



universität
wien

MASTERARBEIT | MASTER'S THESIS

Titel | Title

Digital Approaches to Provenance Research and Restitution of
Nazi-Looted Art in Viennese Museums

verfasst von | submitted by

Marja Nikolčić

angestrebter akademischer Grad | in partial fulfilment of the requirements for the degree of
Master of Arts (MA)

Wien | Vienna, 2025

Studienkennzahl lt. Studienblatt | Degree
programme code as it appears on the
student record sheet:

UA 066 647

Studienrichtung lt. Studienblatt | Degree
programme as it appears on the student
record sheet:

Masterstudium Digital Humanities

Betreut von | Supervisor:

Rebecca Josina Kahn PhD

Abstract (Deutsch)

Diese Dissertation beschäftigt sich mit dem Potenzial digitaler Methoden in der Provenienzforschung zu NS-Raubkunst in Wiener GLAM-Institutionen (Galleries, Libraries, Archives, Museums). Sie untersucht, wie digitale Ansätze die Restitutionsbemühungen unterstützen können, während gleichzeitig die Grenzen computergestützter Methoden kritisch hinterfragt werden.

Die traditionelle Provenienzforschung wird häufig durch begrenzte finanzielle und personelle Mittel sowie durch die Fragmentierung von Archivalien behindert. Digitale Methoden, die sich auf semantische Technologien und Linked Open Data stützen, bieten neue Möglichkeiten für bessere Zugänglichkeit, Zusammenarbeit, Transparenz, Effizienz und Mustererkennung. Dennoch gibt es Herausforderungen, insbesondere in Bezug auf die Verfügbarkeit und Transparenz von Provenienzdaten in Wiener Institutionen. Während globale Initiativen die Prinzipien von Findable, Accessible, Interoperable and Reusable (FAIR) Data fördern, tun sich viele Wiener GLAM-Institutionen schwer, Zugang zu Provenienzdaten zu gewähren - insbesondere in ihren Online-Sammlungen.

Diese Arbeit analysiert Österreichs größte digitale Quelle für die Provenienzforschung zu NS-Raubkunst: die Kunstdatenbank des Nationalfonds der Republik Österreich für Opfer des Nationalsozialismus. Durch den Einsatz von ethischem Web Scraping und computergestützter Analyse in Python zeigt die Studie erhebliche Datenprobleme auf, darunter Unvollständigkeit, Inkonsistenzen und das Fehlen aktueller Standards im Vergleich zu internationalen Provenienzdatenbanken. Trotz dieser Einschränkungen deuten die Ergebnisse darauf hin, dass die Modellierung sozialer Netzwerke auf der Grundlage vorhandener Daten dennoch aussagekräftige Erkenntnisse liefern kann. Dies unterstreicht die Notwendigkeit einer besseren Datenqualität und eines stärkeren institutionellen Engagements für Transparenz.

Abstract

This thesis investigates the potential of digital methods in provenance research on Nazi-looted art within Viennese GLAM (Galleries, Libraries, Archives, Museums) institutions. It explores how digital scholarship can support restitution efforts while critically assessing the limitations of computational approaches.

Traditional provenance research is often hindered by limited funding, personnel, and the dispersion of archival resources. Digital methods, leveraging semantic technologies and linked open data, offer opportunities for easy accessibility, collaboration, transparency, efficiency and large-scale pattern recognition. However, challenges persist, particularly in the accessibility and transparency of provenance data within Viennese institutions. While global initiatives promote Findable, Accessible, Interoperable, and Reusable (FAIR) data principles, many Viennese GLAM institutions struggle to provide access to provenance records, particularly in online collections.

This research evaluates Austria's largest digital resource for Nazi-looted art provenance research, the Art Database of the National Fund of the Republic of Austria for Victims of National Socialism. Using ethical web scraping and computational analysis in Python, the study reveals significant data issues, including incompleteness, inconsistencies, and a lack of up-to-date standards compared to international provenance databases. Despite these constraints, findings suggest that meaningful results can still be achieved by modeling social networks based on the available data. This highlights the need for better data quality and institutional commitment to transparency.

Table of Contents

Introduction.....	1
Literature Review	4
Literature on Historical Background	4
Literature on Digital Provenance Research.....	8
Historical Overview	13
Viennese Jewish Community Before and After the War	13
Anschluss.....	15
Flight from Persecution.....	18
Institutionalized Theft.....	19
Connections with the International Art Market	22
The Role of Dorotheum	23
Complicit Art Market	24
Underground Shelters and the End of the War	25
Austrian Restitution Efforts	28
Austria's Obligations and Commitments.....	28
Early Restitution Measures Under Allied Occupation	30
Heirless Art	32
Austrian Restitution Efforts After 1998.....	34
Washington Principles on Nazi-Confiscated Art and Art Restitution Act (<i>Kunstrückgabegesetz</i>)	35
Commission for Provenance Research	37
The Art Restitution Advisory Board (<i>Kunstrückgabebeirat</i>).....	37
Provenance Research	39
Introduction	39
Challenges of Provenance Research	41
Digital Approaches to Provenance Research	42
Digitization	45
Online Collections and Provenance Research	47

Modelling of Provenance Data	50
Provenance Data in Museums	50
Digitizing and Editing Provenance Data	51
Data Modelling.....	53
Conceptual Reference Model (CIDOC CRM) and Other Digital Provenance Initiatives.....	59
Applying Digital Methods: Scraping, Cleaning, and Analyzing Art Database	65
The Art Database.....	65
Methodology	72
Data Mining	72
Web Scraping	72
Data Cleaning and Preprocessing	74
Limitations of the Dataset.....	79
Exploratory Analysis.....	82
Case Study: Herz von Hertenried Collection from the Austrian National Library.....	90
Conclusion.....	96
Literature.....	100
List of Figures	116

Introduction

The Third Reich had a unique relationship with art, regarding it as both an economic tool and a powerful ideological instrument. Art looting, or what some have called "thefticide", became an essential component of their systematic erasure of Jewish cultural identity.

