Tel ʻEn Gev

Edited by
DAVID T. SUGIMOTO

Orientalische Religionen
in der Antike
48

Mohr Siebeck

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48

Tel ʿEn Gev

Report of the
Keio Archaeological Mission,
2009–2011

Research on Israel
and Aram in Biblical Times

V

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David T. Sugimoto

Mohr Siebeck

DAVID T. SUGIMOTO is Professor in the Department of Archaeology and Ethnology at Keio University.

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Abbreviations

Journal and Series Titles

AAAS	*Annales Archéologiques Arabes Syriennes*
AfOB	Archiv für Orientforschung: Beiheft
AuOrSup	Aula Orientalis – Supplementa
BaM	*Baghdader Mitteilungen*
BAR	*Biblical Archaeology Review*
BASOR	*Bulletin of the American Schools of Oriental Research*
IEJ	*Israel Exploration Journal*
JSOTS	Journal for the Study of the Old Testament Supplement Series
OBO	Orbis Biblicus et Orientalis
OLA	Orientalia Lovaniensia Analecta
OLBA	Mersin University Publications of the Research Center of Cilician Archaeology
PEQ	*Palestine Exploration Quarterly*
QDAP	*Quarterly of the Department of Antiquities in Palestine*
RB	*Revue Biblique*
SJOT	*Scandinavian Journal of the Old Testament*
TOTC	Tyndale Old Testament Commentaries
VT	*Vetus Testamentum*
ZDPV	*Zeitschrift des Deutschen Palästina-Vereins*

Others

3D	3 dimensional
DEMs	Digital Elevation Models
eATE	enhanced Automatic Terrain Extraction
ESRI	Environmental Systems Research Institute
ETM+	Enhanced Thematic Mapper Plus
EXIF	Exchangeable Image File Format
GDEM	Global Digital Elevation Model
GIS	Geographic Information System
GPS	Global Positioning System
ISRAEL TM GRID	Israeli Transverse Mercator GRID
KH-4B	KEYHOLE-4B
L+number	Locus number
LPS	Leica Photogrammetry Suite
n	sample size
NS	new series
RAF	The Royal Air Force
SfM	Structure from Motion
Str.	Stratum, Strata (abbreviated only in lists)
SRTM	Shuttle Radar Topographic Mission
UAVs	Unmanned Aerial Vehicles
USGS	The United States Geological Survey
W+number	Wall number
WebGIS	Web Geographic Information System

Chapter I

Introduction

1. Tel ʿEn Gev and the Keio Mission

David T. Sugimoto

I. Introduction

The Keio Archaeological Expeditions to Western Asia sent a mission team (Keio Archaeological Mission to Tel ʿEn Gev, Israel. Director: David T. Sugimoto; the Keio Mission hereafter) to Tel ʿEn Gev in Israel for three seasons from 2009 to 2011 and conducted archaeological excavations there. This is the final report on this project. The project was conducted under the auspices of the Program for the Advancement of Next Generation Research Project of Keio University and KAKENHI, Grant-on-Aid for the Scientific Research of Japan Society for the Promotion of Science (JSPS, no. 20401033).

II. Tel ʿEn Gev and the Land of Geshur

Tel ʿEn Gev is located on the eastern shore of the Sea of Galilee, at present inside Kibbutz ʿEin Gev (fig. 1.1; see Chapter I.3 for details).[1] While it was occupied, its northern side likely faced the mouth of the Wadi ʿEn Gev (Nahal ʿEn Gev), which originates from a spring on the western slope of the Golan Heights, and the southern side may have also faced another branch of the wadi. It now is a rather low tel, whose highest point is ca. 5 m above the surrounding areas, but originally it may have risen steeply above the Sea of Galilee and the branches of the wadi, which were then ca. 10 m below the present surface of the tel (see Chapter I.3). The raised area at present is ca. 240 m north–south and ca. 120 m east–west.[2] As the northern part of the tel is one step higher than the rest, we call it the "upper city."

To the southeast of the site, in the Golan Heights, is an isolated hill where Hippos (Susita), one of the Decapolis cities, was located during the Roman-Byzantine period. To the south, there was a small bay-like area on the shore that may have been a port during the Roman-Byzantine period.[3] M. Kochavi (1998), who excavated intensively in this area, suggested that Tel ʿEn Gev was important as a traffic post between the "King's Highway," which ran north–south in Transjordan, and the Mediterranean coast, and he discussed the changing routes in different periods.

