we removed them from the ditch that the bulldozers dug at the side of the road. Gentlemen, dozens of cemeteries, wipe, erased from the map dozens of cemeteries of Muslim Bedouin Arabs.

The cemeteries in Beersheba in Beersheba do not exist anymore and if so without the gravestones. I asked my father where my grandmother's grave was, he looked left and right and said "I don't recognize", but think about all your grandmother's grave.

29:51 14 gentlemen from to 1966 I even visited the school because there was no school was martial law rule. We lived under martial law 18 years, from 1948 to 1966.

29:36 under a military Government expelled most of the zahalica tribe and Al-okbi araqib. At 52, the new place was a hard cruel man named Abraham used the military Government representative. MIA was available so that night he had a tent in the morning it doesn't exist anymore, not he and his family fled, leaving the country to Jordan because this man was so cruel and with military police officers who were hitting bloody so people would prefer not to accept the fight not to die and escape. Was.

29:30 gentlemen I my short time, tell me when to stop I will but I want to take this opportunity and invite everybody to see how life and Omar remembering, remembering where we are you know everybody's welcome, Jews and Bedou-ins see and
andand we get this thing

30:59 anyone staying at some family to see how people live as citizens at the Statethey live, it is difficult to describe gentlemen really hard to describe. It's hard to describe how I feel, I feel very bad, 31:19 expected justice in Israel and found but arrests.

31:24 Sayyah told about 50 and some cases had close to 70 and sixty-eight cas-es they
wanted to close any cases against me just to know. Three ...

31:40 police officer doesn't know him and he doesn't know me, I've not attacked and effect any man in my life didn't attack.

31:50 when they were attacking me I would call Mrs. Haya from the Coexistance Forum and she would appear in 10 minutes 15 minutes.

32:03 I lived in a tent here on the hill and could have been killed, I didn't notice. For four years I lived under the dome of the tent

32:16 they took from me more than 50 tents and demolished. They took from me more than 4 cars, they took a drill machine that I bought with my money from Abu Freih. Green patrol members are who work. The area has a green patrol man deposited it is clear that the space distributed all sorts of parts and green patrol man is responsible for a specific area for a specific area and it determines who to give ground to. if one works the has Earth dares to sow so come destroy his wheat crops that the barley the Dora

32:59 Omar talks.

33:27 I also went to the courts about "Giv'ot Bar" and lost. An illiterate Bedouin man said to me, you have no use in seeking Justice, and he was right, and I was wrong, gentlemen, I lost.

33:40 and I went on our land we own, written in black and white you will see thesedocuments we have someone who wrote a book since 1807 as I remember it פרופ׳Oren yiftachel told me, Sitzen, one German, and he mentioned Al-okbi tribe lived in 70 tents, tent this tent, it's never had houses built of stone and three air-
conditioned tents that guy writing this stuff as simple as black and white.

34:23 now I was looking for justice, to get even a part of my land and said, we are willing. Said millions you want we don't want millions we want land, we only want the Earth and some of our land we can survive it. However, the situation is very bad in unbearable, impossible and I struggle is long and you can't tell the whole story and tells the whole story, it's shocking that place if I thought about all the things that have made us the ones who hold them crackers in unbelievable civilians 18 years under martial law is impossible, unreasonable. And this time to expropriate them cut them off from their land, their possessions to destroy and uproot trees. I asked someone why do national fund plant the seedlings of those who have a foot-long spikes and an inch thick, and he told me to grab your lands, so even your livestock don't get to those trees.

Gentlemen, this is the state of things. What's ours is taken, we are being disinherited, we are civilians, but arab civilians and there is racism and hatred and discrimination in this country by the strong against the weak, and that's too bad. No peace will be reached in this way under any circumstances.

Item No 16 /
Hacma al-Turi
Interviewed by Keren Manor (ActiveStills)

The woman is everything and everywhere in Araqib....The man can't manage without the woman. The woman minds the kids, does the laundry, makes the food and breastfeeds. Even while demolitions are carried out she stands like…Not like a man but like a strong woman. She deals with all the ruins. As for myself, even when they demolish more and more, God gives me the strength that I need to deal with the ruins. I have to cope with the state's racism…I don't know what to tell you..I can't explain to you how much we… How much the cold effect the children…We have to take the things as they are. I'm saying let's move forward, there is no point looking back. I just keep moving forward.