The magnitude of this pillage is still difficult to estimate today. In Austria alone, tens of thousands of cultural objects were stolen from Jewish ownership between 1938 and 1945. In Vienna, home to one of the largest Jewish communities before the Second World War and a city with a rich cultural heritage, the preexisting antisemitic sentiment before the Anschluss in March 1938 resulted in especially vehement lootings and destruction, exceeding other places in the German Reich.

This displacement of cultural artifacts continues to present significant challenges for institutions and researchers today. Many of Vienna's museums, galleries, libraries, and archives still hold objects with dubious provenance. Until 1998, provenance research in Austria had not been a serious endeavor, resulting in high-profile international controversies, such as the cases involving Egon Schiele's paintings at the Leopold Museum and Maria Altmann's legal battle. The Leopold scandal centered on disputes over works in the museum, including Schiele's Portrait of Wally, which had been looted from a Jewish collector. Similarly, Maria Altmann's case became a famous legal battle to recover Gustav Klimt's Portrait of Adele Bloch-Bauer I. from Belvedere, a painting that the Nazis had taken from her family. These scandals exposed Austria's lack of systematic provenance research and accountability in addressing its complicity in the decades following World War II.

The passage of the Art Restitution Act (*Kunstrückgabegesetz*) in 1998 marked a turning point, creating a legal framework for the return of cultural artefacts taken during the Nazi regime. Since then, provenance research has been addressed by Austrian museums in a more systematic and open manner.

This thesis critically examines the current practices of provenance research in Viennese museums, with an emphasis on how well they comply with the Washington Principles of 1998. These guidelines were created to encourage transparency, collaboration, and restitution within the GLAM sector (Galleries, Libraries, Archives, and Museums) to promote justice and fairness in the handling of Nazi-looted art. One focus of this research is the level of transparency demonstrated by Viennese institutions in displaying the provenance of items in their collections, particularly those with questionable histories.

This thesis further investigates the potential for incorporating digital approaches into provenance research within Viennese GLAM institutions. In recent years, the use of digital technologies has gained significant traction in the field of conventional provenance research, offering novel approaches to prevalent problems. This study explores whether digital tools can help the identification and restitution of Nazi-looted objects in this specific GLAM setting while addressing gaps left by traditional historical research methods.

The research looks at how publicly available data and online resources, such as the Art Database of the National Fund of the Republic of Austria for Victims of National Socialism (*Kunst-Datenbank des Nationalfonds der Republik Österreich für Opfer des Nationalsozialismus*), can be utilized to conduct digital provenance research. Other digital approaches may include methods such as machine learning, data mining, social network analysis, and advanced data visualization to find insights that traditional methods may miss.

The thesis is organized into three sections. The first section establishes a foundation for understanding the topic by providing a detailed historical overview. It includes a timeline of significant events and key organizations participating in looting activities, many of which reappear in the subsequent data analysis. This highlights the importance of grasping the historical context before delving into digital methodologies. A

substantial portion of this section also examines the evolution of Austrian restitution legislation, underlining its shortcomings and the slow progress made over the decades.

The second section of the thesis explores the theoretical foundations of provenance research, focusing on the challenges related to digital research within GLAM organizations. It addresses the importance of digitization and the complexity of modelling provenance data, such as inconsistency, uncertainty and fragmentation. This section also introduces several leading initiatives and projects in the field of digital provenance research, emphasizing their contributions to advancing methodologies and addressing the requirements in the field, such as linked open data and FAIR principles.

The last section of the thesis is dedicated to analyzing the data from the Art Database and discussing the strategies employed to work with this resource. This section contains a brief case study that demonstrates how the actual application of digital tools may lead to useful historical discoveries, emphasizing the potential and significance of digital methods in advancing the field of provenance research.

Literature Review

Literature on Historical Background

This thesis offers only a brief historical overview of the extensive looting in Austria during the Second World War, as it is not the primary focus of the study. The literature on this topic is substantial, revealing the complex and frequently unpleasant elements of Austria's relationship with its history. Therefore, it is not surprising that most of the relevant literature has been produced in the last 30 years, when the political climate of the late 1990s, a shifting attitude towards the country's past, paired with the 1998 controversies involving Leopold Museum sparked a renewed interest in the issue, extending beyond the academic community to the public,¹ with journalist such as Hubertus Czernin² and Thomas Trenkler³ uncovering histories to the public eye.

The intense pressure on institutions and authorities resulted in the passing of the 1998 Art Restitution Act, a turning point in Austria's restitution efforts. Today, Austrian restitution processes are often regarded as among the best in the world, owing to the proactive "*ex officio*" attitude and the fact that the responsibility lies with the Republic of Austria, the beneficiary, rather than the claimants. However, this has not always been the case. Experts acknowledge that Austria's previous restitution attempts were insufficient, overly bureaucratic, and mostly inefficient, reflecting an unwillingness to truly address the events of the Second World War.

Although the Art Restitution Act represents a significant step in the right direction, it remains a subject of criticism among legal and restitution experts. Historian Ingo Zechner, in particular, has continually expressed dissatisfaction with the law, pointing

¹ Clemens Jabloner, "The legacy of Nazi-expropriation in Austria: The impact of the Historical Commission on research and restitution," 258.

² Czernin's investigation first brought to light the history behind the Bloch-Bauer painting. Czernin, *Die Fälschung*.