The Hebrew Bible records that there was a kingdom called "Geshur" to the east of the Sea of Galilee from before the time of the formation of the United Kingdom of Israel (Deuteronomy 3:12–14; Joshua 12:1–5). According to II Samuel 3:3, King David married a daughter of a king of Geshur and begot a son by her, Abshalom. Abshalom later rebelled against his father and fled to the Land of Geshur (II Samuel 13–19). It is commonly assumed that Tel ʿEn Gev as well as Tel Hadar and Bethsaida were part of the Geshurite kingdom,[4] but that land's exact nature and boundaries are not known.

The Hebrew Bible also reports several wars between Israel and Aram Damascus (I Kings 20 and II Kings 13). Aphek, a fortified Aramaean city referred to in these reports, is often identified with Tel ʿEn Gev.[5] However, clear evidence for this identification is missing.

The history of this area is still obscure, but due to its location, Tel ʿEn Gev likely played an important role in the relationship between the ancient Israelite and neighboring kingdoms. Thus, clarifying the historical changes of this site is a significant task.

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[1] The name of the kibbutz is usually spelled ʿEin Gev, whereas the archaeological site is commonly written as ʿEn Gev. In this report, we use ʿEin Gev for the kibbutz and ʿEn Gev for the site and wadi.

[2] However, the exact dimension of the tel cannot be measured because the course of the city walls is still unclear.

[3] NUN 1991, 11–13.

[4] Tel Dover and Tel Kinrot may also have been included within the boundaries of the Geshurite kingdom. For details, see SUGIMOTO 2015a.

[5] For example, see DOTHAN 1975, 64; KOCHAVI 1991, 181; IDEM, 1992, 44. However, HASEGAWA 2012 argues against this identification.

