The Ronnie Ellenblum Jerusalem History Knowledge Center: Conceptual Framework and Implementation

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No existing city has undergone so many cycles of conquest, exile, destruction, and rebuilding as Jerusalem. Over time, these cycles—and the expectations for rebuilding at the End of Days—became foundational symbols and the base for the collective identities of all the civilizations active here [in Jerusalem]. At the same time, the many dramatic occurrences that took place in this city, in the shadow of some of the most influential empires in history, involving legendary figures who shaped entire civilizations, make it difficult to understand Jerusalem's history, to separate the wheat from the chaff, and to find a meaning and an organizing principle for the many events that the city underwent. Jerusalem has been immortalized in every form of human creation; numberless pilgrims and dreamers, artists and authors, musicians, filmmakers, and intellectuals described it in their works. Many who never visited Jerusalem also described it as they imagined it. The knowledge center would make all these accessible to scholars and lovers of the city, to tourists, to students, and to whoever wishes to deepen their acquaintance with Jerusalem.

Ronnie Ellenblum's vision of the Jerusalem History Knowledge Center

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Abstract

This paper describes the vision, framework, challenges, and implementation of the Jerusalem History Knowledge Center (JHKC) initiated by the late Ronnie Ellenblum. The center's establishment was configured as a joint project of the Hebrew University of Jerusalem (HUJI), the National Library of Israel (NLI), and the Israel Antiquities Authorities (IAA). Its primary mission and challenge were to establish a long-term digital infrastructure constituting an open-access platform about the history of Jerusalem, which draws on diverse sources, such as archaeological records, historical documents, pilgrims' accounts, old and new photographs and videos, architectural reconstructions, etc. The first stages included the classification of databases about two sites in Jerusalem: the Citadel—Tower of David and the Damascus Gate. As part of this work, we implemented a unified search in interdisciplinary databases regarding a specific geographical area or a single monument. The center's products will eventually operate at two levels: at the research level, facilitating work in the fields of history, archeology, art, geography, social sciences, etc., and at the popular level, serving the general public.

Keywords: Databases; GIS; resources; data collecting; integration; access

1. Introduction

The Jerusalem History Knowledge Center (JHKC) was conceived and initiated by Ronnie Ellenblum (1952–2021), who devoted more than 30 years to the comprehensive collection and documentation of sources on the history of Jerusalem.[1] During these years, Ronnie taught numerous courses about Jerusalem and provided an extensive view of the city as a multicultural hub. In accordance with his vision, the center's establishment was configured as a joint interdisciplinary project of the Hebrew University of Jerusalem (HUJI), the National Library of Israel (NLI), and the Israel Antiquities Authority (IAA) and was supported by a generous grant of Israel's Ministry of Innovation, Science, and Technology (MOIST). Its primary mission and challenge were to establish a long-term digital infrastructure that would provide an open-access platform on the history of Jerusalem and rely on various sources, such as archaeological records, historical documents, pilgrims' accounts, old and new photographs and

[1] Ronnie had passed away in early 2021. His sudden and untimely death has left his friends and colleagues in great loss. The Center has been named after him.

videos, architectural reconstructions, etc. This new platform is now incorporated into the National Library's database system (https://www.nli.org.il/en/at-your-service/who-we-are/projects/jerusalem-history-project).

The academic and public need for a comprehensive database on Jerusalem becomes apparent considering the extensive research of the city over the past 150 years. Numerous scholars have partaken in these efforts, systematically collecting written, photographic, illustrated, musical, archeological, and ethnographic sources, covering vast fields of knowledge pertaining to Jerusalem and its environs. These and other outputs are presently spread across numerous archives and institutions in Israel and abroad.

The center's conceptual framework is embedded in the partner institutions' mission, which is to dispense their resources and databases throughout the academic community and the wider public. The main challenge is classifying the various databases, expanding them, and creating a unified search environment that will enable users to find precise, time- and space-dependent information at a level of detail unavailable elsewhere in the academic world.

The center's products will eventually function at two levels. One is scholarly and academic; it will provide access to various types of information from multiple sources under one roof and support analyses by cross-sectioning capable of answering specific research questions in the fields of history, archeology, art, geography, social sciences, and more. The second level is popular and public-oriented; it will provide background material for educational activities, walking tours, knowledge enrichment, etc.