³ Thomas Trenkler, writing for the Austrian newspaper *Der Standard*, closely followed the "Causa Leopold" throughout the 2000s, covering the controversies surrounding the Leopold Museum's art collection.

out several shortcomings, such as the exclusion of private institutions from its scope. Leopold Museum is a prominent example of this loophole, having received publicity multiple times for acquiring art with suspicious provenance, yet being exempt from the law's restitution requirements.⁴ Another concern is the lack of transparency in Austria's restitution process, with decisions regarding the public good often being made behind closed doors.⁵

In relation to the enactment of the *Art Restitution Act* in 1998, several organizations were established to significantly advance provenance research in Austria. A key contributor in this field is the Commission for Provenance Research (*Kommission für Provenienzforschung*), which also provides freely accessible publications on their website, offering extensive insights into the present status of provenance research in Austria, covering legal concerns, ethical considerations, historical study, and specific restitution cases.⁶ In addition to their publications, the Commission has developed valuable digital resources, such as the Lexicon of Austrian Provenance Research⁷ and the Online Card Index of the Central Depot for Seized Collections in Vienna.⁸ As a member of the Network of European Restitution Committees on Nazi-Looted Art, they also frequently issue newsletters with up-to-date information.

An excellent resource for understanding the restitution landscape in Austria is also the collection of reports from the Art Restitution Advisory Board (*Kunstrückgabebeirat*), all of which are available online.⁹ These documents offer thorough insights into the history

⁴ Thomas Trenkler, "Lex Leopold ist möglich."

⁵ Ingo Zechner, "Wie Entscheidungen fallen. Kunstrestitution in der Praxis," 215.

⁶ "Commission Publication Series," accessed October 10, 2024, <https://provenienzforschung.gv.at/en/commission-for-provenance-research/commission-publication-series/>.

⁷ Commission For Provenance Research, "Lexicon of Austrian Provenance Research," accessed October 8, 2024, <https://www.lexikon-provenienzforschung.org/en>.

⁸ Commission for Provenance Research and Archive of the Kunsthistorisches Museum Wien, "Zentral Depot Karteien Online," accessed October 8, 2024, <https://www.zdk-online.org/>.

⁹ Commission for Provenance Research, "Restitution Reports," accessed October 10, 2024, <https://provenienzforschung.gv.at/en/empfehlungen-des-beirats/restitutionsbericht/>.

of problematic objects, detailing their provenance and the specific circumstances surrounding each case.

The developments in 1998 led to the establishment of another organization, the Historical Commission of the Republic of Austria (*Österreichische Historikerkommission*). After several years of extensive research, involving 160 researchers across forty-seven projects, the Historical Commission published its final report in 2003. This report offers an in-depth exploration of Nazi property looting in Austria between 1938 and 1945, as well as an investigation into the government's post-war restitution efforts.¹⁰

The Historical Commission's research activities have been published in staggering forty-nine volumes. The 15th volume on the "Aryanization" of moveable assets,¹¹ as well as Michael Pammer's 8th volume on Jewish assets around the time of Anschluss,¹² were especially helpful for this thesis. The latter is especially interesting since it employs the use of statistical methods, such as Factor analysis, to analyze the economic position of the Jewish Viennese population.

Since the late 1990s, a lot of historical work has concentrated on the Austrian government's failure to face the events of World War II, particularly reparations and the treatment of exiled Jewish inhabitants. Historian Oliver Rathkolb has been a prominent figure in shedding light on post-war antisemitism and state's long-standing refusal to make real efforts towards reparation. His work has been essential to understand how, even after the war, Austria preserved the image of a victim while evading accountability. His research demonstrates how personal gain and an unwillingness to accept the past hindered restitution efforts, allowing antisemitism to persist in Austria's postwar culture.

¹⁰ *Schlussbericht der Historikerkommisison der Republik Österreich Vermögensentzug während der NS-Zeit sowie Rückstellungen und Entschädigungen seit 1945 in Österreich.*

¹¹ Anderl, "Arisierung" von Mobilien.

¹² Pammer, *Jüdische Vermögen in Wien 1938.*

So far, the literature on provenance research in Austria has largely focused on individual case studies from GLAM institutions, offering a great insight into methods of provenance research, or specific phenomena, such as Hitler's unrealized museum in Linz (known as "*Sonderauftrag Linz*", "*Führermuseum*" or Special Commission Linz), a subject extensively explored by art historian Birgit Schwarz, an expert in cultural politics of the Third Reich. Linz as a new cultural center during the Nazi era was also extensively researched by historian Birgit Kirchmayr.

Notable Viennese collections of the pre-war era, such as those of the Lederer and Ephrussi families, have also received significant attention in Austrian provenance research. Although these collections represent only a small portion of the overall Nazi looting, they have become some of the most well-known and thoroughly documented cases due to their historical prominence and the notable works of art they contained. A particularly detailed investigation into this subject has been conducted by provenance researcher Sophie Lillie. Her book *Was einmal war*¹³ offers complete inventories of such individual collections, meticulously reconstructed from diverse archival records.

Furthermore, a substantial contribution to the understanding of the Viennese art market during that period was made by Gabriele Anderl. Her work sheds light on the process of "Aryanization", the forced transfer of Jewish-owned galleries and antique shops to non-Jewish hands. It also highlights the critical role that private art dealers played in this looting, acting as intermediaries among other GLAM institutions, the Dorotheum auction house, and Hitler's museum plans.

Provenance researcher Konstantin Ferihumer notes recent changes in Austria's provenance research trends. As many famous and controversial artworks have been restarted, researchers are now focusing on less glamorous items with less known or unknown owners. The change needs a new methodology that considers both the cultural and material contexts of these items. The primary focus therefore shifted from

¹³ Lillie, *Was einmal war*.

upper-class to middle-class instances, and from well-documented, high-profile collections to those with less records, making research more difficult.¹⁴ One example of this shift is the increasing focus on everyday objects, such as porcelain, books, and other household items, that were looted or forcibly sold during the Nazi era. These items, though not as high-profile as masterpieces of fine art, represent a significant part of the cultural heritage lost during this period, and while their monetary worth may be low, the relevance of restitution of these objects remains the same.

