Mapping and Visualizing Testimonies of Spaces of Confinement:

A Digital Analysis of the Kraków Ghetto

by

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Thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts in the Department of Art, Art History, and Visual Studies in the Graduate School of Duke University

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ABSTRACT

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Abstract

The Kraków Ghetto was created in March 1941. Thousands of Jews lived in the blocks of the ghetto before it was liquidated two years later. Studies of Nazi ghettos often focus on the ideology behind ghettoization policies or the exceptional responses of individuals by means of covert action and resistance. There has been a lack of attention paid toward understanding the lives of those who lived in the ghetto or even investigations into developing a methodology for studying experiences of such space. Testimonies from survivors are rich sources of evidence that allow those who witnessed the ghetto to describe their own memories and perceptions. They are evidence of tough ethical situations that are otherwise difficult to imagine or capture.

Digital methods offer ways to explore difficult spaces and to ask spatial questions about a ghetto that no longer exists. I use historical research and digital methods to create visualizations that might help us better understand experiences of the Kraków Ghetto. While testimonies dictate the narratives shown in each of my visualizations, an understanding of the specific media of audiovisual testimonies, and the mediating presence of collecting institutions and databases is critical to engaging with this body of evidence. In this project, I use ESRI’s ArcGIS Pro to create a map of the ghetto and 3D buildings from point-cloud data. Models are animated in Autodesk 3ds Max to visualize specific audio narratives from testimonies. While the Kraków Ghetto is the focus of study, this project argues that digital visualizations have the potential to capture the affective qualities of testimonies and illustrate ambiguous bodies of evidence. Developing a digital methodology is crucial to future studies into spaces of confinement.
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1. Introduction

Scholars, museum representatives, and educators alike are challenged to question our understanding of the past and the ways that the past has been studied. The question remains - how can we, as scholars of a modern era, look back at the same spaces others have already considered and apply new modes of seeing? Digital methods offer an opportunity to look anew at not just where things happened but also to consider what else was present in both a qualitative and quantitative sense. The close listening of survivor experiences can be brought together with the far-seeing, distant views of mapping technologies. Visualizations can be investigative avenues into reconstructing environments for purposes of interrogating the past to understand histories of violence, of trauma, of place-making, and of spaces that no longer exist.¹

In this thesis, I use historical research and digital methods to create visualizations that might help us better understand experiences of the Kraków Ghetto. While this project is driven by overarching interest in histories and narratives of oppressed or interned populations, Kraków offers a unique path to studying spaces of confinement. Stories of the Kraków Ghetto are dominated by popular interest in the heroic actions of Oskar Schindler. Yet there remains so much more remains to be studied. The ghetto was located in a suburb of the city that existed before Poland was occupied and many of the buildings inside the imposed boundaries remain to this day. It is a space that both exists and is lost forever. It is impossible to recreate the ghetto, but testimonies from survivors can bring us closer to grasping nuances of what it was like to live within its walls.

¹ Forensic Architecture is a research agency that uses architectural technique and visualizations to investigate cases of human rights violations and state violence around the world. Their methodologies and research can be found in a volume written by the group’s founder. Eyal Weizman and Forensic Architecture (Project), Forensic Architecture: Violence at the Threshold of Detectability (Cambridge: MIT Press, 2019).
This project does not pretend to construct a simulation of what life was like in the ghetto; that would be impossible to capture. Instead it asks, how can an experience of the ghetto be communicated? Too often perpetrator narratives are dominant. An understanding of the Kraków Ghetto can just as much privilege what survivors remember and share in audiovisual testimony. The body of collected testimony far surpasses what can be studied or viewed by one person, but there remains a wealth of details in specific memories that can elicit new questions about the ghetto – how it was experienced, where are the unseen spaces, and which sites have greater significance than previously understood?

In developing an encyclopedia of Nazi-era ghettos, the United States Holocaust Memorial Museum (USHMM) worked with a definition that formulated the ghetto as “a place where the Germans concentrated Jews” before making case-by-case decisions on other circumstantial conditions. The Kraków Ghetto of occupied-Poland was certainly compulsory, though permits for residency in the ghetto were in demand – authorization to exist in a designated living quarter was still safer than trying to find a place outside the city. It was segregated, signs were installed outside each gate, residents were forced to wear armbands, and the Yiddish text was applied to the ghetto’s main gate. This enforced that the space was for Jewish people. Moreover, while the ghetto was enclosed, the residents were not always confined. There was constant movement into and out of the ghetto mainly concentrated on hours when individuals returned from their work.

2 I am reluctant to describe components of my project as a simulation and instead use terms like model, illustration, and visualization. Willard McCarty offers a mode of thinking that reminds us that in grammatical terms, modeling is indicative and simulation as subjunctive. Models approximate an unreachable truth while simulations actively operate with a willing suspension of disbelief. Simulations proceed from models similarly to approximate a truth, but also insists on alternatives to the truth. While McCarty’s distinction offers ample opportunity to debate the semantics of how these components should be described, I remain steadfast in not invoking the word simulation. Willard McCarty, “Modeling the actual, simulating the possible,” in Julia Flanders and Fotis Jannidis, eds., The Shape of Data in the Digital Humanities: Modeling Texts and Text-Based Resources, Digital Research in the Arts and Humanities (London; New York: Routledge, Taylor & Francis Group, 2019).

placements in the city. Hundreds of ghettos existed yet no two ghettos are ever the same, just as the experience of the ghetto can never be conflated into a narrative representative of the whole.

This research creates an opportunity to look at these tough places. A digital map or reconstruction of the ghetto offers a compelling space for both analysis and visual exploration. The pliable landscape of a digital environment creates room to look at the form of a place with open ended questions - of what ifs, how, and where – without the restrictions of a more traditional approach of merely what happened and to whom. It is difficult to translate textual evidence into databases, yet the process of doing so forces the scholar to work with and embrace the nuances of deeply human events and stories. Through databases and digital tools, material of disparate scale and mediums can be represented together. Volumes of physical newspapers can be broken into data cell entries and millions of cloud data points extracted to create building. 3D models can be layered upon 2D cartesian maps, with plotted points representing individual businesses all coexisting in the same system. The process of constructing the digital project fosters a deep familiarity with the spatial qualities of the ghetto that goes beyond what conventional historical or literary methods can achieve. There is an opportunity to test and experiment with visual representations and approaches to spatial analysis.

At the core of this thesis is a proposal to explore broader questions of how spaces of confinement may or may not be better understood through digital visualization. While this case study focuses on the Kraków Ghetto, this project also poses the question of whether or not a methodological approach to testimonial visualization can be developed for studying histories of other oppressed and interned communities. The limitations of GIS and 3D modeling techniques are acknowledged in this thesis, but I argue that they can be used as tools for new ways of understanding certain experiences of the ghetto and grappling with the emotive qualities of survivor testimonies.
The visualizations approach the possibility of capturing experience but ultimately rejects the impulse. The final animation gestures at something closer to an experiential illustration of a survivor’s memory of the ghetto. I was able to use digital tools to mediate in the presentation of disparate bodies of evidence. The complexity of testimony and subjective memory demands a multi-faceted approach. Audio editing, database creation, and 3D modeling were necessary digital approaches to managing the auditory, textual, and spatial modes of evidence that create a better encompassing model of the Kraków Ghetto. I operate with the desire to create a digital model of the ghetto that can be queried iteratively, transformed and adapted, by other scholars interested in Kraków Ghetto. The methodology developed for this project explores how studies of other spaces of confinement could similarly mediate and unify traditional modes of evidence to grapple with the difficulties of capturing deeply emotional and complex experiences.

This thesis does not offer change-over-time visualization of the space, or analysis of the ghetto’s development or impact on the city. One reason is that camps had to be planned and constructed over time, but ghettos for the most part took over pre-existing parts of the city. Instead, this project presents a space after it was designated as a space of confinement, while committing to study some of the individual lives lived inside the ghetto. The visualizations are part of an attempt to capture specific moments - pauses in long journeys that survivors endured during the war. Holocaust scholarship often focuses on camp life, but for the thousands that spent interim years in ghettos, what can be done to aid further study of their experiences?4 Survivor testimonies are rich sources of inspiration for informing us of how the space was experienced. All information has spatial qualities, but they are not necessarily expressed clearly or explicitly.5

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4 Even studies on ghettos have a tendency to focus on the evidence from ghettos rather than experiences.
Recorded testimonies demand close listening of witness narratives to identify places, however ambiguous and unclear, that carry significance to their experience of the ghetto. The maps and building models in this project create the environment in which testimonies can be visualized. And survivor narration returns the viewer to moments of individual significance to create a more nuanced view into spaces in the ghetto that are actually places of deep meaning in their memories.

The first half of the following chapter reviews the history of the Kraków Ghetto and is followed by a section that critically engages with the major collections of audiovisual testimony. In looking at the narratives of how testimonies are collected and the mediating effects of interviewer, institution, and digital archives alike, this section aims to examine the evidence at the core of each visualization in this project. The rest of the chapter tracks the way testimonies have been integrated into historical studies of Nazi ghettos. The third chapter looks at multidisciplinary approaches and the ways knowledge and methods from geography, archaeology, and the humanities have been combined to study and create virtual landscapes. The fourth chapter presents the three case study testimonies and the spatial qualities driving the visualization. The methodology of the project and the choices made in this reconstruction of the Kraków Ghetto are presented in the fifth chapter. The final chapter considers possible future steps for the project. The argument concludes by evaluating both the process of this research and the impact of the final visualization in future spatial studies of spaces of confinement.
2. Understanding the Kraków Ghetto and Testimonies

To better understand the context of this case study, there is relevant scholarship that must be considered. This chapter begins with a brief introduction to the central debates around Nazi ghettoization policy. An overview of the history of the Kraków Ghetto is followed by an analysis of the role testimonies played in post-war years and how audiovisual testimonies have since been collected and integrated into Holocaust studies. The final section offers a critical look toward understanding testimonies as mediated bodies of evidence that are nevertheless crucial to both this project and understanding survivor experiences.

2.1 The Ghettos of World War II

The ghettos of the Nazi regime marked a departure from the transcultural spaces of Jewish ghettos and living quarters throughout Europe. Understanding of Nazi ghettoization policy is split between “intentionalist” and “functionalist” camps. Intentionalists view ghettoization as part of a calculated process, a conscious direction toward the destruction of Jews. Functionalists argue that ghettoization was a crucial part of an unplanned movement toward the Final Solution, the appalling spectacle of over-crowded ghettos helped local authorities rationalize the eventual program of mass deportation and murder.1 Historian Dan Michman suggests that the Nazis were debating the advantages of concentration Jews into ghettos throughout the late 1930s.2 Only after the invasion of Poland in September 1939 was the policy of ghettoization officially adopted. Michman further argues that ghettos were only sealed because Christians were reluctant to abandon their homes in demarcated Jewish zones. Browning contends that neither side of the

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debate adequately explains ghettoization policy and the subsequent policy of mass murder, he argues that ghettoization was “carried out at different times in different ways for different reasons on the initiative of local authorities.”