Sometimes, when I'm really being pushed hard I break down. but only a part of me breaks. you don't break a whole person. If a part in you breaks, God would

give you strength from another part. So we're dealing with the state's racism, They destroy everything every two or three weeks, no matter the cold or the rain. Look, we have video from a demolition in the rain. Not only they demolished, they took the children's clothes, took the trucks, they even took the car we're using for driving the kids, sometimes something happens to one of the kids so we have to take them to the hospital or the doctors or to school…They took our car. the car was held in police custody for 20 days. We had to Pay back 13,000 shekels to get it back. 13,000 shekels to bring back a car. So we are being suffocated in all fronts.

We don't want to leave the village behind. I will never.. I speak for myself and not in the name of all the women in the village, I would say that as long as I'm breathing I will never run away from the village. So The strength is with god. First and foremost God strengthens us. You know, It's hard for a woman to manage without a toilets for the kids. You know, without a kitchen it's hard for her, every day we pick up the children's cloth…and then the Yasam comes in….and we have to pick up the kid's clothes, and they come again and come again and so on. You know all of these are difficult for a woman. Really really difficult woman. But what can we do, It's either leaving the village behind or holding up there. So we are holding up, with the help of god.

Keren Manor: How do you manage to hold up and give hope to your family? as the mother of the family, how are you able to keep this strong feeling about the village, despite all the demolitions and all the arrests?

Hacma: We ... If sometimes I'm angry about the situation in the village, Sabach tells me - 'come on, there's no need to be angry'. So we're moving on and keep reinforcing each other. So.. Sometimes it' s me who strengthens Sabah and the people in the village. And sometimes someone else.. we move on forward together, hand-in-hand. Let's say hand in hand we move forward.

KM: How the reality affects children?

H: They will grow up.. knowing how wrong the state treated their parents and their brothers…The kids will grows up while seeing the reality here. He walks in the village and see what's going on. When he sees his dad suffering he will suffers, when he sees the police demolishing the house everyday and the Yasam hit his father, his parents and the family he will remember it. We also teach him to remember. I teach my children to remember what the government has done let's say since 2010 until now. The child, He will not forget. Perhaps an old man will forget but the child will not forget. What the state did and what's going on in Araqib all the time. My children will not forget that three weeks ago the Yasam, it wasn't enough for them to demolished the house, he also went onto the cemetery. they actually destroyed the graves themselves. You know. My son knows that the first grave from the shed is my father's grave. He saw the Yasam demolish his grandfather's grave. He will remember it… he will not forget this and will not forget what they did in the village.

I'll tell you the truth. The police don't care if it's men or women. They don't care. They take it all. Whoever does something or say a word different from each

other, he goes. No matter if it's man or woman. or a child…I saw a boy getting beaten up, as well as women and men and old men too. In our village. Not only in demonstrations, but in the village. in demonstrations as well, of course. So.. If they would treated us like human beings…we manage our lives well. . We manage our lives. Don't make our lives to ... No one can't stand our life. they turned our lives upside down, from top to bottom. We demonstrate for almost five years. We stand here for five years. What have we done? We haven't done anything yet. They never said for a moment - let's not ruin these people's village until the Court rules on this land, whether it belongs to the Bedouin or to the state. They don't even want to wait for the court. We can come and say, as human beings, let us live. let us live until there's a trial, a judge verdict which determined to whom this land belongs, the Bedouin or the state of Israel. So we are not being treated as human beings. We are not even counted as human beings. Even the animals gets better treatment than us. Animals deserve to eat and drink. The animals across the country deserve to drink water. They deserve it, they deserve electricity, they deserve the House. We, they don't want to let us have a House. A Tent they don't even want to stop demolishing. What you want to do in demonstration? We do whatever we can do in the demonstrations. They don't keep the law even if you deserve it. They say - I'm above the law. What can you do to someone who's saying he's above the law? that he doesn't care about the law? The law says this and he say something else. and Not because we have done anything. We haven't done anything yet. and they're Still knocking down our houses. Still doing wrong, to the kids, the women, the men, to everything. Do you want to see how I live in the village? The kids are in the car. six children sleeping in the van. Mom and dad are sleeping in the other car for three or four days because they can't rebuild the house straight away. Nobody helps to rebuild. we have to deal with it, despite everything. We had to sleep under a tree for a Month. For a Month the kids were sleeping in the transit and we were eating and drinking under a tree...we put a net on the tree to make some shade, the state comes and cut the net…They are bothered by this net. My heart hurts when I talk. So I can't do anything else then.. be strong in the village.