Literature on Digital Provenance Research

Within the GLAM sector, provenance research is an essential field that has a substantial amount of academic literature advancing it. It often relies on painstaking manual research techniques, focusses on specific people and artefacts, and employs conventional historiographical methodology to try to shed light on the ownership histories of these items. However, its digital evolution represents a transition, shifting to a data-driven approach and viewing provenance as a complex network of transactions rather than a simple linear chain of custody. This multidimensional method moves the emphasis from an individual item to larger contexts, including interactions between things, owners, and institutions.

Digital provenance research marks a shift in both methodology and theory, coming at a time when institutions are re-evaluating their complex histories and addressing past injustices and questionable processes. Much of the literature on digital provenance research originates from postcolonial contexts, where there is a strong focus on critically examining acquisition practices. These discussions have fueled calls for transparency, openness, and fairness-values that are now central to the field of digital provenance research. These principles are vital in conversations about the ethical stewardship of cultural artifacts, especially as cultural heritage is increasingly seen as a shared, common good. In this regard, digital provenance research not only provides

¹⁴ Konstantin Ferihumer, "Die Gegenwart der Vergangenheit. NS-Provenienzforschung und ihre gesellschaftliche Bedeutung als Teil österreichischer Vergangenheitspolitik," 61–62.

tools for tracking ownership but also offers GLAM institutions a framework for promoting accountability and responsibility.

With digitization, provenance research has moved from the domain of archivists, art historians, and gallerists, and reached computer and data scientists whose expertise has become essential to current advancements in the field. Contemporary research on digital provenance would be unthinkable without the contributions of these experts and initiatives like CIDOC CRM or the Getty Provenance Index. Consequently, current literature places more emphasis on developing digital tools and methodologies, alongside reflections on best practices for digital provenance research and the integration of new tools into GLAM workflows, and less on actual application.

One of the key texts when starting out with digital provenance research is a 2020 work by Anne Luther. Her study provides an excellent overview of the most prevalent obstacles in adopting digital processes for provenance research, as well as the trade-offs involved in the digitization process. Drawing from the works of Franco Moretti and Gabriel Tarde, Luther advocates for a “distant reading” approach to process provenance datasets, enabling researchers to uncover large-scale patterns and relationships that would be difficult to identify through traditional close reading alone. Luther emphasizes that the effectiveness of digital provenance research is dependent on the availability of data in an open, computationally accessible format.¹⁵

Sadly, the call for transparency and accountability has not yet fully translated into practice at German-speaking GLAM institutions. Despite the evident need for open access to historical data, many institutions in this region have been slow to adopt practices that reflect these ideals. This may be influenced by regional restitution and privacy laws, which frequently see provenance research as the duty of governmental entities rather than a public endeavor. Consequently, provenance research is less accessible and participative, limiting the public’s opportunity to engage in uncovering and questioning shared histories. This conservative approach to managing cultural

¹⁵ Luther, Anne, “Digital Provenance, Open Access, and Data-Driven Art History.”

heritage also results in limited opportunities for conducting comprehensive digital provenance research.

However, an increasing number of publicly funded initiatives are emerging in the German-speaking world, providing digital resources for provenance research. One of the most important institutions for provenance research in the German-speaking world is the German Lost Art Foundation (*Deutsches Zentrum Kulturgutverluste*), which provides specialized databases Lost Art¹⁶ and Proveana.¹⁷ The foundation also publishes three specialized periodicals: *Provenienz & Forschung*,¹⁸ *Provenire*,¹⁹ and *Working Papers*.²⁰ These publications serve as an excellent starting point for becoming acquainted with projects and research in German GLAM institutions. They address contemporary issues and best practices while also highlighting the integration of digital technologies. For instance, the latest issue of *Provenienz & Forschung* focuses on the complex provenance research of photographic material, an often-overlooked area in provenance studies.²¹ The initiatives led by the German Lost Art Foundation encompass a broad range of historical contexts, extending beyond Nazi looting to also include the colonial period, the Soviet occupation, and war damages.

With an increasing emphasis on incorporating digital methodologies into traditional provenance research, several research initiatives are currently underway at Munich's Central Institute of Art History (*Zentralinstitut für Kunstgeschichte*) as well. These initiatives are primarily concerned with the private art markets and individual actors engaged in the acquisition, sale, and transfer of artwork. Working on some of these

¹⁶ Deutsches Zentrum Kulturgutverluste, "Lost Art-Datenbank," accessed October 11, 2024, <https://www.lostart.de/de/start>.

¹⁷ Deutsches Historisches Museum, "Datenbank zum 'Central Collecting Point München,'" accessed October 11, 2024, https://www.dhm.de/datenbank/ccp/dhm_ccp.php?lang=de.

¹⁸ Deutsches Zentrum Kulturgutverluste, "Periodikum „Provenienz & Forschung“," accessed January 25, 2025, <https://kulturgutverluste.de/mediathek/publikationen/periodikum-provenienz-forschung>.

¹⁹ Deutsches Zentrum Kulturgutverluste, "Schriftenreihe „Provenire“," accessed January 25, 2025, <https://kulturgutverluste.de/mediathek/publikationen/schriftenreihe-provenire>.

²⁰ Deutsches Zentrum Kulturgutverluste, "Reihe „Working Paper Deutsches Zentrum Kulturgutverluste“," accessed January 25, 2025, <https://kulturgutverluste.de/mediathek/publikationen/working-paper>

²¹ Deutsches Zentrum Kulturgutverluste, *Fotografien*.

projects, art historian and digital provenance expert Meike Hopp has made significant contributions in this area, particularly in her research on art dealers operating between Germany and Vienna, such as Adolf Weinmüller.²² Her work offers valuable insights into the domestic art market during World War II and highlights the latest technological advancements in digital provenance research within the German-speaking region.²³

In recent years, GLAM institutions especially in Germany have made considerable progress in digitization efforts, positioning them to better assess and share their experiences with academic community. This improvement has been especially notable in the areas of ethnographic collections and German colonial history. A notable example of such an initiative is the PAESE project, a postcolonial provenance research project undertaken across six collections in Lower Saxony, Germany.²⁴ While the project mainly focuses on postcolonial provenance, the publications of PAESE collaborators, such as Claudia Andratschke,²⁵ Jennifer Tadge,²⁶ and Sabine Lang,²⁷ have been invaluable for this thesis. Jennifer Tadge's work, especially her research on ethnographic databases, has highlighted challenges in provenance research that are also relevant to the study of Nazi-looted art. In both contexts, researchers often face artefacts with minimal or incomplete documentation, which complicates the reconstruction of ownership histories.