The trope of pathologizing Jewish bodies made it easy for health officials in cities like Warsaw to argue for a sealed ghetto to protect the local population. Segregation would not be based on religious grounds but the racial-biological philosophies driving Nazi rhetoric. Varied responses from Nazi officials to the overcrowding and starvation of confined Jews evidenced the continued disagreement over the purpose of ghettos. “Productionists” argued that the ghettos could serve as valuable sources of labor and that economically productive ghettos could be beneficial to the Nazi war efforts. “Attritionists” saw ghetto populations as useless and saw starvation as a tactic for extracting the last of smuggled wealth among ghetto inhabitants. Productionists prevailed in the end. The purpose of the ghetto changed when it became clear that Jews would not be deported to Madagascar and the Reich needed more time to develop a more permanent plan. In Kraków, the aktionen and liquidation of ghettos beginning in 1941 would eventually supplant both policies, though all three practices were carried out haphazardly at different times in the ghettos throughout Nazi-occupied territory.

2.2 The Case of the Kraków Ghetto

Adolf Hitler established the General Government of the occupied Polish territories with a decree from October 1939. The Molotv-Ribbentrop pact between the German Reich and the Soviet Union saw to a swift division of territory between the two sides. The General Government

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3 Browning, The Path to Genocide, 30.
4 For more on the effects of hunger within the ghetto see Helene J. Sinnreich, “Hunger in the Ghettos,” in Wendy Z. Goldman and Joe William Trotter, eds., The Ghetto in Global History: 1500 to the Present, 1 Edition (New York: Routledge, 2018), 110-126. The categories of productionists and attritionists are Browning’s terms taken from his work as previously cited.
was a place ripe for German exploitation. The General Government itself was split into four
districts: Lublin, Radom, Warsaw, and Kraków as the capital. Hans Frank as the Governor-
General of the Occupied Polish Territories took his seat at the Wawel Royal Castle while major
German offices operated out of the historic city center of Kraków.5

Frank operated quickly to deploy exploitative economic and labor policies. By December
1939, he had decreed that all Poles between fourteen and sixty years old were obligated to work
for the Reich.6 By late 1940, the 60,000 Jews living in Kraków had been stripped of their legal
and property rights, access to their economic assets, and removed from employment in non-
Jewish institutions. Their gradual impoverishment was not enough; Frank wanted Kraków to be
entirely free of Jews. German authorities declared on May 18, 1940 that Kraków’s Jews had three
months to resettle to another town in the General Government. Those who left before the August
15 deadline could choose their new location and take personal belongings, while those who failed
to comply would be forcibly expelled with a limit of 25 kilograms of baggage per person.7 By
merit of particular trade or business skills – or by virtue of administrative bribery - thousands in
possession of special residency permits, Ausweise, were allowed to stay in the city. Yet by August
15, 1940 it was clear from the perspective of the occupiers, there were still too many Jews left in
the city.

The first ghetto in occupied Poland opened in May 1940 in Łódź, and another in Warsaw
just six months later.8 By early 1941, rumors already spread about the possibility that more

Clark, NJ 2005, p. 524” as cited in Monika Bednarek, ed., Kraków under Nazi Occupation: 1939-1945 (Kraków:
6 Hans Frank, Dziennik Hansa Franka, vol. 1 (Warsaw: Wydawnictwo Prawnicze, 1956), 35 as cited in David Crowe,
Oskar Schindler: The Untold Account of His Life, Wartime Activities, and the True Story behind the List (Cambridge,
7 Eugeniusz Duda, The Jews of Cracow (Kraków: Wydawnictwo “Hagada” and Argona-Jarden Jewish Bookshop,
1999), 62.
8 Crowe, Oskar Schindler, 145.
ghettos would be opened throughout the General Government. Kraków’s Chief of Distrikt, Otto Wächter announced the creation of the Kraków Jewish Living Quarter (Jüdischer Wohnbezirk) on March 3, 1941. For security and “health” reasons, a ghetto would be established in the suburb of Podgórze directly south of Kraków across the Vistula. Jews and Poles alike were shocked by the declaration that the ghetto would be established in Podgórze and not in the historic Jewish quarter of Kazimierz. All Polish residents in Podgórze were given the same deadline as Kraków’s Jews to vacate their homes by March 20. About twelve thousand people were moved into an area previously occupied by only about three thousand.  

Figure 1: Map of the ghetto showing walls and gate locations.

Based on figures in Katarzyna Zimmerer, “The Ghetto” in Bednarek, Kraków under Nazi Occupation, 288.
The original iteration of the ghetto was a dozen blocks of 320 mostly one- and two-story buildings. A rail line that linked central Kraków with the suburb of Płaszów ran through the ghetto which also included the central market square of Podgórze and ended just below the Krzemionki Hills. The boundaries of the ghetto were originally delineated by barbed wire entanglements. Brick walls were constructed around the ghetto in April 1941. Polish workers laid bricks to shut entrances and windows of houses that coincided with the ghetto’s borders to create a continuous barrier. The continuous border around the ghetto in 1941 was open at four gates. Besides the main gate, the others were merely breaks in the built walls, patrolled and guarded by police presence.

The main gate to the ghetto was at Podgórze Square directly adjacent to the central post of the German police and the Judenrat. A large Star of David was placed over the entrance and a phrase in Yiddish read Jüdischer Wohnbezirk (Jewish Housing Estate). Gate II was at the eastern end of Limanowskieg Sreet. Gate III at the juncture of Lwowska Street and Józefinska Street was built to allow motor vehicles and army units in close formation passage through the ghetto. And Gate IV between Kaçik Street and Plac Zgody opened up to what is today the Most (Bridge) Powstańców Ślaskich. This gate was most frequented by ghetto residents who had jobs in the city and had to cross the Vistula. All the signs in the ghetto would be changed from Polish to Hebrew with the exception of the sign above Tadeusz Pankiewicz’s Eagle Pharmacy, Pod Orlem.

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10 Crowe, Oskar Schindler, 145.
Figure 2: Photograph of the main gate to the Kraków Ghetto.

Source: Two German soldiers pose near the gate at the entrance to the Krakow ghetto. Photograph Number: 73170A. United States Holocaust Memorial Museum, courtesy of Instytut Pamięci Narodowej.

Threats of violence, hunger, and death permeated life inside the ghetto. Younger children were left in the ghetto when parents and older siblings left for work during the day. Walks between places inside the sealed ghetto were clouded by fears of random acts of violence.\textsuperscript{12} The constant fear of being beaten or shot by Germans or Poles was almost as concerning as any actual violence. Those employed outside the ghetto worked long, hard hours with little to no compensation and returned nightly to the walls of the ghetto.

\textsuperscript{12} Crowe, \textit{Oskar Schindler}, 153.
Yet daily life in the ghetto was not always so precarious. Though the uncertainty of life for Jews in occupied Kraków was oft commented upon in post-war testimonies, a degree of normalcy settled into ghetto life as its new residents attempted to adjust to their circumstances. Advertisements and articles in Gazeta Żydowska announced salons, tailor shops, plumbing services, appliances for sale, wigs for purchase, new cafes, and even symphony concerts. The slopes of Krzemionki Hill at the ghetto’s southern border is remembered as one of the few green

13 This map only offers a sample of the businesses and doctors that advertised in the newspaper between the months of March to June 1941, the first three months of the ghetto’s existence. While it is easy to describe the robust economy and community that emerged in the ghetto, the spread of points across the map shows how people operated across the entire ghetto.
14 LM0423 1940-1942, Gazeta żydowska Yudishe szeitung, United States Holocaust Memorial Museum Archives, Washington, D.C.
places where people gathered on Sundays. Despite being officially outlawed, religion and Jewish education still existed inside the ghetto. There were three synagogues: the Synagogue of the Bkur Cholim Society for the Support of the Poor and the Ill, Zucker Synagogue (now an art gallery), and Skawina Rabbi Symche Fraenkel’s Synagogue. There were three hospitals, a soup kitchen, an orphanage, an old person’s home, and a post office in the Kraków Ghetto. The *Jüdische Soziale Selbsthilfe* (Jewish Social Self-Help, JSS) organization inside the ghetto was an agency of the *Naczelna Rada Opiekuńcza* (Head Welfare Council, NRO) that was responsible for providing medicine and food for the charitable institutions.

The ghetto itself was administered by the *Judenrat* (Jewish Council), a conduit between the Jewish community and the German authorities. They were responsible for fulfilling orders, distributing official food rations, and maintaining public hygiene. They established the *Jüdischer Ordnungsdienst* (Jewish Order Service), also known as the OD, to maintain order. The unpaid militia position offered lucrative advantages for the men who volunteered, including passes outside the ghetto and access to goods that could be sold on the black market without fear of repercussion. In the first months of the ghetto, it was still possible for residents to access the outside city to purchase and smuggle in food to supplement their meager rations. For example, Rinah Birnhak’s family operated a cafe inside the ghetto and she would sneak into the city to purchase provisions for her family and business. Despite guards, Birnhak and other children would help one another sneak under fences or jump on trams passing through. At times her mother would distract guards with cakes and sandwiches from inside the ghetto as Birnhak

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16 Ibid, 299.  
reentered the ghetto. Yet the ability to take advantage of weaknesses in the ghetto’s security or the emerging black market still hinged on whether or not residents had pre-war assets to sell, or personal networks that could secure them jobs.

Work placements secured important documents for those employed - proof of their use and productive capacity for the Reich. Even a poor-paying or menial position could protect an individual from deportation. Still, work did not guarantee rescue from hunger. Most official work positions gave rations or payment akin to certain starvation. In diaries kept during her time in the ghetto, Halina Nelkin wrote about working as a pharmacy technician making what amounted to the purchasing power of just two loaves of bread a month. Officially, Jews were only rationed between 250 and 300 calories a day. Hunger and inevitable starvation could be delayed by the paltry rations certain jobs offered. Many ghetto residents took poorly paid opportunities in hopes of eventually trading up for employment with better benefits, or they turned to illicit measures to supplement their caloric intake. Despite efforts to build community within the ghetto, life became harder to manage as funds dwindled and meager rations failed to improve.

The ghetto was clearly overcrowded from its inception but, in the fall of 1941, a further six thousand Jews from other localities nearby Kraków were moved into unbearably packed conditions. In late November the Stadthauptmann responded by deporting nearly 2,000 Jews from the ghetto, dispatching them on cattle vans headed towards Lublin. Between May 29 and


20 Halina Nelken, And yet, I Am Here! (Amherst: University of Massachusetts Press, 1999), 68.

21 There seem to be some discrepancy between what Jews were rationed without any specific archive citation to confirm the actual number. In the biography of William and Rosalie Schiff, they cite the rations as: 2,600 calories a day for Germans, 700 calories to Poles, and 184 calories to Jews. Yet their entire book lacks citations to confirm these numbers, in this case the information from Zimmerer’s “The Ghetto” are presented. Either way, the allotment for Jews were well below what is required to maintain subsistence living.