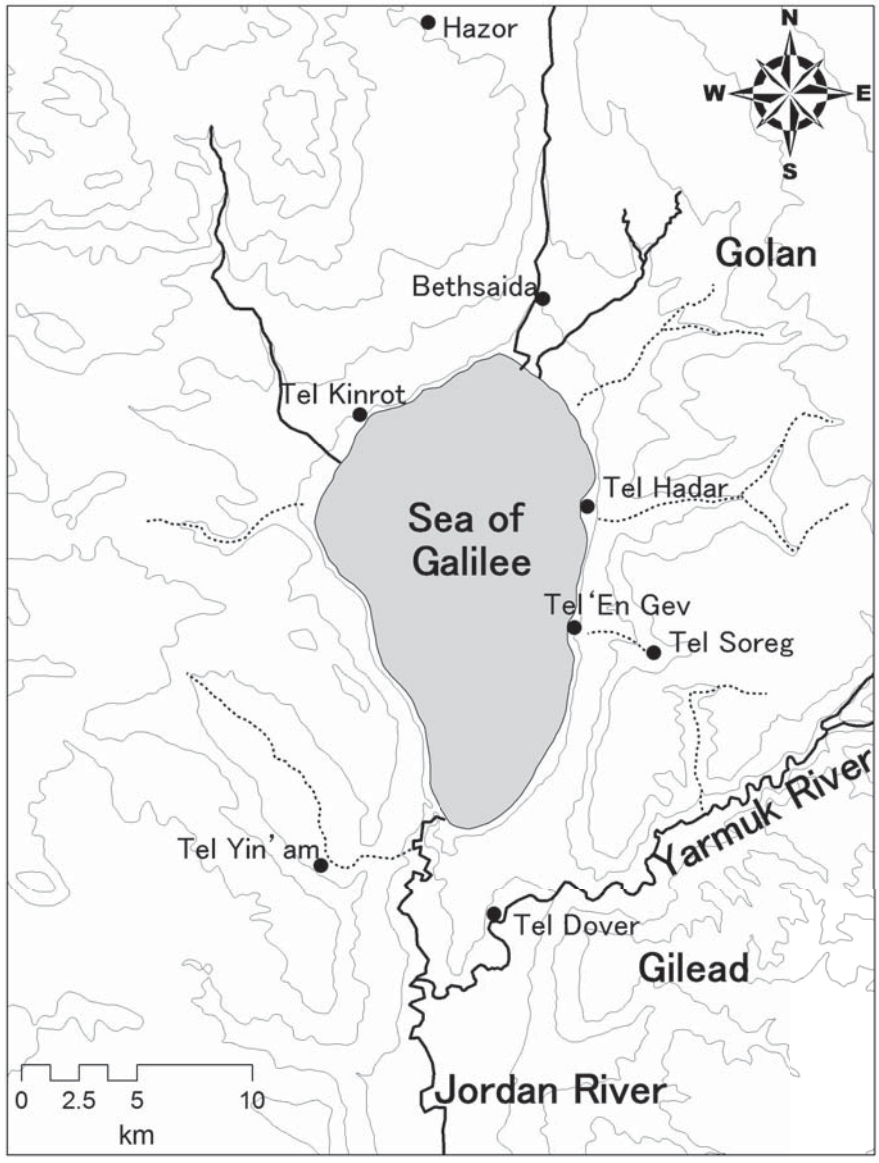

Figure 1.1:1 The location of Tel ʿEn Gev.

III. Previous Research at Tel ʿEn Gev and Unsolved Issues

The first archaeological excavation at Tel ʿEn Gev was conducted in 1961 by four leading Israeli archaeologists, headed by B. Mazar (Mazar's Mission hereafter).[6] They opened five trenches (Areas A to E) along the western and southern slopes of the tel (fig. 1.1:2). Even though this excavation lasted only eleven days, it became clear that the Iron Age city was surrounded by city walls. They also identified four Iron Age strata for the upper city and five for the lower city and proposed a preliminary chronology. As a jar with Aramaic inscriptions was unearthed from their Stratum III, they concluded that Aramaeans were living there by this time at the latest.

Next, a consortium of Japanese universities, the Japanese Archaeological Project in the Biblical Land (the Japanese Mission hereafter), conducted eight seasons of excavations between 1990 and 2004.[7] They established an excavation area in the north-eastern part of the upper city (our Area F), aimed at excavating a larger area. This mission revealed that there were straight casemate walls running north to south along the eastern slope of the tel and that large tripartite-pillared buildings were inside the city.

[6] MAZAR *et al.* 1964.

[7] Tenri University, Rikkyo University, Tokyo University, and Keio University participated in this project. For details, see TSUKIMOTO/KUWABARA, forthcoming; TSUKIMOTO *et al.* 2009.

These missions greatly contributed to clarifying the historical development of the eastern Galilee region, but important issues still remained. Although Mazar's Mission revealed the existence of city walls during the Iron Age, its excavation areas were so limited that the general configuration of the site was not made evident. The Japanese Mission exposed large public buildings and showed that the city was already well developed during the Iron Age II, but the general plan of the city was still not clarified. For example, it was not clear whether the casemate walls surrounded only the higher part of the tel to constitute an "upper city" or extended south to encircle the whole tel.

An even greater issue was that the stratigraphies of the two missions were so different that it was difficult to reconstruct the historical development of the site. Mazar's Mission recognized five Iron Age strata and no later stratum, whereas the Japanese Mission detected Roman, Hellenistic, and Persian strata above two Iron Age strata. As for pottery, Mazar's report was limited to the sherds from particular strata,[8] while most of the sherds from the Japanese Mission were from mixed contexts.[9]