Considerable attention is also being dedicated to the development of semantic technologies tailored to the needs of (postcolonial) provenance research. A significant contribution on the topic of specialized databases in the German speaking region was made by Daniel Grana-Behrens, who advocates for the decolonization of knowledge

²² Hopp, "Der Kunsthändler Adolf Weinmüller (München/Wien) und seine Rolle bei der „einheitlichen Neuregelung des Deutschen Kunsthandels“."

²³ Hopp, "Provenienzforschung und digitale Forschungsinfrastrukturen in Deutschland."

²⁴ "PAESE. Provenienzforschung Zu Außereuropäischen Sammlungen Und Der Ethnologie in Niedersachsen," accessed November 11, 2024, <https://www.postcolonial-provenance-research.com/en/>.

²⁵ Claudia Andratschke, "Netzwerke erweitern. Von NS-Raubgutforschung zur Provenienzforschung in ethnologischen Sammlungen der Kolonialzeit."

²⁶ Tadge, "Digitale Fallstricke in der Provenienzforschung."

²⁷ Lang, "»...nicht die Ausnahme, sondern der Normalfall!« Die digitale Lücke in der Kunstgeschichte und Provenienzforschung"; Lang, "Wie hat sich Provenienzforschung durch Digitalität verändert?"

structures when dealing with objects of colonial origin. He underscores the need to adopt semantic models that prioritize transparency and inclusivity, reshaping provenance research practices to reflect the cultural and historical complexities of these collections more accurately.²⁸

Another important contribution comes from Leuphana University in Lüneburg, where the team behind The Provenance Lab is building upon existing standards and providing up-to-date discussions on data modeling in digital provenance research. Their work incorporates cutting-edge technologies, including artificial intelligence and natural language processing, to enhance and support provenance research efforts.²⁹

In the context of linked art data for provenance research, Laurel Zuckerman has conducted significant research into the technical aspects of transforming provenance data into linked data. Her insights into the shortcomings of knowledge databases, particularly in reconciling data related to Nazi-looted art, have been very valuable for my work. Notably, she demonstrated that reconciliation services often show a preference for the English language and are often unreliable in this context, a limitation that has been confirmed in my own work with similar data.³⁰ Additionally, her blog, Open Art Data,³¹ has been a major influence and served as a key inspiration for choosing this research topic for my thesis.

²⁸ Grana-Behrens, "Digitalbasierte ethnologische Provenienzforschung."

²⁹ Rother, Mariani, and Koss, "Hidden Value"; Rother, Mariani, and Koss, "Interpreting Strings, Weaving Threads: Structuring Provenance Data with AI"; Mariani, Rother, and Koss, "Teaching Provenance to AI"; Lynn Rother, Fabio Mariani, and Max Koss, "Taking Care of History: Toward a Politics of Provenance Linked Open Data in Museums."

³⁰ Laurel Zuckerman, "Linked Data and Holocaust Era Art Markets: Gaps and Dysfunctions in the Knowledge Supply Chain."

³¹ "Open Art Data. Linking Databases To Detect Looted Art," accessed November 17, 2024, <https://www.openartdata.org/>.

Historical Overview

The systematic plundering of cultural objects by National Socialist authorities, often referred to as "thefticide", was a meticulously orchestrated operation driven by widespread anti-Semitism, and had profound symbolic significance. The construction of a new cultural identity under the Nazi regime necessitated the degradation and destruction of the "enemy" culture, while simultaneously appropriating valuable artistic artefacts for cultural, ideological, and financial purposes. Even inexpensive artifacts were confiscated, demonstrating that the primary intention was to plunder and humiliate.¹ This was the beginning of a harrowing process that would tragically result in unprecedented suffering, displacement, and genocide.² It is estimated that approximately 65,000 Austrian Jews perished during the conflict, while around 130,000 fled the country and 5,500 went into hiding.³

Viennese Jewish Community Before and After the War

According to the 1934 Census, Vienna was home to 176,034 Jews, accounting for 9% of the city's total population and 92% of the Jewish population in Austria. In the years preceding the Anschluss, the Jewish population in Austria decreased somewhat, mostly due to the escalation of anti-Semitic sentiment, following the Nazis coming to power in Germany in 1933. Additional factors contributing to the population decline included a decrease in birth rates and exits from the Jewish religious community. The latter was

¹ Birgit Kirchmayr, "Restituiert. Von der Unzulänglichkeit und gleichzeitigen Alternativlosigkeit des späten Zurückgebens," 183; Birgit Kirchmayr, "„Es ging mehr um den persönlichen Wert...“ Der NS-Kunstraub im Kontext kultureller Auslöschungspolitik," 2–3.

² *Schlussbericht der Historikerkommision der Republik Österreich Vermögensentzug während der NS-Zeit sowie Rückstellungen und Entschädigungen seit 1945 in Österreich*, 80–81.