June 10, 1942 three stages of displacement were launched. The German *Sonderdienst*, the Gestapo, and the *Arbeitsamt* were assisted by the OD and members of the *Judenrat* in carrying out a series of ID checks and issuing *Blauschein* – blue working papers – to those permitted to stay within the ghetto. Those without the papers or lacking new seals on their *Kennkarten* were immediately put onto trains. Within days, approximately seven thousand people were deported from the ghetto, again loaded into cattle vans towards fates unknown. Further changes were imposed on June 20 as the ghetto’s boundaries were moved to exclude the streets on Rękawka, Braci Dudzińskich, Parkowa, Benedykta, Czarneckiego, parts of Krakusa and Węgierska, and the even-numbered side of Limanowskiego.

Figure 4: The ghetto divided into Ghetto A for the working population and Ghetto B for the non-working group.

The contraction caused major overcrowding and general chaos. Businesses and workshops suddenly outside the ghetto’s walls had to be closed down. The hospital and orphanage were moved and forced to adapt to smaller accommodations. And Jews who
previously commuted to work at German firms in the city now found themselves living in barracks at their worksites. On October 27, 1942 a German directive announced the impending conversion of two nearby Jewish cemeteries into a labor camp. Weeks later, the blocks west of Plac Zgody were eliminated and the ghetto reduced once again. A decree from Frank announced on November 14, 1942 that there were only to be five closed ghettos in the General Government: Kraków, Radom, Bochnia, Warsaw and Lwów. Jews living outside the ghettos were to return to one of them and the General Government was declared *Judenrein*. The Kraków Ghetto was further divided on December 6 into two parts separated by barbed wire. Ghetto A was for Jews with jobs and Ghetto B was for those without proof of employment or *Judenpasses*. In March 1943, the newly appointed commandant of the soon-to-be finished Płaszów labor camp ordered the *Judenrat* to close the entire Kraków Ghetto for good.

Between March 13-14, the ghetto was liquidated. Only those from Ghetto A were meant to move to Płaszów. On the first day they were lined up on Węgierska Street and marched by guards to the camp. Children were separated from parents with false promises of a separate children’s barrack in Płaszów. The elderly, young, and infirmed residents of Ghetto B were assembled in Plac Zgody on the morning of the 14. By the end of the day, 3,000 people had been deported and nearly 1,500 murdered. Clean-up of the ghetto soon began and was systematically carried out. Jews were brought into the ghetto to remove and sort possessions from the previously occupied apartments. By September 1943 the barbed wire surrounding the ghetto was taken down and renovations began. The damaged buildings were to be made available to Poles and in

the end all traces besides two small parts of the wall were removed. Before the war, Kraków was home to over 60,000 Jews and by 1945, just over three thousand of them survived.26

2.3 Contextualizing Recorded Holocaust Testimony

The story of the Kraków Ghetto ends in 1943, but the city remained occupied until German troops withdrew in January 1945. Soviet troops entered the city just days later. The historic part of Kraków was saved from destruction and violence that the Germans left in the wake of their departure though the city’s remaining residents were left with new ambivalence toward the encroaching Soviet troops. Allied forces encountered shocking scenes as they moved into German-held territory. Soldiers were unprepared to find mass graves, abandoned camps, and dying people.27 Images captured by the photographers and journalists who accompanied troops horrified those at home. The visual evidence of what had occurred elicited an imperative to understand what had happened and how such things could have taken place. The avenues through which testimonies have been collected, used, viewed, and studied has changed throughout the decades. The history of recorded Holocaust testimony is important. Understanding how these deeply emotional, subjective, and valuable archives were created is crucial to any project that works with them.

In the immediate aftermath of World War II, information on what had occurred in Nazi-occupied territories was still incomplete. During the war, some Jews documented their experiences in the form of diaries, narratives, or artworks. Group documentary projects like those found in the Warsaw and Łódź ghettos have proven invaluable in the post-war era. There were early efforts to document the genocide as much as it could be understood at the time. Journalists

narrated news reports on the liberation of concentration camps, and photographers were
dispatched to capture what remained. The US Army Signal Corps and the British Ministry of
Information made film records of liberated concentration camps in April and May 1945. In all
cases, survivors were often seen but rarely heard.

In 1945, General Dwight D. Eisenhower issued an open call to newspaper editors to
document the liberated concentration camps. The journalists who answered his call to action took
photographs and wrote articles for audiences at home. These were consumed by audiences in
newspapers and magazines. Sometimes the narratives were turned into radio broadcasts.

David Boder, a professor of psychology at the Illinois Institute of Technology identified a
problem with the mediums deployed for the preservation endeavor. Despite all the visual material
collected, there was relatively little audio material, especially recordings that allowed survivors to
tell their own stories. For “psychological as well as historical reasons,” Boder noted the
importance of recording displaced persons in “not only their own language but in their own
voices.” In the summer of 1946, Boder traveled to Europe with a model 50 magnetic wire
recorder, 200 spools of wire, and a collection of converters and transformers. His collection of
119 interviews is the first recorded set of testimonies of survivors speaking of their experience of
the Holocaust even before it was known as the Holocaust. Boder’s work revealed the difficulty
of documenting an event while its full scope was still under investigation. Despite translating and
publishing interviews for an American audience, Boder’s work remained largely unknown until

28 Jeffrey Shandler, Holocaust Memory in the Digital Age: Survivors’ Stories and New Media Practices, Stanford
29 David P. Boder, “The Displaced People of Europe: Preliminary Notes on a Psychological and Anthropological
30 Carl Marziali and Ira Glass, “Mr. Boder Vanishes,” This American Life, October 26, 2001,
In the post-war years, Americans listened to stories of Jewish survival and persecution as dramatized by actors in radio plays. There were few opportunities for the voices of Holocaust survivors to be heard. Academics began publishing histories of the Holocaust, and there was a drive to make sense of the events that had occurred during the war. The narratives privileged political and economic approaches to understanding the events that surrounded and facilitated genocide. These perpetrator focused histories attempted to make sense of the Holocaust but in doing so neglected survivor narratives.

The voice of the survivor was largely absent until the trial of Adolf Eichmann in Jerusalem in 1961. It was the first court case to be broadcast internationally, viewed by millions in thirty-eight countries. Unlike the Nuremberg and Frankfurt Auschwitz trials that largely focused on the perpetrator, the Eichmann trial put survivors at center stage to provide legal testimony as witnesses of Nazi crimes. As suggested by Anette Wieviorka, the trial marked the first time “the Holocaust was linked to themes of pedagogy and transmission...but above all, the Eichmann trial marks the advent of the witness.” The charged immediacy of first-person accounts provided an emotional and human quality that could not be captured in documents. This triggered a wave of survivor memoirs and media attention.

Away from the public eye, changes in available technologies with audiotape recorders facilitated new forms of documenting survivor stories. In the way that state-of-the-art recording technologies allowed Boder to create mobile recordings, video cameras created new archival possibilities. For both private, familial endeavors and institutional projects, recordings changed the way testimonies could be documented, stored, revisited, and studied. In 1979, a local

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television station interviewed survivors for a broadcast documentary released to coincide with the dedication of a monument in New Haven, Connecticut. The collection of testimonies would eventually grow to become the Fortunoff Video Archive for Holocaust Testimonies (the Fortunoff Archive) now operated out of Yale University. The intersection of local initiative and public broadcast created a space for survivors to tell their stories outside the realm of legal testimony.

The following two decades saw the clear arrival of visual media into the realm of Holocaust remembrance and survivor testimony. Landmark releases permanently re-shaped the way testimony would be collected, shared, and consumed. The broadcast, for example, of the NBC television miniseries *Holocaust* (1978) to an audience of 220 million viewers brought the Holocaust back to the general public’s attention. Media helped to establish a “narrative template that categorized the Final Solution as a Jewish event in need of public recognition and explanation.” In the 1980s and 90s, a host of documentary television and film productions, including Claude Lanzmann’s *Shoah* (1985), put survivor voices at the forefront. Lanzmann’s film eschewed archival footage, relying solely on his interview with survivors, perpetrators, and witnesses. No audio translations were edited into the film. The voices of Lanzmann, interpreters, and interviewees are privileged and presented in tandem to create an act of witnessing in cinematic form. Lanzmann signals to the very impossibility of representing the Holocaust. His

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aesthetic approach is mindful of respecting boundaries of what should or cannot be transmitted through film.36

At the diametric opposite to Lanzmann’s approach, the release of Steven Spielberg’s *Schindler’s List* (1993) signaled the apex of capturing public memory of the Holocaust by way of America’s Hollywood industry.37 The film’s claims to representational narration laid the foundation for a new digital archive and signaled a new media landscape of considering the Holocaust in the present. In preparation for *Schindler’s List*, Spielberg and his team conducted interviews with Holocaust survivors from Kraków independently of testimonies previously collected by other institutions. The mission to create a morally galvanizing movie relied on testimony for survivor memories as “truth to experience.” The interviews collected for the film motivated Spielberg to establish the Survivors of the Shoah Visual History Foundation (the Shoah Foundation). Profits from the film provided initial financial support for what is now the Visual History Archive (VHA), the largest collection of videotaped interviews with survivors and witnesses of the Holocaust.38 Since its inception, the VHA has collected over 50,000 video testimonies from Holocaust survivors and continued to include testimony from survivors and witnesses of more recent and ongoing genocides from around the world. The VHA’s relationship with the film would directly shape the methodology through which its testimonies would be collected and have a far-reaching impact on Holocaust memory beyond what the filmmakers could have imagined.


The VHA exists as a documentary institution, there are no plans for displaying or exhibiting the testimonies collected in the archive. Unlike the VHA, the United States Holocaust Memorial Museum (USHMM) was always positioned to be public facing and educational. The USHMM not only established a methodology for collecting testimony, but the staff also concentrated on designing permanent exhibitions that could properly display recordings of survivor stories.\textsuperscript{39} The museum was authorized through a unanimous act of Congress in 1980 and declared a mission to function as a “living memorial” to the Holocaust.\textsuperscript{40} The museum’s dedicated oral history department signaled the institution’s strong commitment to utilizing digital mediums in telling the stories of survivors. The 1993 moment of both \textit{Schindler’s List} and the USHMM’s opening signaled a new direction for how the Holocaust would be seen and studied in the American context.