Or as the Bedouin say, you put a stick in the ground and sit. Like a stick in the ground. Other than that there's not much else I can do.

Item No 17 /
Aziz al-Turi
Interviewed by Ariel Caine

Ariel: so here's the ...

Aziz: Sheikh, The name of this tent? Where you accept guests? just like this one, exactly

Ariel: here are the kitchens?

Aziz: here is the kitchen, this black one..
Look here. One, two. This is one this is the second. This one was recognized by the Court in Beersheba for more than 10 people as an arrest alternative at Sheikh Sayach's , we named it section 4 and section 5.
When People are offered alternative detention , each detainee the sheikh would greet him here and they would sleep either here or here..
Six or seven years people used it who had alternative arrest here and the Beersheba court accepted it, distancing them at sheikh Sayach's either here or here.

Here are Salim's houses.
This is Ashraf's house.
These are the houses of Salim
This is my home which I built, this is my home, Aziz's

Ariel: then each plot (one second I'll come across to the other side)

Then each plot such as this, let's say which you plough, is it adjacent to your house or is it not necessarily related?

It is right up next to my house. This you know I ploughed, to sow so that when it rains that the rain water will not go to waste, will enter my soil which

For the future I want to plant some watermelons, in their season , some rows of watermelons.

A few rows of this, a few rows of tomatoes, a few rows of peppers and so on.

Ariel: and who's are these houses?

Aziz: These houses, this is Jum'ah's complex

This is Jum'ah's House , these are the houses of Jum'ah's sons

Here, this was a warehouse for foodstuffs, like, to here arrived from the Ashdod and Haifa Ports, containers.

And we unloaded them and the tax and VAT acknowledged this and in all the taxes we paid they acknowledged

But that we continue to plan the future, that a man will go on planning his future, progress in life, that is not allowed, to use the ground that is not allowed... that's our situation.

Here's a home of Muhamad, a school teacher

Here is my uncle Sa'id's House blessed be his memory Allah pity his soul

Ariel: when did he pass away?

Aziz: He passed away in 2003, he died due to herbicide,

Between 1999 and 2003 they were spraying all that plot, look, this entire strip from here to here was planted, all the planting al the planting , it was all the land where you see that there's ploughing, we planted in the season wheat and barley
and what did they do? From 99 to 2003 they would come with airplanes, 3
4 planes spraying the entire area with herbicides.

Then, in 2003 he was out here with the sheep and didn't managed to get back form there to the House on time and by the time he got to the house he was covered in the chemicals
Then we took him to Soroka Hospital

Unfortunately, they too did not give an opinion that this is dangerous, the 'round-up' etc. Etc.

And after that he was always unwell and falling ill, until at 2013 he passed away, perhaps some 3 months after the spaying, perhaps even less

Ariel: 2003 or 13?

Aziz: 2003.

These are the houses which I told you, of Salim's and of Ashraf's

And these are structures related to the cemetery

This is the mosque that was demolished in 2014

A: here is where the minaret was?

the minaret wasn't here, after that we constructed the minaret

Here then is the mosque which they demolished at 2014

That it's forbidden, forbidden that there will be a mosque in some village, they try to destroy the evidence, destroy the history, destroy anything which represents the Bedouin, represents the Arab
This is the JNF's work together with the Israeli land Authority together with the green patrol

That's it, That's how we lived, in peace. here was a herd of sheep, there was a herd,

You see the sheep here, this is their herd and here you see them, this is the second herd from which we used to make dairy products, milk butter

And used to sell, this is the nest, here is is my home, this is the chickens nest

That I would sell, myself and my wife we used to sell the eggs.

And ... Here are the trees, these are our trees

You see the trees? You see trees, trees, trees, trees, trees

Here is the sheikh (tent) you see how dense the trees area.

There are also trees, trees

Ariel: all the work here by the JNF in what year did they start?