³ Albert Lichtblau, "Integration, Vernichtungsversuch und Neubeginn – Österreichisch-jüdische Geschichte 1848 bis zur Gegenwart," 537–538; Exner and Schimany, "Die Volkszählung von 1939 in Österreich und die Erfassung der österreichischen Juden," 137.

often necessitated by interfaith marriages, which frequently required conversion or the renunciation of Jewish identity.⁴

At the time of the Anschluss, Vienna had the largest Jewish population in the German Reich. However, by 1939, the Jewish population had decreased by half due to intense pressure from the new authorities.⁵ It is significant to note that with the implementation of the Nürnberg Laws, the authorities expanded their definition of who belonged to the Jewish community, leading to higher estimates of the Jewish population.⁶

The pre-war Jewish population of Vienna was extremely heterogeneous, consisting of many groups. From the early 1900s, and particularly during and after World War I, Vienna became a major destination for Jews from the eastern regions of the Austro-Hungarian Empire. This influx led to tensions between the newly arrived Jews and the established "Austrian" Jewish community, as well as with the broader population. These tensions were fuelled by cultural, class, religious, and linguistic differences, as well as fears that the arrival of Eastern European Jews would exacerbate existing antisemitic sentiments among the local population.⁷

Contrary to popular belief, particularly in discussions about the restitution of artworks, pre-World War II reports indicate that Jews in Austria generally experienced significantly worse living conditions compared to the rest of the population.⁸ While the most famous restitution cases often involve prominent Viennese families such as the Rothschilds and the Ephrussis, who gained wealth and status during the 19th-century

⁴ *Statistisches Jahrbuch der Stadt Wien. 1930 - 1935*, 3:12; Exner and Schimany, "Die Volkszählung von 1939 in Österreich und die Erfassung der österreichischen Juden," 140; Lichtblau, "Integration, Vernichtungsversuch und Neubeginn – Österreichisch-jüdische Geschichte 1848 bis zur Gegenwart," 67.

⁵ Safrian, "Expediting Expropriation and Expulsion," 400.

⁶ *Schlussbericht der Historikerkommisison der Republik Österreich Vermögensentzug während der NS-Zeit sowie Rückstellungen und Entschädigungen seit 1945 in Österreich*, 85.

⁷ Lichtblau, "Integration, Vernichtungsversuch Und Neubeginn – Österreichisch-Jüdische Geschichte 1848 Bis Zur Gegenwart," 497–499.

⁸ *Schlussbericht der Historikerkommisison der Republik Österreich Vermögensentzug während der NS-Zeit sowie Rückstellungen und Entschädigungen seit 1945 in Österreich*, 86.

monarchy, these elite families were not representative of the broader Jewish population in Vienna, nor of the full spectrum of restitution cases.⁹

Furthermore, there were relatively few art collectors among Viennese Jewry, and even fewer who specialized in modern or contemporary art, such as the Lederers or Jenny Steiner. According to a historian Ingo Zechner, Jewish art collectors of the time had conservative, bourgeois tastes that aligned with the general preferences of the middle class.¹⁰ This so-called "living room art" (*Wohnzimmerkunst*) represented the assimilation of (upper) middle-class Jewish inhabitants into the Viennese bourgeoisie, as well as their newly acquired position and identity. Frequently, these artworks, which constitute most of the confiscated art from that period, are frequently of lesser quality but serve as a testament to a specific cultural and social milieu.¹¹

Anschluss

The annexation (*Anschluss*) of Austria into the Third Reich on March 12, 1938, marked the beginning of a period of profound upheaval for Vienna's Jewish community. The Anschluss served as a catalyst for intense anti-Semitic sentiment which reached a peak during the uncontrolled and unofficial plundering of Jewish private properties by sympathizers of the NSDAP and civilians in what became known as the March Action ("*Märzaktion*").¹²

The complicity of the general population in these events is frequently debated in the context of World War II. However, given the highly public nature of these early acts, claims of ignorance are implausible.¹³ Many of these looted items ended up in the private possessions of building janitors or neighbours of the targeted individuals.¹⁴ Not

⁹ Franz, "Wider das Vergessen: Deutsch-österreichische Zusammenarbeit über www.lostart.de," 237.

¹⁰ Zechner, "Zweifelhaftes Eigentum. Fußnoten zur Kunstrestitution in Österreich," 236.

¹¹ Gaudenzi and Niemeyer, "Between Material Culture and 'Living Room Art,'" 333; Löffler, "'Living Room Art' and the Material Culture of Provenance," 370.

¹² Caruso, "Raub in geordneten Verhältnissen," 13.

¹³ O'Donnell, "The Restitution of Holocaust Looted Art and Transitional Justice," 52.

¹⁴ Lisa Frank, "'Wenn es uns nicht zusteht, werden wir es den rechtmäßigen Eigentümern zurückgeben'. Private Initiativen zur Restitution," 80–81; Decker, "A Legacy of Shame," 55–56.

only Jewish assets, but also those of political opponents, members of other religious organisations, and even libraries or archives, were targeted.¹⁵

As a response to these events, on June 18, 1938, the so-called *Führer Reserve* (*Führervorbehalt*) was brought to life. It was supposed to bring looting under the control of the authorities.¹⁶ In comparison to the rest of the Reich, the looting began early, namely with the Anschluss, while in the rest of the Reich such events only began around the time of Kristallnacht.¹⁷

Austrian anti-Semitic policies, known as the "Vienna model," are seen to be substantially more radical than those in Germany, even though they had been in place for longer.¹⁸ Following the Anschluss, several legislative measures were enacted against the Jewish population, including the Reich Flight Tax (*Reichsfluchtsteuer*). This tax, aimed at preventing the outflow of money from the country, required emigrating citizens to pay around 25% of total assets or income. In November 1938, this tax was replaced by the Jewish Asset Levy (*Judenvermögensabgabe*), which mandated that every Jewish citizen pay a 20% of all private assets as a tax. This obligation proved impossible for many citizens to fulfil, leading to the confiscation of private properties.¹⁹

In the initial stages of the Anschluss, the government's seizure of Jewish private property operated within a semi-legal framework, governed by the Second Regulation for the Law of the Reunification of Austria with the German Reich (*Zweiten Verordnung zum Gesetz über die Wiedervereinigung Österreichs mit dem Deutschen Reich*), enacted on March 18, 1938.²⁰ However, the government quickly established the bureaucratic infrastructure for a more controlled and organized plundering of Jewish assets with the enactment of the Ordinance on the Registration of Jewish Property (*Verordnung über*

¹⁵ Holzbauer, "NS-Kunstraub in Österreich. Von 1938 bis heute. Ein Überblick," 233.