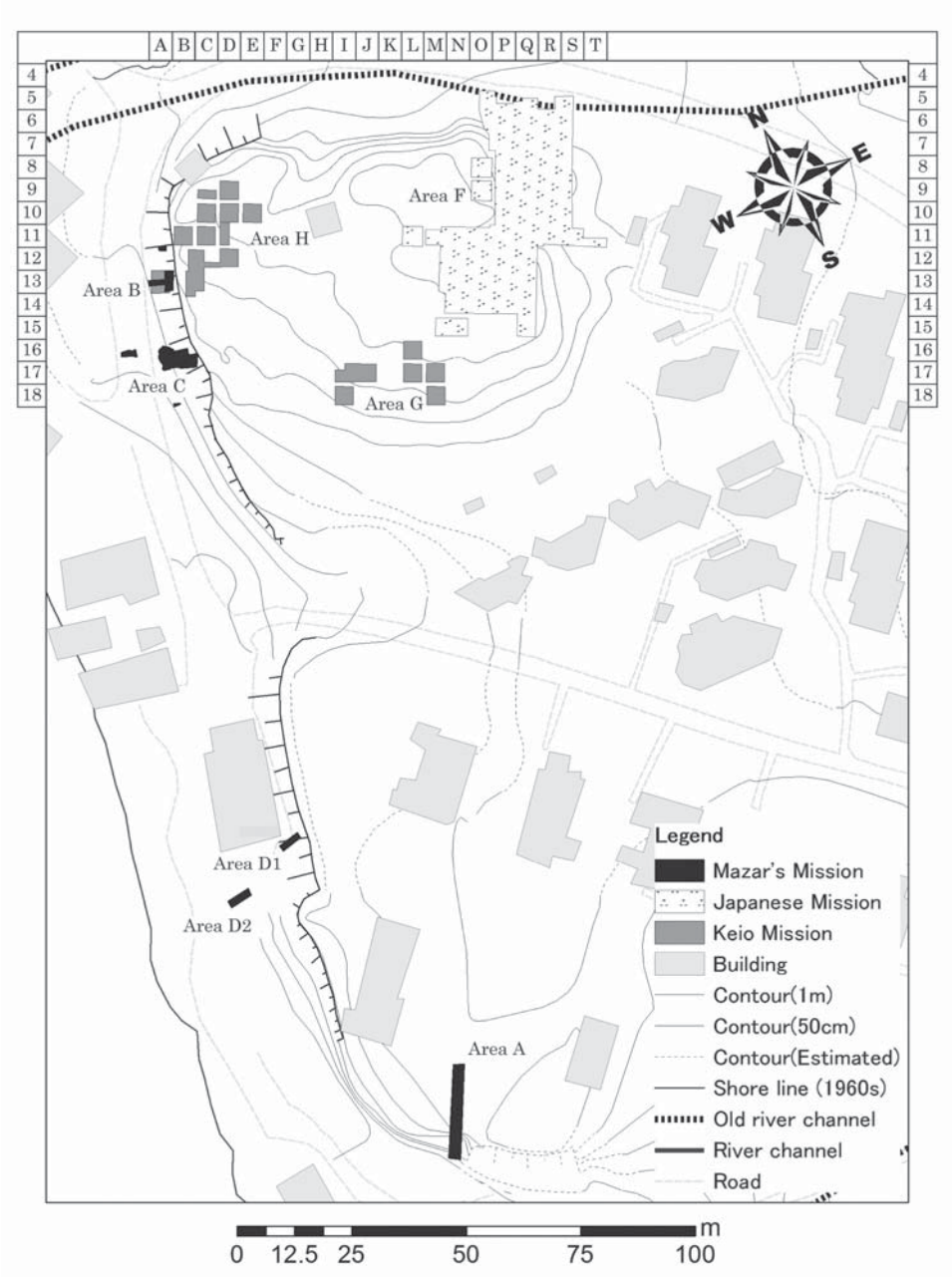

Figure 1.1:2 Excavation areas of Tel ʿEn Gev.

[8] Most of the pottery reported is from Str. MIII and MV of the lower city, and none is reported as clearly from the upper city.
[9] SUGIMOTO 2009; IDEM 2015b; IDEM, forthcoming.

IV. The Objectives and Methods of the Keio Mission

The Keio Mission determined that the goal of its excavations was to establish a coherent stratigraphy, including the results of the two previous missions, and make it possible to trace the historical development of the site. We also aimed at clarifying the plan of the cities during each period as much as possible, particularly the course of the casemate walls and the relationship between the upper and lower cities.

We established excavation areas on the southern slope of the "upper city" and the north-western part of the tel (see fig. 1.2:3). Since Mazar's excavation used the nomenclatures of Areas A to E, we designated the excavation area of the Japanese Mission as Area F, our area on the slope as Area G, and the one on the north-western part of the tel as Area H. In Area G, we wanted to examine whether the casemate walls surrounded the "upper city." If so,

Photo 1.1:1 Area G before the excavation.

Photo 1.1:2 Area H before the excavation.

we would expect to find the southern wall somewhere on the slope (photo 1.1:1). Area H is located on the opposite side of the casemate walls found on the north-eastern side of the tel (photo 1.1:2). Because Area H also abuts Areas B and C of Mazar's Mission, it would be important for clarifying the general plan of the cities as well as establishing a coherent stratigraphy between the three missions. In addition, since this area was thought to be the original highest point of the tel,[10] it was expected that important public buildings would be uncovered.

Both previous missions used simple labels such as Stratum I or II for their stratigraphy. However, for our purposes, we refer to the strata of the lower city in Mazar's Mission (Area A) as Strata MI to MV, those of the upper city (Areas B and C) as Strata MI* to MIV*, those of the Japanese Mission as Strata JI to JV, and those of the Keio Mission as Strata KI to KIV.