05:41

Aziz: this, this, here, this and here are our borders, from the western side these are our limits

You see?

These are our borders, until here.

And all the time, the JNF said, all the lands on which there are claims in the court, such as ours, such as this one,

This memo lawsuit is in the courts since 1973. you see, it is written there, until this very day the ministry of justice did not discuss this case, 43 years they did not discuss it. 43 years they did not discuss it and you believe that now they will? Now the case is in the court

These are the borders. This, you see? These are the borders of the cemetery.

Now what happened? in 2013, 2014 they came here and took down the fence that ran along here you see, along the side from here, here, here, here...this entire fence they took down up until here.

And they left only this part, then, what do they say? That the cemetery should only run up to here

Why enclose the cemetery? What do you want to do there? What you wish to do?

They have nothing left, they have no respect left, not for dead nor for the living, not for anyone.

They're here, The Israel Lands Administration along with their gangs, they work like gangs, as colonizers, as thieves,

really, really, really in the full meaning of the word, thieves who want in any price to steal our land.

This, this is the situation about which we are talking of in the village of al-Araqib

What's bothers them that we continue living here? What bothers them? That's the question I keep asking myself why?

Why ruin my livelihood , my future,

Look, I stayed, you left me here under the category of unrecognized village since the foundation of the state, what happened in 2016? What changed in 2010?

07:53

Why use all this force, why use this force to destroy, why plant all this hatred?

And there's no answer, no answer.

This is Salim's keep, Salim's sheep were here

These are Jum'a's sheep, what more do you need? What more do you need to make it more beautiful than this? Tidy, houses, each one with its plot, each one with it's thing, keeping the area clean, tidy, beautiful and sparkling. With our own means we paved all these roads, these leading to these, this to this, from here I go down to Salim's , from here I continue all the way to Jum'a. Here we have parking, vehicles, here is it's house. This is a small kitchen with all the things like at the sheikh here, why? Why? Why destroy?

Ariel: And did they give any explanation? Did they send any official letters before they came to destroy in 2009?

Aziz: they don't send any letters, they say that by law all our homes in the unrecognized villages are illegal because no house is authorized in the unrecognized villages

Because there is no way to authorize this. We don't have an Office to which to go in order to authorize that. I submitted plans, and we handed in plans and everything, but no, no, no, no, there is no open ear for the Bedouin, no one hears the Bedouins, they look at us as invaders

And we have here the inciters, there are a few inciters here in the Negev, they incite the Negev, want to set it in flames Here you see that thing? Here

This is all electrical power station for all the village, for all this region.

Here there were two generators

You see here, here this black one, this was the tank, this black tank which you see here

On this black one exactly, the black.

This is the diesel tank.

And here, Monthly, every month, every first of the month, every first

We would Collect money and buy 2000 liters diesel.

We have 2 diesel generators, we have electricity only at night.

Only at night. From sunset till dawn we let it work.

We have lighting, we had lighting , it was all, you see there are no wires, not even one power cable outside.

It's all dug below ground, all marked electrical cables that take from here to here, here to here, here to here.

And from here it was the first cable, we took from here until the station, where...I'll show you now, where is the point? , here is a point...no...here it is, here exactly. At this point all the cables were assembled, the tri-phase current that reached here underground up to this point.

From this point, from this point, it takes all this way up to this point.

From here it distributes to all it's area And from here there's a pathway from here to here. Here, he took electricity here and he takes electricity here

And from this point we give electricity to Muhamad And in the same way, from here electricity goes down to Salim's area And ... Everything was documented, We did it in a beautiful way and... what else...what else does one need to do? What can we, what can we do, what can we do more? We can do a lot more, we can make our houses from stone, from every thing beautiful , and all the time a little bit more and a bit more and more and more There was a plan to make street lighting from here until Route 40 Up to here, to the cemetery, and then continue throughout the area, But destruction came before development

Item No 18 /
Nuri al-Uqbi Speaking of the house of Haj Sliman, Sheikh Sliman Muhammad Al-Uqbi