¹⁶ Caruso, "Raub in geordneten Verhältnissen," 13.

¹⁷ Anderl and Caruso, Alexandra, "Einleitung," 12.

¹⁸ Safrian, "Expediting Expropriation and Expulsion," 390.

¹⁹ Lillie, *Was einmal war*, 14.

²⁰ Anderl, Blaschitz, Edith, and Sabine Loitfellner, "Die Arierisierung von Mobilien und die Verwaltungsstelle für jüdisches Umzugsgut," 60–61.

die Anmeldung des Vermögens von Juden). Under this law, Jewish-owned businesses and private individuals were mandated to register their assets within a three-month timeframe, with an exemption for private properties valued under 5000 Reichsmark.²¹ Additionally, any artwork or items considered "luxurious" had to undergo evaluation by a court-appointed appraiser. These registrations, carried out by the newly established Property Transaction Office (*Vermögensverkehrsstelle*), were typically accessible to customs officials, the Federal Monuments Authority (*Zentralstelle für Denkmalschutz*) and even to Dorotheum.²² It's estimated that around 43,629 individuals in Vienna alone were compelled to register both their domestic and foreign assets with the Property Transaction Office, encompassing both material and non-material possessions.²³

During the second half of 1938, an alarming spike in physical violence against Jewish individuals and institutions took place, culminating in an explosion of brutality on the night of the Kristallnacht on November 9, 1938, which proved to be more violent in Vienna than anywhere else.²⁴ During Kristallnacht, about 4,000 businesses in Vienna that had not yet been "Aryanized" were robbed, trashed, and destroyed. Private properties were also subject to extensive pillage, with an estimated 1,950 private flats targeted in Kreis I alone.²⁵ Shortly afterwards, on November 20, 1938, the Ordinance on the Seizure of Assets of Enemies of the People and the State in Austria (*Verordnung über die Einziehung volks- und staatsfeindlichen Vermögens im Lande Österreich*) was enacted, which paved the way for the confiscation of private property belonging to those deemed enemies of the state. It made it possible to quickly seize those who were allegedly supporting "anti-state" activities.²⁶

²¹ Pammer, *Jüdische Vermögen in Wien 1938*, 11–12.

²² Lillie, *Was einmal war*, 14.

²³ Pammer, *Jüdische Vermögen in Wien 1938*, 37.

²⁴ Safrian, "Expediting Expropriation and Expulsion," 400.

²⁵ Anderl, Blaschitz, Edith, and Sabine Loitfellner, "Die Aryanisierung von Mobilien und die Verwaltungsstelle für jüdisches Umzugsgut," 46–47.

²⁶ Schwarz, *Hitlers Sonderauftrag Ostmark*, 43.

Flight from Persecution

Emigration posed significant challenges to the Jewish people since it was both financially and bureaucratically complicated. Individuals had to file an official request and obtain approval from authorities before relocating their property abroad. In Vienna alone, an estimated 10,500 such requests were received in 1938.²⁷

This legislation provided authorities, particularly the Federal Monuments Authority (in 1940 renamed to *Institut für Denkmalpflege*), with comprehensive information on Jewish residents who intended to leave the country while trying to transport their valuable possessions with them. However, at this point, authorities usually already had information about their most valued assets collected via the Property Transaction Office.

In addition, an earlier legislation rendered exporting an artwork difficult. The Export Prohibition Act (*Ausfuhrverbotsgesetz*) of 1923 prohibited the export of artworks or artefacts with historical, cultural, or artistic importance. Consequently, collectors trying to emigrate were frequently forced to quickly sell their artworks for substantially less than their true value, rarely receiving the proceeds themselves.²⁸ Art dealers benefited enormously from these terrible circumstances, making a profit by reselling such cheaply obtained artworks, frequently to Dorotheum and officials themselves.

Even with approval from the authorities, the export of possessions was often hindered by numerous obstacles, resulting in these items rarely leaving the country.²⁹ When the war began, goods in shipping warehouses awaiting shipment were legally transferred to the ownership of the country. These goods, which usually included the entire furnishings of people's homes, began to accumulate at the shipping companies' facilities, where over 5,000 moving containers were held. To deal with this problem, The Gestapo Office for the Disposal of the Property of Jewish Emigrants (*Verwaltungsstelle*

²⁷ Holzbauer, "NS-Kunstraub in Österreich. Von 1938 bis heute. Ein Überblick," 243.

²⁸ Loitfellner, "NS-Kunstraub und Restitution in Österreich. Institutionen – Akteure – Nutznießer," 14.

²⁹ Holzbauer, "NS-Kunstraub in Österreich. Von 1938 bis heute. Ein Überblick," 243.

für jüdisches Umzugsgut der Gestapo, or VUGESTA) was established on August 1, 1940. VUGESTA was given the task of confiscating and then distributing these items, initially via Dorotheum auctions. However, the high expense of storage and the substantial number of confiscated artefacts presented a financial concern to VUGESTA. To turn profit faster, they began arranging independent direct sales, although Dorotheum continued to receive VUGESTA-confiscated objects valued over a thousand Reichsmarks.³⁰ According to reports, the auction business made over eleven million Reichsmark from VUGESTA confiscations alone.³¹ From 1938 to 1940, Dorotheum auctioned off entire the entire contents of apartments approximately fifty-four times.³²

Institutionalized Theft

Federal Monuments Authority played an essential part in the acquisition of Jewish-owned art and cultural property. They had access to information about the whereabouts of valuable artefacts since all evaluations of private assets performed by the Property Transaction Office were transmitted directly to them. Furthermore, they oversaw the adoption of "safeguarding measures" to prevent valuable artefacts from being exported, as all export requests were routed to them as well.³³ The magistrates carried out the confiscation items following instructions from the Federal Monuments Authority.³⁴

Prior to being distributed, confiscated items were usually stored in specific places around the city. In the autumn of 1938, the Neue Burg (Hofburg) welcomed the opening of a new Central Depot for Seized Collections (*Zentraldepot für beschlagnahmte Sammlungen*) to house them all under one roof. This initiative was driven by the *Kunsthistorisches Museum* and its newly appointed director, art historian

³⁰ Anderl, "Arisierung" von Mobilien, 123

³¹ Lillie, *Was einmal war*, 15.