For our excavations, we created a new topographical map but basically employed the grid system of the Japanese Mission to avoid confusion. However, we had to modify it slightly to adjust to the topographical map. The excavation areas of each season are as follows:

2009 Area G: I17, I18, J18, L17, L18, M18
Area H: C9, C10, D10
2010 Area G: L17, continuation; L16, new
Area H: C10 and D10, continuation; B11, C11, and E10, new
2011 Area H: C11 and E10, continuation; B/C12, B/C13, D9, D11, D12, new.

In the 2009 and 2010 seasons, we conducted excavations in both Areas G and H, but in the 2011 season, we concentrated on Area H because it became clear that the state of preservation of Area G was not good. We enlarged the excavation area in Area H and attempted to clarify the plan and nature of the structures there as much as possible.

The excavation period of each season is as follows:

August 3 (Monday) to 28 (Friday), 2009
August 2 (Monday) to 25 (Wednesday), 2010
August 1 (Monday) to 30 (Tuesday), 2011.

The members in each season are as listed below. The affiliation given is that at the time of the season.

2009

Director:	David T. Sugimoto (Keio University)
Supervisors:	Keisuke Takai (Keio University), Ryuzo Fujiyama (Meiji University), Gaku Takata (Kaichi Gakuen High School), Ido Wachtel (Hebrew University of Jerusalem)
Registrar:	Hiroo Kansha (Keio University)
Surveyors:	Nobuya Watanabe (Chubu University), Makoto Ezoe (Keio University)
Artifact Artists:	Shiho Takata (Kaichi Gakuen High School), Tomoko Ochiai (Keio University alumnus)
Manager:	Mayumi Okada (Keio University)

In addition, Akiko Matsubara (Keio University) and Nobuya Watanabe conducted the geographical survey, Yusuke Kawai (Keio University) explored and designed a plan for the preservation of the site as an archaeological park, and Mayumi Okada conducted public archaeology programs in the kibbutz. Ido Wachtel also worked as a liaison between the Israeli and Japanese sides. Student volunteers from the Hebrew University of Jerusalem and Keio University also participated, and Druze workers supported the excavation works.

2010

Director:	David T. Sugimoto (Keio University)
Supervisors:	Keisuke Takai (Keio University), Ryuzo Fujiyama (Meiji University), Keiji Hirakawa (Fukuoka City, Japan), Ido Wachtel (Hebrew University of Jerusalem)
Registrar:	Hiroo Kansha (Keio University)
Surveyor:	Nobuya Watanabe (Chubu University)
Artifact Artist:	Kumi Makino (Kamakura Women's University)
Manager:	Mayumi Okada (Keio University)

In addition, Nobuya Watanabe conducted the geographical survey, and Mayumi Okada conducted public archaeology programs in the kibbutz. Ido Wachtel also worked as a liaison between the Israeli and Japanese sides. Student volunteers from the Hebrew University of Jerusalem, Chubu University, and Keio University also participated, and Druze workers supported the excavation works.

[10] The present topography has been slightly modified by the dump of the Japanese Mission.

2011

Director: David T. Sugimoto (Keio University)
Supervisors: Hiroo Kansha (Keio University), Minori Sannohe (Keio University), Ido Wachtel (Hebrew University of Jerusalem)
Assistant Supervisor: Mayumi Okada (Keio University)
Registrar: Manami Sano (Keio University)
Surveyor: Nobuya Watanabe (Chubu University)
Artifact Artists: Kumi Makino (Kamakura Women's University), Keiji Hirakwa (Fukuoka City)
Manager: Mayumi Okada (Keio University)

In addition, Nobuya Watanabe conducted the geographical survey, and Mayumi Okada conducted public archaeology programs in the kibbutz. Ido Wachtel also worked as a liaison between the Israeli and Japanese sides. Student volunteers from the Hebrew University, Tokyo University, and Keio University also participated, and Druze workers supported the excavation works.

V. Preservation and Utilization of the Site

Beside the excavations, this mission conducted various programs to raise the awareness of the site as an archaeological site among the residents of the Kibbutz ʿEin Gev, where the site is located. They included the publication of daily bulletins, organization of explanatory meetings, and interviews; Okada reports on these in Chapter I.4 of this volume. We also presented plans of an archaeological park designed by Kawai that can be constructed with minimum cost to the members of the kibbutz. We set fences around the site of the proposed park even though these plans were not adopted.