The Fortunoff Archive, USHMM, and Shoah Foundation are the three main collecting institutions that have played a role in facilitating the Americanization of the Holocaust.\textsuperscript{41} It would be difficult to capture the impact they have had on the way testimonies have been recorded and shared. Survivor stories have been recorded since the end of the war, yet robust archives of testimonies were only earnestly collected, made available for public consumption and integrated into documentary efforts beginning in the 1980s-90s. The media of audiovisual testimony lifted survivors from the pages of written accounts and brought the immediacy of their stories to a digital medium. It took longer for scholars to recognize the value of testimony in historical research and to begin analyzing the effects of the digital media on memory and remembrance. Even before the full acceptance of testimony in scholarship, institutions and methodologies were

\textsuperscript{39} Ibid, 58.
\textsuperscript{40} “A Unique Institution: The United States Holocaust Memorial Museum,” undated press release issued prior to the opening of the Holocaust Museum, USHMM as cited in Shenker, \textit{Reframing Holocaust Testimony}, 58.
\textsuperscript{41} To borrow from the phrasing used by Shenker in his preface. Shenker, \textit{Reframing Holocaust Testimony}, xi.
already documenting witnesses and their testimonies in anticipation of the time when survivors of the Holocaust will no longer be alive. There exists a time-based imperative to document individual, lived experiences of a still confounding historical event. Yet the extent to which these institutions and other media representations have exerted a mediating presence onto the collected testimonies also allude to the necessity of looking at how testimonies have been and continue to be deployed in research and education.

2.4 Studying Testimonies

As outlined in the previous section, testimonies have been collected since the end of World War II. Yet how testimonies were received changed considerably - first as legal evidence before being acknowledged as bodies of historical evidence. Witnesses were crucial in providing testimony in legal proceedings, beginning with the Eichmann trials, yet it took time for Holocaust scholarship to understand the value of survivor voices. Prior to the use of testimony in research, commemorative, and educational measures, studies into survivor testimonies focused on attempts to understand how memories took shape. For example, conceptions of common and deep memory have been explored by Lawrence Langer, Saul Friedländer, and Charlotte Delbo among others. In Langer’s work, he differentiates between common memory and deep memory to show how “a witness can move from the chronologically grounded and more removed nature of the former, only to find him- or herself thrown out of sequence by the destabilizing and often anti-redemptive grip of the latter.”

Psychologist Henry Greenspan’s work focused on implications imposed by

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42 The VHA have a holographic survivor testimony that is meant to mimic the presence of watching a survivor speak firsthand of their experiences. The ethics of such a project and future media iterations of testimonies will be analyzed in forthcoming work by Shenker.

the existence of listeners whose very presence affect how survivors tell their stories, how events are remembered, and the order in which they are told. Early analytical work on testimony was about the quality of their retelling, as well as how the stories of those who bore witness to events could be deployed in legal proceedings, and trauma. There came a tipping point when the role of testimony in Holocaust research changed the evidentiary value of testimonies and their power in conveying experience was recognized.

In his scholarship on survivors of the slave-labor camps of Strachowice, Poland, Holocaust historian Christopher Browning argues for an integrated approach between traditional sources, like archival documents, and testimonies. He is critical of historians’ tendencies toward sidestepping postwar testimony in favor of surviving contemporary documents. More importantly, Browning contributed to the methodology of using testimony as historical evidence by acknowledging their limitations while arguing that they could be used responsibly, especially in cases when the lack of archival evidence necessitated the use of testimonies in place. He builds on Greenspan’s conclusions that noted the lack of differences between early and late survivor testimonies, survivor memories could be more stable than previously understood. Browning argues that beyond a critical approach in analyzing the authenticity or factual accuracy of survival accounts, there remains a core memory that emerges from the critical mass of testimony. There should be less focus on validating minute details from each story. Testimonies should be taken as generally gesturing toward truth and representative of a possible experience of a camp or a ghetto rather than of an absolute truth. Testimony can be most effectively deployed when understood as

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a fragmented, conflicting collection of personal accounts, and not as a homogenous representation of collective experience.45

Browning’s methodology and critical approach toward postwar testimonies has directly influenced the scholarship Noah Shenker produced on the audiovisual testimonies that have been collected by the three major institutions.46 Browning recognized the interventionist presence of interviewers from each of the institutions. They help survivors articulate the retelling of their experience yet impose narrative story lines and dismiss digressions deemed unimportant to each archive’s methodology.47 Scholars who integrated survivors earlier on had the benefit of being able to conduct supplemental interviews and revisit survivors to ask questions beyond what was captured in available testimonies. As it becomes increasingly impossible to talk to survivors for direct research, it becomes more pertinent to understand the ways video testimonies are inherently mediated records. Shenker analyzed institutional history to demonstrate how cultural agendas and interviewing methods influence and frame the testimonies collected and distributed. Though some have argued that video testimony actually blocks attempts to frame trauma in a redemptive way, Shenker argues that personal and institutional voices do play a role in constructing closure and redemption narratives in the testimonies they capture.48 He distinctly looks at the medium of recorded video testimony, the presence of the interviewer or literal framing of the camera, as impacting how the archive of the Holocaust and genocide is being created, distributed, and remembered by these institutions. Understanding testimonies as mediated bodies evidence becomes a crucial point to any study or project that works with them.49 As records of lived

46 Shenker, Reframing Holocaust Testimony.
47 Browning, Remembering Survival, 6.
49 For further reading see Hannah Pollin-Galay, Ecologies of Witnessing: Language, Place, and Holocaust Testimony (New Haven, CT: Yale University Press, 2018). Pollin-Galay analyzes the meaningful differences between testimonies
experiences, the medium is distinct as both a singular representation of a survivor’s lived experience but also only one part of larger archives of survivor testimonies.

Tangential to Shenker’s work in thinking about the ways collecting institutions mediate the testimonies recorded, Jeffrey Shandler considered how the media surrounding presentation of the Holocaust has already affected on how these personal narratives are related. In his analysis of the VHA’s interface, Shandler also suggests that the indexed keywords that scroll along with the testimony in real time creates a different network of survivor relations. The keywords both disrupt the user’s experience and tie the testimonies to one another by a different means of narration. He looks critically at media practices and the tendency to understand the VHA itself as an “artifact of remembrance.” Even though the VHA’s Holocaust testimony efforts have concluded, Shandler argues that it is still a complex, ongoing part of developing practices for scholars, artists, and educators alike to reconcile memory and media in digital form. The testimony and archive are precious sources of future and ongoing work generated from the preservation and transmission of survivor experiences.

Shandler’s critical look at the VHA’s interface builds directly from Todd Presner’s proposal for a more crowd-sourced model for indexing the archive as a way to fully embrace the open-source ethos of the Internet. Presner locates new ethical questions that arise from the move toward digital and computational methods of analyzing survivor testimony. For Geoffrey Hartman, a founder of the Fortunoff Archive, video testimony offers an “optic” for viewers to experience their nonexperience of the Holocaust. They create a “duty to listen and to restore a

depending on the language spoken and where survivors lived their postwar lives. She thinks about how non-places are described, and how metaphorical language gestures at motion between places. In my listening to testimony, I listen for movement and spatial qualities but refrain from close language analysis.

50 Shandler, Holocaust Memory in the Digital Age, 172.
dialogue.” He positions them as dialogues between the survivor and the viewer, yet in acknowledging the mediating circumstances of their collection and production, it becomes clear that these recorded testimonies are not exchanges between two individuals. They evidence memories, but do not engage in two-way interactions. Despite the presence of an interviewer, to view a recorded testimony is a one-sided experience. The databases of testimony archives are called into question when information management systems inflect another unseen hand in how testimonies are searched, selectively listened to, and consumed. Presner suggests the indexicality of these databases expel human expression from the data. The objectivity of information manifests in a way that erases the nuance of survivor stories. He ultimately argues that the ethics and “interpretive practices at the heart of the humanities” can be applied to the realm of information and database architecture as a way to guide computation representation.

Beginning with Browning who argued for a critical methodology and space for testimony in history, subsequent scholarship has put forth an analysis to better understand Holocaust memory through testimony in the digital age. Still, as Presner argues, the idea of testimony as a digital product can be problematic and elicit deeper questions about the impacting role of media. Despite the volumes of work that have been made richer by the inclusion of testimony, there are increasingly new ways to analyze the available audiovisual records. The digital space embodied by the medium of audiovisual testimony can be studied in manifold to be critically aware of the ways institutions, interviewing practices, and even the databases that organize the testimonies themselves mediate the listening of survivor experiences.

53 Ibid, 201.
54 For further reading see Christopher Browning, Ordinary Men: Reserve Police Battalion 101 and the Final Solution in Poland (New York: Harper Perennial, 1998). And Tim Cole, Holocaust Landscapes (London: Bloomsbury Publishing, 2016). Testimonies play a crucial role in each of these works, they function as supporting evidence rather than driving the histories explored in each volume.
3. Place-making, GIS, and Affective Visualizations

Digital methodologies create avenues into analyzing spatial questions beyond traditional historical scholarship. At their most limited, visualizations can only show as much as the scholar has compiled in their database, or animated based on their expertise in computer graphics technology. Models communicate what the human hand that creates it wants to represent. Each GIS, map, and animation in this project represents an abstract reality made to fit into the technological system of their making. Yet each digital tool also brings us closer to the potential of a better model of physical realities that existed in the past. Understanding the nuances of what each platform demands of its user also enables us to push its capabilities further. The digital can give visual form to the broad strokes of ambiguity in testimony and personal experience of places – unveil narratives that otherwise exist under the shadow of dominant narratives.

People give meaning to places to develop and discover their own identity. Places acquire meaning through significant experiences and transitions regardless of positive or negative connotation. They are our connection to the past, to history, and “can be like a path mark of the point we were back then.” Meaning is especially potent when places are no longer existent or absent in the life of the person relating to it. The specific case of Kraków is notable. It is possible to walk the modern-day streets and stand between some of the same buildings that were part of the ghetto. Yet the ghetto as it was, a space of confinement, surveillance, and uncertainty, is gone forever and will never be recreated. Creating a visualization of the ghetto is an attempt to grapple

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1 As the authors of the introduction of Knowles, ed., Geographies of the Holocaust, would like to remind us of their projects - “we are empiricists, not positivists.” For further reading on models conceptually, consider the chapter “The Miniature” from Susan Stewart, On Longing: Narratives of the Miniature, the Gigantic, the Souvenir, the Collection (Durham: Duke University Press, 1993). Or “Models and Archetypes” from Max Black, Models and Metaphors: Studies in Language and Philosophy (Ithaca: Cornell Univ. Press, 1981). Both operate on an understanding of models as metaphors. While their concepts may not apply comprehensively to digital models that don’t occupy physical free space, they help to make a case for the power of models.

with spatial questions and narratives through digital environments. To borrow Victoria Szabo’s phrasing, what this work does is attempt to “apprehend the past” rather than fully recreate or simulate what is now lost.³

For geographer Yi Fu Tuan, place is a pause in movement that “makes it possible for a locality to become a center of felt value.”⁴ He argues that space and place require one another to be defined. It is the contrast between the two that allows the other to be possible. If place is a break, then a nebulous condition is its contrast. Space is freedom, the power to act and transcend the present condition.⁵ Tuan’s conceptions of space and place are not concrete, and it is the exact illusive nature of these notions that have been integral to my understanding of the where, why, and how of this digital project. For many authors, like Tuan, place is socially constructed and operating. Yet the processes by which place making and meaning are constructed can also be further broken into various scales.⁶ Different factors affect place making on national, local, or individual scales - this project focuses on individual place making.