Audio Recording by Ariel Caine

Al-Uqbi describes the history of the house of Sheikh Sliman Muhammad Al-Uqbi: 'These are the remains of the house that belonged to Haj Sliman, Sheikh Sliman Muhammad Al-Uqbi on Area 1 of the al-Araqib land. Near the house, in the garden, we grew fruitful fig trees, pomegranate trees, grape trees and prickly pears. However, the JNF took over the lands. I confirm and assure the audience and history that we never gave up one centimetre of the land. Israel, however, forced us [the Bedouin citizens] in deceptive and terrorising ways to leave at the end of 1951. This house was built in 1936 when my father married the daughter of Saleh Al-Uqbi. I was born in this house but today I am forbidden to enter the land. They destroyed the land and the house and transferred the stones to the city of Beersheba. In addition, they destroyed the green wheat that grew and beautifully covered the land in 1990, as far as I remember. Unfortunately, Israel ruins and destroys the agriculture, the houses, the wells, and takes down the trees. What can I say? It is a first-degree crime. We see our lands but we cannot harvest, grow [crops] on it or use it. I want to ask a question: how is that we were thrown out of our lands and homes without any reason, and the [Jewish] citizens who lived next to us in [Kibbutz] Mishmar HaNegev remained on the land that they bought (approximately 2000 acres)? They were our neighbours. Is this not discrimination? I will tell you it is discrimination when some of the citizens are thrown out while others remain on their lands.'

Item No 19 /
View of the cave of Abu Zheiri Ibn Beri, point cloud (side view), 2016

Item No 20 /
View of the House of Abu Zheiri Ibn Beri, point cloud (top view), 2016

The house of Abu Zheiri (Ibn Bari) and the Al-Turi family. Remains of this house still stand along with the cisterns and a grain storage cavern (zunar), further indicating the extent of their sedentary inhabitance of the land.

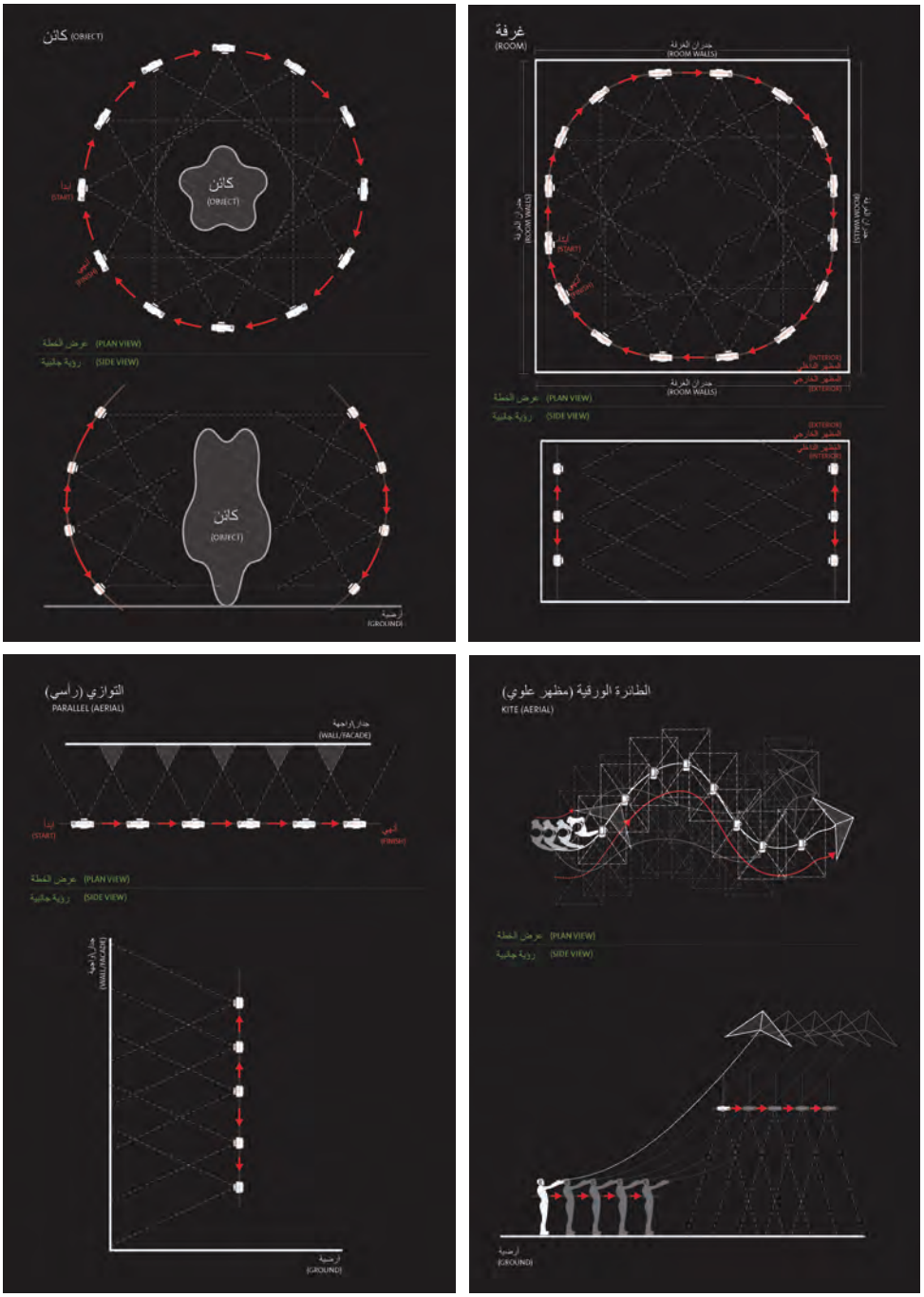
Item No 21 /
The well of Awimer Salman Abu Mdigham, point cloud, 2017