2. Contributing Partners

Founded in 1892, the National Library of Israel (NLI) is dedicated to collecting the cultural treasures of Israel and Jewish heritage. It owns the world's largest collections of Hebraica and Judaica and is the repository of many rare and unique manuscripts, books, and artifacts. The collections of the National Library contain hundreds of thousands of items dealing with Jerusalem from various angles. The NLI's collections contain manuscripts in more than 70 languages devoted to Jerusalem and its sanctity. They include descriptions written by pilgrims and tourists who have visited it throughout the ages, thousands of books on Jerusalem as a tangible geographical place as well as an imagined utopian and abstract concept, rare and unique copies of the first newspapers and books printed in Jerusalem, the world's most extensive collection of maps delineating the city's geography, and a photograph collection comprising thousands of items, including rare 19th-century photographs taken by early pioneers in the field. The

NLI's constantly growing collections, thus, cover depictions of Jerusalem ranging from Middle Age atlases and maps to the latest satellite photographs.

The data contributed by the Hebrew University of Jerusalem (HUJI) firstly includes the extensive materials collected by Ronnie Ellenblum during his many years of research and teaching, which were systematically cataloged and labeled according to their location. Particularly notable among these materials is the extensive visual documentation of historical events and scenes of daily life in Jerusalem. Other contributions by HUJI include sources housed in the Center for Computational Geography and the Steven Spielberg Film Archives.

Additionally, HUJI will provide the center with hundreds of hours of HD-quality filmed classes, which otherwise would have been disposed of.[2] The center will strive to provide a long-term repository of the diverse materials related to Jerusalem produced in the course of academic activities in the humanities. Moreover, recently, HUJI established a minor in Jerusalem Studies comprising a wide range of academic courses in the humanities and social sciences. The JHKC's evolving databases will directly contribute to this program.

The Israel Antiquities Authority (IAA) is the national statutory cultural heritage organization of the State of Israel. The IAA is in charge of storing the country's archaeological resources, dating from 1920 when the British Mandate Department of Antiquities was established. The databases and available archival material place the IAA in an excellent position to advance research through the dissemination and analysis of archaeological data. With a wide-ranging staff of archaeologists, the IAA conducts interdisciplinary research ranging from the field to publication. All salvage excavations in Jerusalem and its environs since 1967 were conducted by the Department of Antiquities and, as of 1990, by the IAA, creating an enormous database of sites and finds. Beyond mere administrative management of cultural heritage resources, the IAA has invested in recent years in GIS-based research to integrate the archaeological data at its disposal into a unified digital system (Matskevich and Weinblum 2021; Münger and Weinblum 2022; Birkenfeld and Garfinkel 2020; Alperson-Afil 2019). The IAA's documentation of Jerusalem can be accessed through the JHKC.

Traditionally, the Ministry of Innovation, Science, and Technology (MOIST) focuses on engineering, exact, and applied sciences. However, occasionally, it has been open to funding innovative interdisciplinary initiatives in the digital humanities. In the case of the JHKC and Bar-Ilan University's parallel project (LISROP; see Faust and Shweka, this volume), the ministry's involvement was facilitated by the uniqueness of Jerusalem as a topic and the project's fostering of the digital humanities in Israel. These projects also coincide with the expanding

[2] All the participants in these classes agreed to be filmed.

support for enhanced collaborations between the humanities and the computer sciences. The cooperation embodied in both projects sent an important symbolic message to the wide range of stakeholders—governmental and non-governmental—that science also includes the humanities, and their role is no less important than the exact sciences.

3. Data Collections and Resources

At the heart of JHCK is a unified database composed of datasets from multiple and varied worlds of content and research methodologies. The datasets originate from three disciplines: archaeology, informatics, and cultural studies . Each discipline has a different perception of history, which results in distinct documentation and cataloging standards and, hence, different research languages and methodologies.

3.1. Archaeological and architectural resources

Archaeological research of Jerusalem encompasses thousands of excavations conducted in and around the city from the 1850s to the present day. Integrating these excavations and their results is one of the project's greatest challenges. Augmented by numerous archaeological and architectural surveys, they constitute a huge database of the city's layout, its public buildings and monuments, streets, and residential areas.

The precise number of archaeological excavations conducted in Jerusalem since the beginning of modern research is debatable. The IAA archives contain some 1,852 entries on excavations conducted in and around Jerusalem. The actual number, however, is probably far higher. Many "unofficial" or clandestine explorations were conducted inside and near the city, mainly between the second half of the 19th century and the 1970s, and, unfortunately, did not leave any detailed written records. Additionally, numerous finds, which were not revealed during proper archaeological investigations, have been documented. Thus, it appears that the actual number of excavations conducted in and around Jerusalem over the last 150 years comes much closer to 2,450. The total area explored is exceptional, encompassing ca. 30 percent of the ancient city. Additionally, several comprehensive summaries of Jerusalem's archaeological record have been published in the past decades (e.g., Bieberstein and Bloedhorn 1994; Bahat 1996; Kloner 2003; Küchler 2007; Galor and Avni 2011; NEAEHL), as well as large-scale excavation reports and archaeological studies of specific areas in the Old City and its surroundings, including the Temple Mount area (Baruch, Reich, and Sandhaus 2018), the Tyropoeon Valley (Ben

Ami and Tchekhanovetz 2020), the Western Wall Plaza (Weksler-Bdolah and Onn 2019), and the City of David (Reich and Shukrun 2021).