Though Tuan’s work operates on the notion that place is static, the meaning of places changes and often in flux. The Kraków Ghetto was simultaneously been a space and a place. For the German perpetrators designating its boundaries, it was a space on a map separated from their own living quarters. The oppression of unwanted populations in newly occupied territory adds to a sense of national place making for the relocated German officers and families. Re-naming the streets of Kraków attached new meaning to the old city. The ghetto only became a place of meaning once Polish Jews were resettled into it. Places are the anchoring points where people

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⁴ Yi-Fu Tuan, Space and Place: The Perspective of Experience (Minneapolis, Minn.: Univ. of Minnesota Press, 2011), 138.
⁵ Ibid, 52.
affix their memories. For its Jewish residents, the ghetto was still a space unknown and unfamiliar on the first day they moved in. For those from outside Kraków, the ghetto could have felt like a temporary stop after a prolonged period of uncertainty and displacement. Meaning was inscribed to place when residents realized they were caught, while the boundaries of the ghetto also demarcated a space that was theirs to belong to. It was the memories of homemaking and family life, and the experiences of terror or momentary reprieve that transformed the Kraków Ghetto into a place. As this project questions, how can place be visualized in the context of its space? The slippery nature of capturing moments of place making challenges the boundaries of what is possible in visualization and mapping.

Our methodologies need to create digital environments that allow for creativity and ambiguity in digital spaces. A geographic information system (GIS) can be defined as a software system that enables layers of spatial information to be layered, analyzed, and visualized.7 GIS was developed in the 1960s as a tool to map land-use and monitor regional natural resources. Beginning in the 1980s, GIS was increasingly adopted into human geography to analyze quantitative sources like census data.8 At the same time, GIS entered the humanities through archaeology as a resource management tool. In the 1990s, historians began to use GIS primarily to study quantitative demographic or environmental data. By the 2000s, the more limited sub-field of historical GIS developed to a point of recognizing GIS as an avenue for applied research rather than just technology and method. The developed of digital humanities increased scholarly interest in using GIS with traditional resources like maps, texts, and images. GIS has a position in

8 This brief overview relies heavily on as history of GIS summarized in Constance Crompton, Richard J. Lane, and Raymond George Siemens, Doing Digital Humanities: Practice, Training, Research (New York, NY: Routledge, 2016), 178-79.
the spatial humanities as not merely a visualization tool, but a driving force for researchers to ask questions about a location beyond merely where and when.

GIS has the capacity to be a platform for narrative generation in its simultaneity in mapping events across time and space within the context of their spatial qualities. It can connect actors, locations, actions, and time, acting on the interplay of both generalization and specificity to generate narratives out of spatial information. The maps or map-like visualizations created from GIS draw links between disparate sources and help to communicate narratives. This project works with a smaller sample size, a micro-history approach to testimonies from survivors of the Kraków Ghetto. GIS can help to generate visuals for the place where lives were impacted and experienced, as opposed to a textual retelling of history as events were imposed upon or merely happening to victims. Rather than thinking of a GIS as a mapping system, approaching it as a database management system better highlights its ability to bring together information of differing scales and reconcile incommensurate sources.

GIS privileges quantitative data, it insists on specificity and is less adept at representing uncertainty. To create a qualitative database is to make uncertainty machine legible, while the success of the final product is dependent on components made human readable. Qualitative GIS is more than just linking or storing spatial or visual information within the same geographic system. By now, most GIS software has developed to accommodate a variety of multimedia. Yet, in addition to a conventional GIS, a qualitative analytical approach “assumes that geographic phenomena, their relationships, and their meanings are produced and negotiated at many different

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10 Paul B. Jaskot, Anne Kelly Knowles, Andrew Wasserman, Stephen Whiteman, and Benjamin Zweig. “A Research-Based Model for Digital Mapping and Art History: Notes from the Field.” Artl@s Bulletin 4, no. 1 (205): Article 5.
moments in GIS development and application.” 11 Sarah Elwood and Meghan Cope position qualitative GIS as a mixed methods approach predicated on the premise that knowledge is always partial and situated. 12 Multiple approaches can be brought together under circumstances to create valid, hybrid epistemologies to foster understanding for specific circumstances. A mixed methods research approach acknowledges that the work done is inherently political - the methodological decisions made toward data or visualizations have social and political consequences. GIS researchers have critical agency in bringing together complexities for purposes of further knowledge production.

Writing comprehensive histories of any topic will always be impossible, there will always be some culture, group, or individual missing, no interpretation can ever be without detractors and criticisms. In historical and art-historical GIS projects, the politics of who or what is excluded from the data is more implicit, hidden in the historiography of sources or context of the subject itself. Embracing idiosyncrasies in archives and evidence is an important step in creating geo-spatial databases, the information both present and absent influences how data is ultimately structured to be legible to a GIS. 13 Scholars know their evidence is selective, and geographers know that maps lie, but the degree to which that is reflected in a digital visualization is not always obvious to most viewers. 14 For a user to critically review HGIS projects is to not

11 Cope and Elwood, Qualitative GIS, 2.
only scrutinize the ways data have been qualitatively registered but to also take note of what is represented or missing from the map itself.

While HGIS has a tendency to draw on methodologies for studying textual evidence, qualitative research is useful for “recovering the silenced voices of marginalized individuals and social groups whose feelings and thoughts have been ignored by the dominant discourse.”15 The politics of participatory GIS is at the forefront, for HGIS its often implicit, hidden in the historiography of sources or context itself. The subjectivities of subject matter might speak for itself but when something is focused on visualization, illustration, the politics needs to be fully acknowledged in symbology and communicated. GIS has the capacity to be a platform for narrative generation in its simultaneity in mapping events across time and space within the context of their spatial qualities.16 GIS connects actors, locations, events, and time, operating on the interplay of both generalization and specificity to generate narratives out of spatial events. With a smaller sample size, such as a micro-history approach to testimonies from the Kraków Ghetto, GIS can help to generate visuals for the place where lives were impacted and experienced, as opposed a textual retelling of history as they were imposed upon or merely happening to victims.

Critics of GIS point to inadequacies in its representative capacity, positivist epistemology, data driven methods, and even its role as surveillance or military technology

deployed by the state.17 While GIS continues to be a valuable research avenue in the humanities, scholars working with GIS must contend with a number of common obstacles. Within GIS, a mix of multimedia formats, qualitative, and quantitative data find place for simultaneity in presentation. Yet one result of layered media is a problem of legibility. Interactivity and the ability to toggle layers is almost always necessitated by virtue of allowing any user to read everything that has been collected. In authoring traditional maps, symbology is crucial to creating a stand-alone product easily understood to convey what the author feels most important to the reader.18 In designing the final product of a GIS, symbology and contextual knowledge of relevant visual history becomes every bit as important as going to the basics of UX design and understanding how users might perceive and experience the project.19

Stuart Aitken and James Craine coined the term “affective geovisualization” to propose a link between “emotive work in geographic studies of media, particularly film, and some of the cognitive and behavioral work in geovisualization.”20 Their concept developed out of a desire to create with dialogue between the tools and techniques of spatial visualizations, and the emotive work in geographic studies of media. GIS is often more impactful to create than to consume, more interesting to think about than to experience. Aitken and Crane are concerned with GIS as a technology of information transfer and knowledge production. It communicates not only events and phenomena as they happened but also enables researchers to see what might not be readily visible. GIS can both construct and deconstruct spatial reality to enact an experience of was

18 Crompton, Lane, and Siemens, *Doing Digital Humanities*, 187.
physically present. Such an approach asks both the user and the maker to go beyond images, how things are visualized, and to look at the affective properties of the image. They contend that affective geovisualizations “promote the look and being of the viewer/consumer – understanding that production comes first, followed by the perception it guides.”

Geovisualizations can take the perception of GIS representations as natural or inherently true to draw attention to alternative narratives – to make visible the unseen experiences and stories that coexist in the same locality. Aitken and Crane crucially draw attention to the idea that the meaning of geographical representations is in constant flux. Visualizations have the power to be emotive, comforting or intimate, threatening or distancing. Mei-Po Kwan developed GIS maps with subjectively colored, abstracted representations of women’s fear of downtown locations at night. Kwan mapped routes of women’s daily movements and photographs of the physical spaces to experiment with the potential to incorporate emotional response to place within conventional GIS databases. Affective geovisualizations can be used to examine the act of seeing external images of what is most evident, and the internal process of what is understood and processed. Aitken and Crane’s proposed methodology acknowledges the power of representation and draws attention to how a user can be grasped by the emotive reach of a digital environment.

The GIS of the Kraków Ghetto at the most basic level captures perpetrator defined spaces. Mapping Jewish established businesses and addresses in the ghetto marks one step in drawing viewers toward a more nuanced understanding of how residents made attempts to create a semblance of normality in their ghetto. This thesis also embraces the ambiguity of testimony

21 Aitken and Craine, “Into the Image and Beyond” in Cope and Elwood, Qualitative GIS, 153.
22 Ibid, 154.
and attempts to convey the affective qualities from this body of evidence that are otherwise absent from non-qualitative GIS.

At the core of this project lies survivor testimonies. Viewing testimonies effects people. The sounds of voices, faces of the aged survivors leave lasting impressions and people can only view testimonies for limited periods before they have to stop entirely or take breaks. In using videos for teaching, Dominick LaCapra has found that students generally reach their limit after one hour. Within that limited time frame, LaCapra also questions whether it would be possible to develop an ethics of response for secondary witnesses. He reminds us that watching testimonies or reading texts is not akin to making contact with the survivor. An academic cannot assume the voice of a survivor. Most testimonies do not begin accounts of ghetto life until at least an hour into the video. Listening for spatial cues and experience of the ghetto requires intentionality. For the brief moments that this visualization uses, the survivor is allowed to narrate and dictate their own memories. The ghetto stops being merely a space of confinement, but the environment in which something impactful took place. Scenes of evasion, normalcy, and terror carry different weight for survivors. No two experiences can be replicated or identical, but this project challenges the limits of digital visualizations to transfer and bring viewers back to individually potent spaces.

4. The Evidence of Testimonies

Given the VHA’s vast database, parsing through and eventually selecting a set of testimonies presented a very difficult step. The chosen testimonies represent just three of the nearly 2,000 results based on a criteria search of Jewish Survivors given in English based on the term “Cracow ghetto.”

The testimonies of Leon Leyson, Marianne Rosner, and Nathan Nothman were selected based on a spatial narrative that took place inside the ghetto from each of their stories. These records also appear in the first three pages of the search results. The design of the VHA’s database determined that Leyson, Nothman, and Rosner’s testimonies were among the most relevant based on the search results sorted by “Video Availability,” an unseen influence in shaping the likelihood that these records would be seen and studied.