2. Recording Methods at Tel ʿEn Gev

Nobuya Watanabe

I. Introduction

Archaeological excavation often requires documentation of various types of spatial information on different scales. Modern archaeology is increasingly deploying UAVs and SfM techniques[1] that have rapidly changed current digital documentation. Although the Tel ʿEn Gev excavation slightly preceded this technical revolution, it was aided by satellite remote sensing, digital photogrammetry, early-stage UAV, and laser scanning. These techniques proved their worth in both the field excavation and the cartographic laboratory work.

Satellite remote sensing provided preliminary information about the landforms and landscapes of the region. Using this information, we narrowed down the possible candidate areas for the fieldwork (see Chapter I.3). Topographic maps of the excavation area were generated by aerial photogrammetry, total station measurement, and laser scanning techniques. The unearthed archaeological features and geological layers were recorded by GPS and digital photogrammetry data, which provided detailed 3D models and ortho-photographs. Finally, the information collected during the fieldwork and excavations was integrated into a GIS database. GIS enables a seamless observation from the micro-scale (within-site level) to the macro-scale (region level), enhancing our understanding of the spatial context of the target site. This chapter reports our attempts at adopting these techniques and their advantages in the survey.

II. Recording Methods

1. Preparing a Base Map of the Area from Satellite Images

Satellite images (Landsat ETM+ and CORONA KH-4B), aerial photographs, and DEMs (Digital Elevation Model of SRTM and GDEM) were prepared and stored in the GIS database. CORONA is a reconnaissance satellite launched by the United States that was operated mainly during the 1960s and 1970s. Made public in 1995, its images are now available via the USGS website.[2]

The CORONA satellite images are especially advantageous for archaeology because they show the land surface before recent rapid urban expansion. Many archaeological studies have deployed the KH-4B camera system, which has a comparatively high resolution (ca. 2 m, 1.83 m at best). At this resolution and under appropriate conditions, archaeological features can be detected.

Although we detected no unknown archaeological features or sites in the KH-4B images, the KH-4B imaging was effective for understanding the environment and landforms in the study area. For example, the interpretation of the KH-4B image indicated that a spring provides the headwater of the Wadi ʿEn Gev. This interpretation was later confirmed in the field survey.[3]

However, the utility of the KH-4B image as a precise base map has limitations, as the camera system's panoramic functions cause severe distortion. Therefore, the image was geometrically corrected[4] by adding the appropriate projection and coordinates (ISRAEL TM GRID). The rectified KH-4B image was used as a base map in the GIS database.

Another helpful information source was historical aerial photography. By virtue of their high resolution and stereo-viewing capability, aerial photographs are among the best spatial data for remote sensing in archaeology. However, similarly to the CORONA satellite images, aerial photographs must be rectified for use as GIS data. In this study, we applied ortho-rectification using stereo-paired images. Ortho-rectification converts the geometry of

[1] The Unmanned Aerial Vehicle (UAV) is a so-called drone that is convenient for taking aerial photographs. Structure from Motion (SfM) is a method to compute 3D model and camera position from multiple overlapping photographs. The combination of UAV and SfM is known to be quite effective for large-scale mapping.

[2] Earth Explorer, https://earthexplorer.usgs.gov/.

[3] See Chapter I.3.

[4] A simple geometric correction (thin plate spline) was adapted to KH-4B. Adapting full-scale ortho-rectification to CORONA KH-4B was difficult at the time of the survey. Today, the proper ortho-rectification could be easily applied to the KH-4B image using the SfM technique.

the data from a *center projection* to an *ortho projection*. The ortho-rectified aerial photographs were then stored in the GIS database.

III. Recording of the Micro-topography Around Tel ʿEn Gev

The excavation areas in the acropolis and the lower city were documented in a large-scale topographic map. Due to the limited resources of the overseas excavations, we wanted a cost-effective method that minimized the time, budget, and manpower for mapping and documentation without sacrificing the demand for accuracy.

1. Micro-topography Measurements Using Total Station Data

The main excavation areas on the tel were measured in 2009. Most of the measurements were collected by a total station. Measurements were made at the periphery of the tel to capture its outline and the surrounding modern roads. However, the original shape of the tel was uncertain because the periphery has been partly destroyed by recent constructions and human activities, such as road construction, pathway installation, and other structural activities. The map contours were derived from the DEM, itself generated from the XYZ points densely collected over the tel surface. The tel measurement took five days with two surveyors working three hours per day. Finally, 590 points were collected, approximately one point per 4 m^2.