The preliminary reports of all excavations conducted in the Jerusalem area since 1990 are published in the IAA online journal *Excavations and Surveys in Israel* (http://www.hadashot-esi.org.il/default_eng.aspx). Otherwise, the technical documents of all excavations are stored in the IAA archives (Matskevich and Weinblum 2021). The JHKC receives access to IAA excavation and survey data in Jerusalem and its environs; these data derive from several sources:

1. *The Archaeological Survey of Israel* (ASI) systematically documents the country in technical 10 × 10 km units, each defined as a *map*; originally, the survey results were published in print but, today, are also openly available online (https://survey.antiquities.org.il/index_Eng.html#/).
2. *The British Mandate archive* includes hundreds of files with data from the inspection and monitoring of archaeological sites and artifacts. They were all digitized, and the outputs are openly available online (http://iaa-archives.org.il/).
3. *Annual reports conducted under IAA licenses.* These include records of both Israeli and foreign academic expeditions and include diagrams, drawings, plans, and photographs of the finds. Preliminary reports of all excavations in Israel are published in the IAA newsletter *Excavations and Surveys in Israel* (ESI; http://www.hadashot-esi.org.il/default_eng.aspx).
4. *'Atiqot,* the IAA's peer-reviewed journal, covers a large chronological span from prehistory to the Ottoman period and stages articles of site excavations studied from various perspectives and disciplines. These articles, including many concerning Jerusalem, are openly accessible online (http://www.atiqot.org.il/, https://www.jstor.org/journal/atiqot).

The architectural study of historical Jerusalem encompasses the survey and documentation of hundreds of ancient buildings, mostly Medieval and Early Modern (Burgoyne 1987; Auld, Hillenbrand, and Natshe 2000; Hillenbrand and Auld 2009). Among these buildings are the main religious monuments of Jerusalem, including the Temple Mount—Haram al-Sharif and its surroundings (Ben Dov 1985; Rosen-Ayalon 1989; Grabar 1996; Grabar and Kedar 2009) and the Church of the Holy Sepulchre compound (Corbo 1981, Biddle 1999, Vieweger and Gibson 2017).

3.2. Photographic and cartographic archives

The photographic materials of Jerusalem are vast and distributed worldwide. The NLI and the IAA old photograph collections form the JHKC's core

(accessed through the NLI system) and are supplemented by many others, some accessible online, such as the Matson collection of the American Colony photographers, stored at the US Library of Congress, and the Yad Ben Zvi and the Ecole Biblique collections. One of the project's future aims is to provide seamless access to these and other collections.

3.3. Textual sources

The textual sources include pilgrims' and travelers' accounts through the ages, administrative documents, and inscriptions in numerous languages and styles. The NLI's dynamic and constantly expanding collections are the main source of these materials. Presently, these collections encompass approximately 4.6 million volumes (including ca. 100,000 manuscripts, documents, and early printed books considered rare items) and 1,500 personal archives. The NLI's digital collections consist of about 5.5 million digital objects, representing part of its physical collections and those of over a thousand partnering institutions.

4. The JHKC as an Information Hub

The sheer scale and diversity of the data about Jerusalem render their unification and representation challenging. Nevertheless, a feature all data items have in common is their relationship to a geographical entity within the city. Therefore, a GIS-based platform seems to offer the most powerful and useful venue. We expect that the incorporation of data from various sources into a GIS-based platform navigated with a single search engine will provide a powerful research tool. It will allow scholars of various fields to address specific research questions, while the immense quantity of accessible and unified information will enable the establishment of advanced learning environments.

The principal challenge in establishing a unified database comes from the worlds of data analysis and processing and information systems. They include,

a. Defining a data structure that suits all data sources;
b. Finding a common denominator for the data sources that will enable linking all relevant records to geographical sites and filter search results;
c. Geo-labeling all items related to Jerusalem. This requirement sometimes proved difficult to realize, as many items were not connected to a specific location, necessitating further labeling. The geo-labeling of other items had to rely on experts when concerning, for example, the identification of specific places documented in photographs.