Leon Leyson was born in 1929 in Narewka in Eastern Poland. About half the population of Narewka were Jewish and attended the only synagogue together. Leyson recalls a comfortable

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1 Search results inclusive of all languages totaled nearly 3,000 and the spelling of the city of Kraków reflected the internal tags of the VHA database, specifically “Cracow (Poland: Ghetto).”
childhood surrounded by sibling and extended family. The family eventually moved to Kraków around 1938. His father was a machinist already living in the city after being transferred out of their hometown. When the family was forced into the ghetto at the end of 1940, Leyson noted that they already lived on the same side of the Vistula as Podgórze, “not too far from our original place.” People that refused to move were either caught or shot. The interviewer asks Leyson if he had ever seen anyone shot - he had - and whether he feared the same fate for his father. Leyson did, “all the time,” and offers memory of an incident that occurred in 1941. After taking an elderly woman to the hospital, Leyson and a friend were late returning home before curfew. The two were caught and fired upon by a guard, the shots missed Leyson’s friend and the two ran in separate directions. Leyson narrowly escaped a second round of gunfire because he had just, “managed to jam myself into an entryway in another apartment house that was recessed.” After he was let inside, Leyson spent the rest of the night hidden in an apartment without being able to let his family know of his safety. The episode had a lasting impression and he “never went back” to the same area and used to “make a big turn…to avoid that place where the guard stood.” Leyson wraps up the memory, wryly noting that it was just one of many incidences that his family went through. For him, the two worst things about the ghetto was hunger and constant danger of trouble.

Though only four of the 181 segments in his testimony, Leyson’s memory of the harrowing night offers a spatial journey through the ghetto. It begins at the hospital and identifies several interactive points: a spot where a guard stood, a recessed doorway that suddenly became a source of evasion, and a new buffer point that Leyson would avoid for the rest of his residency in the ghetto. The spatial narrative brings together points of reference both readily identifiable, like

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2 Leon Leyson, testimony 8916, tape 2, segment 46.  
3 Ibid, segment 49.
the hospital, and places that only carry meaning for Leyson as a witness. For example, after an hour of recording, near the end of the second video, Leyson describes his sister’s forced removal to a nearby labor camp as another uncontrollable incident. Responding to imagined critics as to why the family did not resist or leave the ghetto, Leyson retorts “this was our home, this was our place, people didn’t just pick up and move and there was no place else to go.” Without going into detail, Leyson mentions that he slipped out of the ghetto many times as a child without detection, but lacking secure network or shelter in greater Kraków meant that it was still safest to remain in the place of home and family life. The fear of being found and arrested outside of the ghetto was worse than managing the uncertainty of daily life within.

Unlike Leyson, Marianne Rosner was born to a wealthy Jewish family in Vienna, Austria in 1910. Rosner’s father owned a successful Cafehaus business and the family resided in a large apartment with servants in a mixed neighborhood of both Jews and Gentiles. Rosner married a violinist and the couple left Vienna in 1930 to fulfill her husband’s orchestral contracts. Rosner settled in Warsaw after her son was born in 1935. By 1939, the family was living in Kraków when they were suddenly deported by train in the middle of the night to an unfamiliar town in the countryside. Unsure of where they were and where they should go, they walked back to Kraków and in 1940 the Rosners moved to the Warsaw Ghetto where Rosner’s husband played in a café. When rumors began to circulate that the Warsaw Ghetto would be sealed off, Rosner’s family moved again to a town outside of Kraków before the ghetto was created and all Jews from the district were forced into the Kraków Ghetto.

Rosner experienced a year filled with constant displacement and uncertainty. Yet once inside the ghetto, she was faced with daily boredom, overcrowded living conditions, and

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5 Marianne Rosner, testimony 24958, tape 1.
relentless difficulty paying for food purchased on the black market. As Rosner recalls, “when you had money you could have [food], the black market was blooming.” Rosner’s brother-in-law liked to play cards with friends so “at night, after the children went to sleep, they came up into the house.” When it was 11 o’clock they would get hungry and Rosner would serve cake, coffee, or sandwiches she made during the day. The interview does not follow up to ask Rosner more questions about her evening guests and quickly moves on to ask about general conditions in the ghetto, interactions with the Jewish police and worsening options as people ran out of money.

The memory described by Rosner is not singular in occurrence as Leyson’s brush with danger, she describes a regular gathering with no context for their duration or frequency. Rather than the witness experiencing spatial action on the ghetto streets, Rosner’s home becomes the focus of spatial movement. It was a routine for men to gather at the Rosners’ apartment at nighttime, moving bodies from within apartment buildings, to the ghetto streets, and back into the security of a crowded, but known lodging space. None of the guests were mentioned by name or linked to the testimony so it is not possible to refer to their memories of gathering into the Rosner apartment. But the short minute-long recollection is enough to reveal much about life in the ghetto as a complex place of women’s domestic labor, social gatherings, and evening respite. The nuanced memory counters misconceptions that might otherwise characterize the Kraków Ghetto and other ghettos as mere spaces of confinement.

The third testimony is that from Nathan Nothman, born in Kraków in 1925. The family lived comfortably in Kazimierz, the Jewish neighborhood. His mother operated a store and his father worked as a plumber. They were expelled from their home in March 1941 and forced to move across the Vistula to the Kraków Ghetto. Unlike other testimonies, discussion of the ghetto

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6 Ibid, tape 2, segment 33.
begins quickly at six minutes into the recording, just seven segments after the start – both the interviewer and Nothman spend little time contemplating his pre-war life in Kraków. In recounting the ways Jews were humiliated or physically threatened by German soldiers, Nothman recalls that German police would often enter the ghetto to catch Jews for labor jobs. Once, while he was inside “the marketplace,” trucks of soldiers entered but he evaded capture by running inside a building. As Nothman explains, “by the time I was in the building, I wind up half a mile away because you could jump the fences inside the building because the buildings were connected together.”

Nothman shares that he frequently left the ghetto with this brother, both blond boys who spoke Polish perfectly. Though unclear as to how they left the ghetto, they would jump off the streetcar before it reached the ghetto and go to the “wall back to the ghetto.” Throughout this testimony, Nothman is animated and quickly transitions between stories, sometimes confusing himself or the interviewer. When recalling a labor selection process in the ghetto, Nothman recollects the chaos that occurred when Jews realized they were going to be killed. They mixed with the safe crowd and ran into nearby buildings, to evade gunfire. He references back to his own escape in the marketplace, “like I said if you run to a building you can wind up 10 buildings away because you jump to it, or you go to the attic, or you run on the rooftop – as long as you’re in a building you’re safe.”

Nothman’s sense of security in the ghetto was shaped by certain factors: being off the streets, up higher in buildings, and indoors. Without a larger study of testimonies from the Kraków Ghetto, it is unclear whether or not this technique was more widespread or mostly unique to Nothman. Yet his testimony takes a spatial reference of the ghetto to the z-axis, upward and

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7 Nathan Nothman, testimony 10564, tape 1, segment 19.
8 Ibid, segment 28.
above ground level. Height as a factor cannot be represented in traditional 2D cartesian mapping and beyond ambiguity of site specificity, presents an additional challenge to visualization.

The testimonies chosen for this project are linked by the spatial quality present in the survivors’ retelling of their ghetto experience. Every experience of the Holocaust is inherently spatial as witnesses are moved out of their pre-war life, between ghettos and camps, and finally to their life post-liberation. This is not a new acknowledgement; scholars have worked on spatial places of the Holocaust before. For example, Tim Cole’s work on genocidal landscapes recognizes the place-making events that created micro- and macro-geographies within the landscape. While he captures places “between the scales of the continent and cattle car,” Cole fails to acknowledge the movements within these microgeographies as much as he focuses on these places and movements between. Close listening to testimonies specifically concentrates on episodes occurring within the walls of the Kraków Ghetto identified in these examples. These three testimonies are not representative of any particular subset of identity or even specific experience of the Kraków Ghetto. They are the center of this project and allow us to ask, where might this have happened? With all its spatial ambiguities, how can we visualize this? Can our digital methods capture the affective significance in each of these testimonies?

9 Cole, Holocaust Landscapes, 6.
5. A Digital Methodology

This thesis originated as a component of a joint project between Paul Jaskot, Anne Kelly Knowles, and Anika Walke titled “The Holocaust Ghettos Project: Reintegrating Victims and Perpetrators through Places and Events.” Their project aims to create a spatial model of 1,400 Jewish ghettos and analyze relationships between perpetrators and victims through geospatial methods.1 Jaskot’s own research on Kraków and the German construction industry from World War I through the Holocaust required a GIS map of Kraków. My original research focused on identifying addresses and points of interest within the Kraków Ghetto. Chapters from Oskar Schindler’s Enamel Factory Museum’s catalog of their permanent exhibition, Kraków Under Nazi Occupation: 1939-1945, were integral in providing context and identifying archival resources. Translations of newspaper ads in the Gazeta Zydowska, photographs of the ghetto, and maps of the ghetto in its various iterations were also vital to the beginnings of the GIS project.

The advantage of GIS is that the system makes it possible for different digital layers to coexist and represent the various changes to the ghetto synchronously. I used Environmental Systems Research Institute’s (ESRI) ArcGIS Pro software for my project. Their powerful software insured that geographic analytics and 3D visuals could be handled within the same program, another factor in choosing to work with proprietary software instead of open source options like QGIS. To both the benefit and detriment of an ongoing project, frequent software updates introduced new ways to manage data and handle robust point cloud features. ArcGIS StoryMaps also allows for easy online publishing so project layers can be combined with supplementary text and images to create user-friendly multi-media storytelling sites.

Though the testimonies are the focal points for the final visualization, research began with gathering maps of the Kraków Ghetto. Historical maps of Kraków are widely available as copies of archival sources are made increasingly accessible through digitization projects. Survivor biographies and historical anthologies were also combed through for cartographic representations of the ghetto. A map of the ghetto from 1941 with its original borders served as the basis for all polygon and line features. The map clearly delineates where the borders of the ghetto were erected and symbolizes the locations of every gate. It outlines every block on what appears to be unit or room-level identification. Though the history of the city reveals that relatively few changes have been made to the buildings of the former ghetto, the base map is able to confirm the continuity visually.

Figure 6: Map depicting the major structural changes to buildings in the former ghetto.

2 Cited as “Chart in the collection of the Historical museum of the City of Kraków” in Bednarek, Kraków Under Nazi Occupation, 304.
The origins of the map are unclear. Further information on the circumstances behind its creation and additional documentation would allow for more granular mapping of the ghetto divided to the level of rooms or family assignments within each building. The map was georeferenced on an Open Street Map layer as a widely accepted base map under the advice of Edward Triplett. Once the map was aligned, I digitally traced polygons and lines to represent the boundaries and area of enclosure of the ghetto in its multiple iterations during its existence. Time fields were added to the features’ attribute tables to enable change over time representation of the ghetto’s borders both within ArcGIS Pro and on Esri’s web based StoryMap timeline functions.