2. Measuring the Micro-topography with a Motorized Laser Ranger

From the second season of the survey (2010), the micro-topography was measured by a motorized laser ranger. This device consists of a laser ranger, a digital compass, and a motorized camera gimbal controlled by a micro-computer. The camera gimbal turns the device in the scan direction, while the laser ranger and digital compass collect the distance, azimuth, and angle of the target. The device automatically converts these values into XYZ coordinates. The device continues scanning until the pre-planned area is fully covered, collecting a point cloud of XYZ coordinates in the area. Finally, a high-resolution DEM is created by interpolation from the collected point clouds (fig. 1.2:1).

3. Generating an Ortho-photograph and High-resolution DEM from the Aerial Photogrammetry

A topographic map was constructed using the ortho-rectified photographs and the DEM, which were processed by aerial photogrammetry. Both the modern aerial photographs and the historical aerial photographs taken by the British Royal Air Force (RAF) during 1944 and 1945 were processed using photogrammetric software (LPS2011 and eATE of Erdas Imagine).

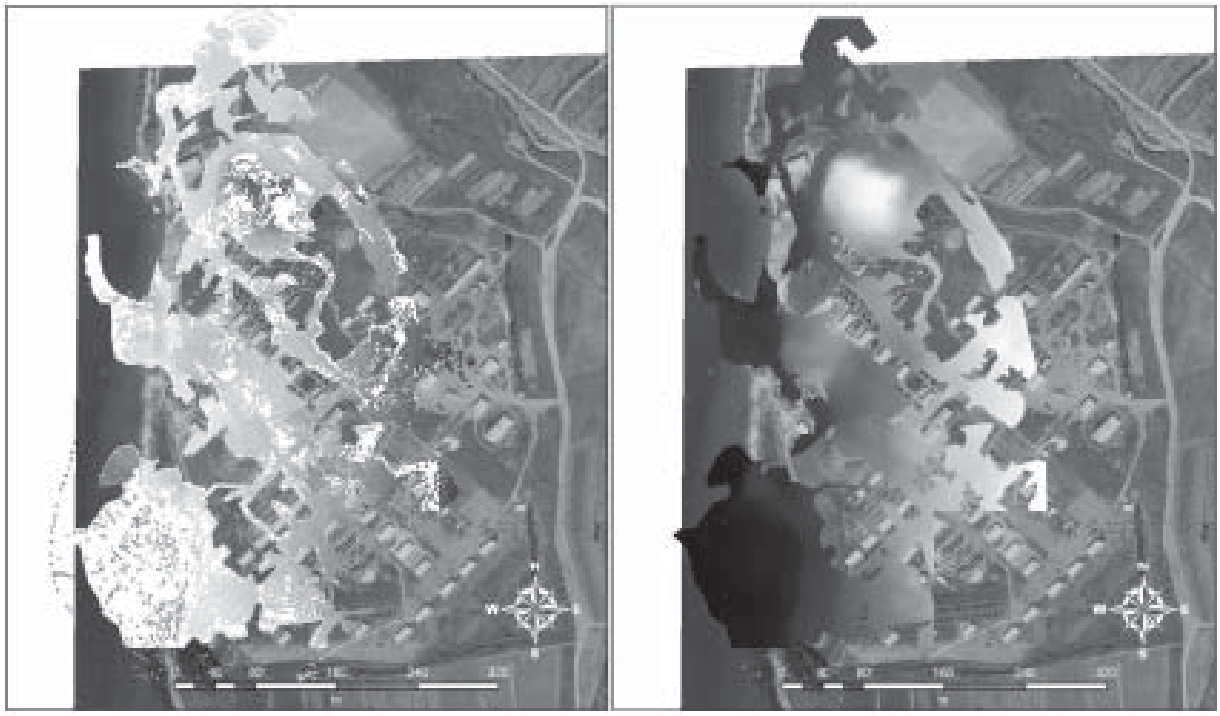

Figure 1.2:1 Left, the collected point clouds: Right, DEM generated by interpolating the point clouds (Kriging method) (MATSUBARA/WATANABE 2010, figs. 9 and 10).

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