The unified database was superimposed by a search and display layer, which had been developed on a geographical platform so as to allow searches according to catalog information or by marking an area on the map. The search results are presented as pins on the map.

5. The JHKC as a Research Hub

The JHKC will reflect Jerusalem's multicultural character and rich history by providing easy access to meticulously collected interdisciplinary sources of information and knowledge. These diverse materials will shed light on the history of specifiable locations and bring to life knowledge that was otherwise inaccessible or demanded a big effort to reach. The system was constructed so as to meet the requirements of the humanities and social sciences. The NLI has built-in access to article repositories (Rambi and JSTOR); thus, the search results will be accessible to users and include the results of academic studies.

The platform will also serve additional audiences by offering educational activities, planning walking tours, presenting general knowledge about the city, etc. It will also serve as the main forum for spreading knowledge about Jerusalem.

6. The Process of Data Collection from Various Resources

The Ronnie Ellenblum collection constitutes a major component of the JHKC. It consists of approximately twenty-thousand items collected during Ellenblum's extensive research on Jerusalem, including photos, videos, audio tapes, scanned maps, manuscripts, historical and archival sources, and original illustrations. A central aspect of our work entailed grouping all the materials into one collection and defining its conceptual lines. The decision to treat all these materials as a single collection rested on the acknowledgment that most of them were part of an unfinished research project, *the Jerusalem Library*. This project, conducted in collaboration with Al-Quds University between 1998 and 2003, assembled archaeological, epigraphic, historical, and visual materials to create a database for learning and research. However, the project ended about twenty years ago and much of their processed work was lost due to technological developments in digital media since then. Consequently, whatever the concepts and reasons underlied the collection's organization, they have been lost. For example, we found many photos and historical documents regarding the neighborhood of Rehavia. These materials were clearly collected with a specifiable idea in mind, but what precisely this idea was remains unclear.

Having established the collection, we needed to decide what would be its organizing principle. Based on the project's central vision, we chose a geographical guiding principle. Therefore, every item in the collection was associated with a specific location and UTM coordinates, allowing users to find various materials and resources based on these designations.

The decision to organize the collection according to the geographical principle elicited several methodological questions. First, what geographical resolution ought to be used for categorizing items? For example, the Temple Mount—Haram al-Sharif platform consists of dozens or hundreds of monuments and important sites; do we classify all the sites under one umbrella of the *Temple Mount—Haram al-Sharif* or break them up into smaller geographical units? Such a level of detail can improve items' accuracy and the collection's richness. On the other hand, however, it requires more work and time and considerable knowledge of monuments, styles, chronology, etc., which is not always readily available.

The second question asked who is the database's target audience. If our audience is an expert audience of Jerusalem researchers, the depth of detail is appropriate and valuable. In contrast, if it is a broader audience, such as teachers, high school students, etc., then it may be ineffective. Moreover, too much detail can render the collection cumbersome and difficult to navigate.

The third question followed from Jerusalem's unique position among the three monotheistic religions. For instance, the choice of place names for the catalog was not trivial. Can *Haram al-Sharif* or *Al-Aqsa Mosque* apply equally well for the *Temple Mount*? Choosing the name for this and many other sites in Jerusalem carries weighty political and religious associations. These questions were formulated through ongoing discussions between the team and the project's steering committee, which contained various city experts familiar with the city's complex and sensitive aspects.

7. Two Case Studies: Damascus Gate and the Citadel—Tower of David

The choice of geography as the collection's organizing principle and the implementation of a geographical search system currently being built into the NLI platform will provide users with access to various materials and sources per location. To explore the potential of these operations, we used the Damascus Gate and the Citadel, two of the city's important sites, as case studies. The student team gathered all the relevant information and sources regarding

these two sites: articles, photographs, excavation reports, videos, etc. Additionally, the team consulted specialists in the history and archaeology of Jerusalem,[3] who pointed us to less-known sources.

Concomitantly, we invited Amy Giuliano, an international expert in virtual reality technologies, to photograph both sites and produce 3D models. These models allow users to conduct high-quality virtual tours of the two sites and review various sources within the tour (https://my.matterport.com/show/?m=1Xop2o84mGG; https://my.matterport.com/show/?m=mmLUR3Rn8wY). This part of the project also served as a case study of photogrammetry and 3D modelings' potential as research tools for archaeology, architecture, and site and artifact visual reconstruction (e.g., De Reu et al. 2014; Howland, Kuester, and Levy 2014; Douglas, Lin, and Chodoronek 2015; Weigmann 2016; Corniello 2020; Jones and Church 2020; Magnani et al. 2020).