Throughout the process of research into historical anthologies and survivor biographies, an ongoing database of identified addresses of both Jewish and perpetrator spaces was kept on Google Sheets. Though the majority of street names in the ghetto remain unchanged, Polish street names in the historic city centering and surrounding residential neighborhoods were changed into German during Kraków’s occupation. Addresses listed with German street names were cross referenced with maps from the same time period to determine their modern equivalent. As opposed to a desktop spreadsheet software, access to a geocoding add-on, GeoCode by Awesome Table, and continuous backups presented Google Sheets as a more attractive option for data management. GeoCode operates on a better database of place-names and is a preferred method of getting longitude and latitude from street addresses than the internal geocoding tool from ArcGIS. Geocoding based on present day geographic information is predicated on the assumption that the address numbering system in Kraków has remained the same since the war. Further municipal research would be required to verify this methodology. Both visual and manual review is necessary after points are imported onto the base map.

My project began to deviate from Jaskot’s when I began to listen to and consider survivor testimony as a source of historical information. It quickly became clear that testimonies do not
provide the same level of clarity to easily identifiable locations. Unless prompted, people rarely offered specific street addresses and were more likely to refer to places with ambiguity – “the building,” “at home,” “the hospital” etc. The wealth of testimonies available and their potential for providing spatial information begged the question as to how testimonies could fit into a visualization of the Kraków Ghetto. Address points, building polygons, and boundary lines define the spaces Jews lived within, but a more complex approach challenged the possibility of visualizing the places that survivors remember from this specific period of confinement. As such, a 3D model of the Kraków Ghetto became a priority in the digital project.

Figure 7: 2D viewshed of St. Joseph’s Church at a height of 70m.

There are both advantages and disadvantages to creating 3D models for a digital mapping project, certain questions can probe the practicality of such an approach. How does 3D enhance

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3 Alberto Giordano and Tim Cole, “The Limits of GIS: Towards a GIS of Place,” *Transactions in GIS* 22, no. 3 (2018): 664-76. In their GIS work, Giordano and Cole utilized corpus linguistics methods to parse similar terms. Their city-scale map focused on points where perpetrators could have met and interacted with victims, mapping an “abstract view of space – the perpetrator’s policies – meets the place-making activities of victims as well as of perpetrators.”
the project? What do 3D features contribute that cannot otherwise be visualized in a 2D GIS? A three-dimensional representation allows me to run viewshed and sight-line analyses on concepts previously only explored textually. Photographs of the ghetto usually focus on views of the ghetto from the outside, but what might have actually been visible inside the ghetto to a bystander standing just outside? For example, survivors mention the looming presence of St. Joseph’s Church in Podgórze, but just how far did its visual presence actually dominate over the ghetto?

A 2D viewshed can accomplish the same analysis but lacks an experiential quality to the resulting visuals, it is generally more legible to someone trained to read it, it is less affective. Survivors also share memories of events that traditional, two-dimensional Cartesian mapping would fail to capture. The ghetto was not only experienced on the ground, around spaces. Witnesses describe movement within and between the ghetto’s buildings, streets, and boundaries. The environment in which their own memories are visualized should reflect the three-dimensionality of their spatial referent.

4 Digital recreations are not only presentations of studied sites, but integral research tools. For a project that delves deeper into sensory experiences in computer visualizations and historical viewsheds, see Diane Favro and Christopher Johanson, “Death in Motion: Funeral Processions in the Roman Forum,” Journal of the Society of Architectural Historians 69, no. 1 (March 2010): 12–37, https://doi.org/10.1525/jsah.2010.69.1.12.

5 Bernard Offen and Norman G Jacobs, My Hometown Concentration Camp: A Survivor’s Account of Life in the Kraków Ghetto and Plaszów Concentration Camp (London; Portland: Vallentine Mitchell, 2009), 22.
In his work on the Nazi Ideal Plan for reconstructing Kraków, collaborator Davide Contiero used Cadmapper as an option for downloading CAD files of modern cities. Contiero stitched together multiple 1 km² downloads to create a pre-made 3D model of Kraków. Incompatible file formatting required research into file conversions and ultimately the failure of AutoCAD to successfully georeference the 3D buildings to adhere to their modern-day locations rendered use of the models irreconcilable with ArcGIS Pro.

To avoid problems of georectifying city models made by other companies or projects, acquiring LIDAR data of Kraków became the best option. LIDAR, Light Detection and Ranging, is a remote sensing method that captures dimensional information about the Earth’s shape and surface characteristics. Instruments used typically consisted of a laser, a scanner, and a GPS receiver, LIDAR systems allow for accuracy, precision, and flexibility. Instead of trying to georeference a model to a map, information extracted from topographic LIDAR systems already

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contain geospatial information and layers that be extracted for use with ArcGIS visualization tools. While LIDAR is often readily accessible for cities domestically, locating free resources for Poland proved difficult. Ultimately a 2017 LIDAR capture of the city was purchased from a Polish firm that specializes in providing spatial data.

Figure 9: Multipatch extracted from LIDAR in ArcGIS.

With LIDAR, ArcGIS is able to stitch together captured blocks and create what ESRI calls “multipatch features” – essentially 3D vector layers with most of the same attributes as 2D shapefiles. Polygon outlines of buildings from the historical map were the “footprints” for defining the borders of each building. Steps to create the multipatch layer were repeated after key buildings were identified and cut out from block-level polygons so that their symbology and labels could be represented differently from the rest of the ghetto. Problems emerged after I exported the 3D features. While ArcGIS is ideal for mapping and running geospatial analysis tools, the actual visualization portion of my project had to be exported to a more robust computer graphics program like Autodesk 3ds Max that has more flexible animation and modeling.

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9 The red building identified in this view is the Judenrat. Key administrative buildings, hospitals, and work sites were segmented from the rest of the ghetto and highlighted with color symbology.
capabilities. The Collada files exported from ArcGIS were too large and unmanageable for 3ds Max to open and required file format conversion to be readable.

I needed another way to create multipatch features from LIDAR that could be useable in other programs. I found the answer through an ArcGIS Solutions, a toolkit of industry-specific configurations, offered for the authoring of Local Government 3D Basemaps derived from 2D operational data and LIDAR. Originally released in December 2015, a January 2019 update to the toolkit made it possible for roof forms to be extracted. While the buildings are ultimately rendered without texture, roof slants are important and effectively communicate that the grey block structures are city buildings. Flat-top blocks lack the visual variety to help viewers instantly understand that they are looking at a model of city. Steps within the Local Government toolkit used point cloud data to make digital elevation models of the area, added roof form information to the layer’s attribute table, and converted the data to a multipatch feature. A previously considered method relied on extracting max building heights from the point cloud and extruding building footprints as flat roof features before exporting the layer to 3ds Max and splitting roof forms individually. Instead, the ArcGIS Solution translates complex, “bumpy” LIDAR data of building tops into semantic categories such as eaves, gables, and slopes, automatically determining slope and maximum height. The 3D layer created was also manageable in file size and more easily exported. Ground raster information was also extracted from LIDAR via ArcGIS’ classification tools and imported into WorldCreator to create the terrain under the digital city model.

The GIS acknowledges change over time as the ghetto’s border changed repeatedly and dramatically. The visualization conforms to the ghetto’s original 1941 iteration to avoid confusing reliance on symbology or textual explanation. An issue of accuracy comes into play when it becomes even more difficult to pinpoint during which iteration of the ghetto the survivor’s memory took place. Businesses addresses taken from newspaper ads are plotted onto the map, but the lack of historical information makes it difficult to know how long the establishments remained in the ghetto. The models of the ghetto are momentary captures of the space as it existed at one time. The project is an imagined combination of research and records layered upon one another that the viewer is guided through.

For further reading on the complexities of actually modeling time and the differ temporal models, see Benjamin Schmidt, “Modeling Time” in Flanders and Jannidis, The Shape of Data in the Digital Humanities.
There is an impossibility to the challenge of reconstructing the Kraków Ghetto. The 3D model of the ghetto is not an architectural model or realistic simulation of the city. The buildings are intentionally left in block form and untextured. Representations of historical sites in virtual environments that are too realistic can be perceived by users as unconvincing. When there is insufficient data and the past is uncertain, photo realistic views can only pretend to represent truth.

In the GIS, billboards of historic photographs placed in the vicinity of modern buildings reference how the city might have appeared, yet the evidence of these photographs privilege perpetrator spaces and experiences of the ghetto, almost always taken from the outside. They capture but do not reveal anything about spatial experiences of the ghetto. The mixed presence of untextured buildings and archival photographs are to remind the viewer of the links between past and present without suggesting that one is meant to substitute the other, they represent visual dialogue. In a sense, the models are meant to be static but not at all uncanny. Space of the past is presented within space of the present. Blocks of buildings have been demolished to make room for wider roadways, new tram systems, and larger high rises. My 3D model is of both the ghetto and the modern city of Kraków some buildings have remained the same throughout the past decades, but my visualization of testimonies is not an invitation for users to experience the virtual reconstruction for themselves.

This project does not evoke agent-based modeling as it is not a simulation of experience inside the Kraków Ghetto but rather an illustration of certain possible experiences. Virtual reconstructions are usually entirely devoid of people or deploy generic non-player characters
At best, interactive NPCs function to impart preset knowledge to the user as agents for its creators about the reconstructed architecture or historical period at hand. Even within games or digital reconstructions where users are allowed to explore, that freedom is illusory and only amounts to a false sense of spatial access that is meant to make investigation feel authentic. The design of the avatars in my visualization purposely bears no resemblance to the human form. The capsule-like forms are standard primitives often found in game engines like Unity 3D. Capsules have orientation, as they are upright and there is clear verticality to signal to a bipedal human form without intricacies that the viewer might otherwise be distracted by or fixate upon.

My visualization also attempts to give narrative authority back to the survivor. Audio excerpts of their recorded testimony dictate the story of the animation, the duration, and maps the time seek of the content. Interruptions from the interviewer and extended silences are removed so that the story can be heard more seamlessly. Pauses maintain the natural rhythms of someone speaking of events that occurred almost fifty years prior to the recording. It is an ethically dubious position to over edit audio from the testimony and to suggest that I am offering an outlet for testimonies to “speak for themselves” when they are ever more mediated, yet working with the audio rather than text creates an opportunity to think critically about how we can listen to and engage with testimonies differently. These audiovisual testimonies are molded records of how institutions want to catalog witness accounts. The decision to cut the interviewer’s interjections allows the listener to express and experience their own moments of incredulity or confusion.

visualization places the user in the position to listen, not as part of a dialogue but as an individual in a momentary contract to focus on the possibility of a memory that the survivor has shared. Audio carries the affective qualities of the speaker to through the visualization.

Figure 13: View looking down Jozefinska Street with the Central Hospital visible.