Item No 22 /
Detail of the well of Awimer Salman Abu Mdigham, point cloud, 2016

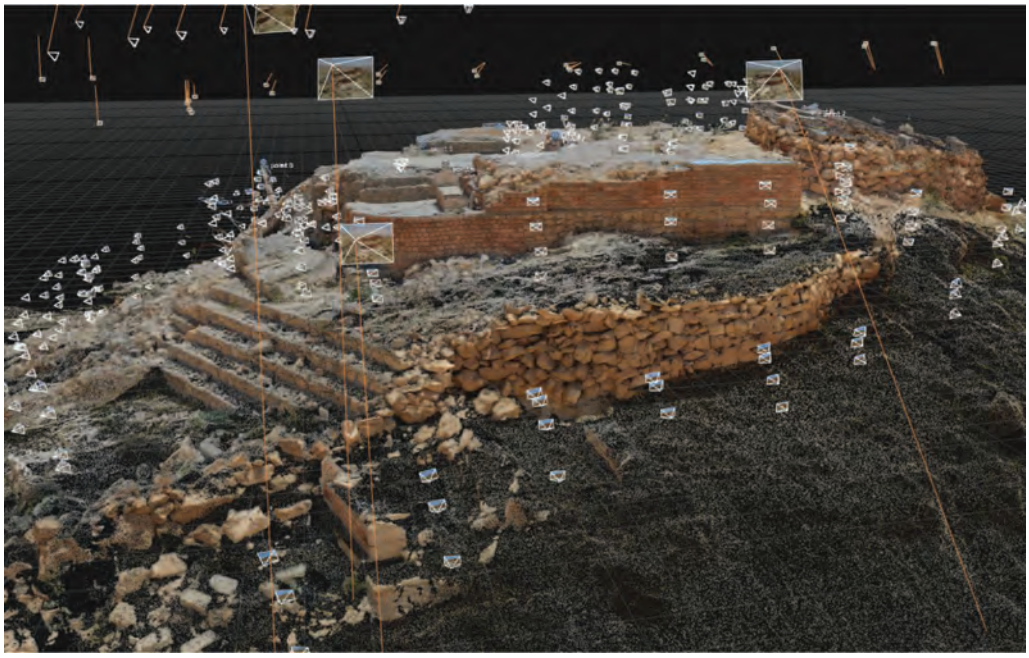
Item No 23 /
Detail of the northern well of Shehade Abu Siam, point cloud, 2016

Appendix For Conclusion

Item No 1 /
Photogrammetry Manual translated into kurmanji by Yazda researchers, (Designed with Tane Kinch, FA)



Item No 2 /
Reality Capture scan by drone and ground researchers at Mam Rashan (destroyed) temple, Mount Sinjar, Iraq 2018



Item No 3 /
Reality Capture scan by drone and ground researchers at Sheikh Mand (destroyed) temple, Mount Sinjar, Iraq 2018

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