8. The JHKC's Pitfalls and Challenges

Unification of data produced and curated in different institutions with different needs, assignments, and missions usually requires intensive, careful mapping and information checking and accommodation. The primary pitfalls and challenges can be summarized as follows:

- *The city's limits*. The city's boundaries changed over time, expanding and contracting with conquests and dominions. Responding to this challenge, we avoid-ed establishing a cartographic definition of the city's limits as a category of data collection, adopting a flexible approach to the question of Jerusalem's limits.
- *Different geographical cataloging concepts at the entity level.* While the NLI classifies an entity at the site, street, or neighborhood level, the IAA applies a higher resolution, assigning entities to area cells in sites or exact locations in extensive geographic units. For example, the NLI will catalog a synagogue ac-cording to the building's address, while the IAA will catalog it using a polygon locating the winepress underneath the synagogue.
- *Site classification and location.* Place names and locations had to be unified in the project's initial stage. This was necessary for data unification, as we relied on geographical locations as the substrate for data integration. Parallel naming of sites had to be unified and updated within the NLI database.

[3] We particularly thank Prof. Ora Limor and Dr. Shlomit Weksler-Bdolah for their assistance. Thanks are also due to the members of the steering committee, headed by Ora Limor: Sara Cohen, Tawfiq Da'adli, Kimmy Kaplan, Eilat Lieber, and Iris Shagrir.

- *Unprovenanced data.* We assigned one point of interest to all geographically "orphaned" data (e.g., poetry, newspapers). The chosen location is the center of Gan ha-'Atzmaut in the center of Jerusalem. Due to the uniqueness of this point, a different symbology was chosen for it.
- *Multi-provenanced data.* A special treatment was needed to display entities with multiple locations. The task was challenging, given the need to display only those locations related to Jerusalem while providing a source's complete context. Pertinent examples of such cases are pilgrim or traveler itineraries, which include the route to and inside Jerusalem.
- *Dating unification.* While the IAA uses periodical terms derived from the organizational thesaurus, the NLI catalogs the periods as topics. There was a need to unify the two lists and make sure that the time frame for each period of the IAA corresponds to the equivalent period in the NLI. This matter is still under development due to language and search-option complexities.
- *Data organization.* Sometimes existing data had to be rearranged and accom- modated to meet the requirements of the JHKC's program. For example, the materials collected by Ellenblum were originally designed for facilitating ac-ademic courses and needed to be partially reorganized to fit the cataloging system of the NLI.
- *New technologies.* The JHKC was the first NLI project to use a geographical platform as its main user interface (UI). As far as the library is concerned, this was an entry into a new technological environment, which required data reorganization, data indexing, and the development of a geographical graphic user interface (GUI).

9. Sustainability and Service Capabilities

Choosing the NLI as the project's core institution and the HJKC's host ensures continued sustainability and maintenance. It transforms the project from an enterprise limited in time into an infrastructure that continues to be maintained and expanded as part of the library's ongoing activities.

We believe that several circles of users will benefit from the JHKC. The core community to benefit from the knowledge center will be scholars and numerous graduate students (both master's and doctorate-level students) who will use this vast database in creating, assembling, and studying Jerusalem in its widest aspects. We wish to establish the future core of Jerusalem scholars dealing with the ancient, historical, and contemporary city. Many more scholars in the wider circle will benefit from the center's resources. The number of entries into the site of the NLI is expected to exceed 400,000

sessions in the coming year, which is more than 1,000 sessions a day. This number is likely to increase even further once the project is launched, marking the central position of Jerusalem as an object of research and interest. Lastly, the outer circle comprises the general public. The Tower of David Museum boasts about 500,000 paid visitors a year. We believe that the yearly number of people using the services of the center while visiting the city of Jerusalem can exceed 1 million.

10. Future Challenges

The future challenges of the HJKC encompass both technological and content-related issues. A major goal of the new center is to expand the distribution of knowledge beyond the academic world. To enhance public awareness and interest, the center formed a partnership with the Tower of David—the Museum of the History of Jerusalem. According to this partnership, the museum will use a paid targeted application to convey the knowledge accumulated by the JHKC to tourists visiting the city.

Since we strive to continuously expand the center's data, fostering smooth collaborations with datasets in other institutions is a prerequisite. Accordingly, one of the center's long-term aims is to establish collaborations with other organizations and share resources and database systems connected to the history of Jerusalem and the region (e.g., Savage and Levy 2014a; 2014b). Therefore, we plan to publish a cataloging standard, which will allow external datasets to easily integrate into the already existing unified database and infrastructure.

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