The animations contain scenes that intend to convey a sense of randomization. As previously explored, the testimonies describe moments of place making without specificity in location. The animation of Leyson’s story shows moments when building structures fade away and pattern arrays of cubes appear in place. An approximate count of windows in the central block of the ghetto determined the number of boxes along splines traced through the midpoint of residential blocks. The array is duplicated with vertical spacing to mimic building infrastructure. Objects where known offices, like the Arbeitsamt, Central Hospital, or Eagle Pharmacy, are identified as places where the narratives could not have occurred. The cubes represent three levels of possibilities: residential units, windows, and people.¹⁶ When one box descends to street level to

¹⁶ A well-documented methodology of how Nazi administrators designated residential units in ghettos or allotted square footage per person was by counting the number of windows in each building, regardless of whether or not windows actually reflected adequate spacing or separate rooms.
join other avatars, its removal from the array of identical objects signals that it is a random sample from hundreds of options. The visualizations are not definitive in depicting where events actually occurred, so I worked with the notion that they should convey ambiguity through visual cues. Pushing the boundaries of what can be communicated about subjective experience through 3D models of the ghetto means eschewing reliance on textual context as much as possible. The scenes of randomization are meant to communicate my mediating presence without explicitly taking the viewer’s attention away from the survivor’s narrative.

Ultimately where each visualization takes place reflects my own biases and familiarity with the layout of the ghetto. It can be disorienting for a viewer to see drone-like overhead views of the ghetto, difficult for them to understand which streets or buildings the animation is covering. In making the visualization, I am purposefully resistant to letting the viewer become too comfortable with the scene. The animation intentionally lacks an orienting map on a corner of the screen. If a viewer becomes too familiar or comfortable with the space of the ghetto, the potency of the animation in conveying an affective narrative of place-making is lost and too much meaning would be inscribed to what would ultimately be an arbitrary location.

Time is a subtle yet important component of the animation. The length of my edited audio segment dictated the duration of the visualization. With each spoken word and passing second, the action on the screen progresses. Time is always an implied aspect of a moving narration without needing to be explicitly addressed or visualized in any way. Over the course of a testimony in its entirety, the time of experience is often disrupted, non-linear, and jumps in chronology. As acknowledged, “like the space within which places form, time is elastic and discontinuous.”17 There exists the truth of exactly where, when, and how this evening transpired.

in Leyson’s life. More importantly, there also exists his memory of the moment the street corner became a place inscribed with deep feelings of fear and caution, and how Leyson chose to tell his story. The time of the testimony is untethered from the scale of its geographical setting. The visualization is indexical but not representational, it gestures to the past to remind the viewer of a truth while resisting specific anchoring locations. I draw the viewer toward an experience while ultimately rejecting a mimetic simulation, it is experiential to create and view a 3D environment. It is the testimony that inspires and informs each digital story, it is the narration that remains at the forefront.

18 Representing chaotic or difficult events has proven challenging for Holocaust scholars. In his visualization of evacuations from Auschwitz, Erik Steiner created an abstract timeline from a piece of rope that eschewed direct linearity. The resulting “rope of history” represented a “bridging of sculptural, cartographic, and historical inquiries. It is a sensory reflection, grounded in objective geography and direct testimony, on the experience of a community …over the course of a traumatic foot journey.” See Simone Gigliotti, Marc J. Masurovsky, and Erik B. Steiner, “From the Camp to the Road Representing the Evacuations from Auschwitz, January 1945” in Knowles, ed., Geographies of the Holocaust, 218-221.
6. Conclusion

A digital approach helps us to visualize ambiguous evidence and narratives. It creates the opportunity to return to tough spaces without the hazard of conjuring dubious facsimiles of what no longer exists. Various mediums of data can be compiled, and problems of scale collapsed and queried in a single system. A GIS of the ghetto can show what archives and scholarship already describes while also enabling us to query observations and personal experiences of the space. The nature of testimonial evidence does not readily conform to the accuracy demanded by digital mapping software. It is precisely the complexity of testimony and experience that requires a multi-modal approach to spatial evidence. The practice of developing each animation forced me to probe my research and knowledge of the ghetto to consider where events could and could not have taken place. The digital environment facilitates an iterative approach of querying and thinking of space in multiple ways to place stories back into the spaces where they occurred. The process of researching and creating these visualizations offers new pathways into evaluating and making sense of the past.

One of the biggest challenges to constructing a digital environment is compiling reliable information. Even when the final product is explicitly not intended to be photorealistic, there always remains a question of accuracy. A mix of archival maps and modern-day data will result in inconsistencies despite efforts to precisely georectify to the same bases. There is a high degree of uncertainty when attempting to visualize testimony filled with such ambiguity. These memories are resistant to specificity. There is little information to fill in the gaps of certain habits and preferences that people would have had in their daily interactions with the ghetto, the city, and with one another. It is a similar problem faced by Cole and Alberto Giordano in their study of
the Budapest ghettos. They used network analysis to calculate “least-cost” routes, or shortest distance routes, between Jewish residences and the nearest market hall, the nearest hospital, and the Swedish and Swiss legations in the city. Their GIS produced a map of the results, but the authors conceded that they could not know precisely whether or not Jews would have taken the most direct path or had their own preferred routes, for example using side streets to avoid interactions with non-Jews or officials.

There are steps that future research can undertake to improve on the models and to expand the scope of this case study. In order to draw focus to Leyson’s individual story, the experiential quality of crowding within the ghetto is lost in this visualization. A deeper look at the ways Kraków represents its history through guided walks, museum exhibitions, and memorials could interrogate how survivor experiences have been filtered through the lens of public memory. Additional archival sources of the city of Kraków in the 1930s-40s would make it possible to more faithfully model the ghetto as it existed. It would not contradict the non-photorealistic nature of the current project but explains the parts of the digital model that reflect the modern city rather than how it appeared historically. The LIDAR data is less relevant in the eastern portion of the former ghetto as smaller buildings have been demolished to make way for high rise buildings and modern tramways. The project looks at certain possible experiences and is not intended to be representative of any identity group, but more time dedicated to testimonies and close listening for spatial elements could identify trends in specific spaces in the ghetto or of certain survivor groups.


In his work, Evgeny Finkel analyzes pre-war politics and interethnic dynamics of Jewish communities as determinants of survival strategies individuals chose. He looked at Jews in the ghettos of Minsk, Kraków, and Białystok. Finkel brings a political science approach to draw macro conclusions about communal behaviors in very different cities. This also opens multi-disciplinary collaborative possibility of what it might mean to visualize both identities and behaviors to query questions of how the space of the ghetto might have further influenced coping
The digital components of this project have the potential to be used iteratively to visualize other testimonies and spatial narratives. Known locations like the hospitals or administrative buildings are identified in both 2D and 3D databases. Layers of ground raster and building data in the GIS can easily be deployed for further spatial analysis as more information is uncovered about experiences of the ghetto. There is an opportunity to broaden the range of methods for visualizing human experience. By organizing the database of buildings and spaces clearly, the digital environment of the Kraków Ghetto can be built upon, improved, and ultimately used again by other scholars for alternate visualizations of the space. They might use a similar methodology for their own process of working with and learning to be sensitive to testimony.

There are deep questions that guide studies of the Holocaust. Why did this happen? How could this have happened? This project has been cautious is engaging with specificity not only within this discipline but also in representation. This remains a case study of a space of confinement that aims to return to the stories of the people that were enclosed. Testimonies as deeply personal, subjective, and mediated evidence allowed me to work on the narratives of lives lived rather than the events that happened to or around “victims.” They demand a lot of time and focus to watch and listen, yet each survivor of wide-scale calamity or genocide has a story worth hearing.

The ghetto was a complicated space. For its inhabitants, places in the ghetto developed meaning over time and instantaneously – there exists no singular experience of the ghetto. This study was neither interested in perpetrator spaces or histories, nor in the politics or backgrounds mechanisms and survival strategies. Evgeny Finkel, Ordinary Jews: Choice and Survivor During the Holocaust (Princeton: Princeton University Press, 2019).
of the survivors. It was an investigation into how witnesses could inform our study of spatial experiences of the ghetto in ways that are ambiguous, difficult to capture, and ultimately deeply personal. The methodology that developed out of this project cannot be smoothly applied to every Nazi ghetto or study of other sites of systematic oppression. Yet it offers a case of how critically engaging with a medium of subjective evidence and pushing the boundaries of digital visualizations can bring us closer to a better understanding of deeply personal experiences of difficult spaces like the Kraków Ghetto.
Appendix A

The following images are screenshots from my animation of Leon Leyson’s testimony. A transcript of the testimony audio is included at the end of this section.
“While we were in the ghetto I was - my friend and I went to take a woman to the hospital. She was a small woman, she was an older lady and she needed to be - she was very ill. So he and I got her in a stretcher and we took her to the hospital. And on the way back it was 9 o'clock and we were a little bit past that time. And as we were coming around the corner there was the guard standing there and he was moving his rifle, getting ready to shoot. And my friend, he ran in one direction, and I was slightly behind him so I started running the other direction. And as I - he shot at him first and missed him then turned and shot at me and he missed me because I had just managed to jam myself into an entryway in another apartment house that was sort of recessed a little bit. So I stood there and thought maybe I was shot because I heard that when you’re shot you can’t tell or something. But anyways, I was just a kid. I knocked on the door and somebody actually opened the door and I spent the rest of the night there. And my parents and my sister and my brothers didn’t know where I was. It was in 1941, I must have been about 11 years old. Well, I never went past that spot again. I used to make a big turn to get where I was going to avoid the place where the guard stood.”

Appendix B

An overview of the technical methodology of my visualization is produced below. This methodology was developed with Edward Triplett to work with lidar files (.las) to create 3D buildings and terrain. It is not comprehensive and details the broad steps to getting started. The project worked through software versions ArcGIS Pro (2.4.1) and Autodesk 3ds Max 2020. Steps listed [between brackets] reflect the names of ArcGIS Tools as of October 2019.

- In the Catalog pane of your ArcGIS project, right click your project and create a new LAS dataset. Right click the LAS dataset (.lasd) > Properties > LAS Files > Add Files

- Find the lidar files (.las) of the ghetto and add them. Drag the LAS dataset to the Scene.

- Run [LAS Dataset to Raster] to create a digital elevation model (DEM) raster of surface information.

- Download Open Street Map shapefiles or outline building polygons of the buildings in the ghetto. This polygon feature class will be the footprint or selection of buildings for future steps.
For 3D models in ArcGIS:

- Run [LAS Building Multipatch] to create building models derived from lidar data. Your Input Features should be some shape files or polygon layer that outlines where you want the structures cut out.

For models to be exported:

- Follow the steps for Extract elevation surfaces from LAS datasets, Ground elevation surface, and Create 3D buildings from the ArcGIS Solutions tutorial, “Extract Roof Forms for Municipal Development.”

- Run [Layer 3d to Feature Class] to convert the buildings to a multipatch feature.

- Export the multipatch feature as a 3D shapefile (.shp).

- Convert the 3D shapefile (.shp) in FME to .fbx files.

- Import .fbx files into 3ds Max.

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Testimonies and Archives


LM0423 1940-1942. Gazeta żydowska Yudishe tseitung. United States Holocaust Memorial Museum Archives, Washington, D.C.
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Symposium Celebrating 10 Years of the Wired! Lab at Duke, Duke University, Durham, North Carolina, October 18 2019.