³² Caruso, "Raub in geordneten Verhältnissen," 93–94.

³³ Lillie, *Was einmal war*, 14.

³⁴ Loitfellner, "NS-Kunstraub und Restitution in Österreich. Institutionen – Akteure – Nutznießer," 15.

Fritz Dworschak. In July 1940, Dworschak was relieved of his leadership role at the Central Depot when it fell under the purview of the Federal Monuments Authority.³⁵

The new regime found considerable support among museum and gallery workers.³⁶ Without their help, the confiscation operation would not have been such a success. These experts had knowledge of private collections, the locations of artworks and the value of items. Furthermore, the dismissal of all “unwanted” workers also meant new opportunities to climb the career ladder.³⁷

One such case was Dworschak. As the director of the biggest museum in Vienna at the time, he was directly involved in most confiscation procedures, including the seizure of a collection belonging to industrialist Oskar Bondy just two weeks after the Anschluss. Dworschak was highly ambitious, striving to acquire the most prominent artworks and collections for his museum, often lobbying with the authorities or submitting wish lists.³⁸ His efforts paid off, leading to the remarkable expansion of the *Kunsthistorisches Museum* between 1938 and 1941. During this period, an astonishing eleven new departments and collections were established within this one museum alone.³⁹

Each item in the Central Depot, including some from renowned collections like Rothschild, underwent cataloguing and photography. The magnitude of this inventory process became apparent in a statement found in a yearly report of the coin collection in 1939. It noted that cataloguing the items and maintaining cooperation with the Gestapo consumed a significant portion of the time that had previously been dedicated to work on the museum's collections. Nonetheless, despite the intense workload, the task was completed in a little over a year. By the time Hitler visited the collection for

³⁵ Ibid., 16.

³⁶ Haupt, *Jahre der Gefährdung*, 16.

³⁷ Jabloner and Schölnberger, “Wider das Vergessen. Die Kunstrückgabe in Österreich 1998 bis 2003,” 36–37.

³⁸ Haupt and Seipel, 129–130.

³⁹ Ibid., 145.

the second time in June 1939, it had already been meticulously organized and catalogued.⁴⁰

The Central Depot goods were meant to be distributed and sold among the institutions. But once the Führer Reserve was passed on June 18, 1938, all art that had been seized was set aside for the unrealized Hitler's personal museum in Linz. Only a special commissioner Hans Posse, a man chosen by Hitler himself, could "release" the art for further distribution. Hitler's architect, Albert Speer, recommended Posse, who had previously served as director of Dresden's Old Masters Picture Gallery, for putting together a collection for the Linz Museum based on Hitler's own preferences. Posse's role extended to distributing the artworks from the Central Depot and determining which institutions would receive which items, sparking intense rivalry between galleries and other museums.⁴¹ Maintaining excellent contact with Posse was crucial. His amicable relationship with *Kunsthistorisches Museum* director Fritz Dworschak made it possible for the museum to acquire a few items from the Rothschild collection that was kept in the Central Depot. After Posse's death in 1942, Hermann Voss, the former deputy director of Berlin's Bode Museum (previously known as Kaiser-Friedrich-Museum), took over his responsibilities.⁴²

According to contemporary sources, Hitler planned from the start to give artworks to museums and galleries throughout Austria. This plan did not sit well with Dworschak in particular, who aimed to retain all the artworks in Vienna.⁴³ However, as the Central Depot rapidly filled up, accommodating approximately 10,000 artworks by autumn 1939, the challenge of storage became increasingly pressing.⁴⁴

To assist in guiding the distribution of artworks from the Central Depot, Hitler appointed Berlin art dealer Karl Haberstock as an advisor to Posse. Haberstock suggested that artworks remaining in the depot could be sold on the market,

⁴⁰ Ibid., 129.

⁴¹ Loitfellner, 15–18.

⁴² Haupt and Seipel, *Das Kunsthistorische Museum*, 129.

⁴³ Schwarz, *Hitlers Sonderauftrag Ostmark*, 53–55.

⁴⁴ Haupt, *Jahre der Gefährdung*, 16.

particularly abroad, to generate profit. However, he was cautioned against this idea, as it was feared that the previous owners might attempt to reclaim the artworks through legal means in English or American courts, disputing their confiscation.⁴⁵

It is evident that financial gain played a significant role in the confiscation of artworks. On a couple of occasions, there were some nearly successful attempts to sell some of the larger collections abroad. For instance, when the London-based company Duveen Brothers expressed interest in purchasing the Rothschild and Guttman collections, the potential sale was halted by Dworschak on February 4, 1939.⁴⁶

Connections with the International Art Market

Even before 1938, there were strong ties between Germany and the global art market. Confiscated and stolen goods were routinely sold internationally to fund the German economy and war operations. This scenario was mutually advantageous, especially for Swiss galleries, museums, and art dealers, who benefited tremendously from the events in Germany. Swiss institutions frequently lent artworks from German Jewish collectors since they could ship these objects from Germany to Switzerland, freeing owners of taxes and tariffs. These flight goods were then showcased at major exhibitions in Swiss institutions, gaining significant publicity before being sold, often through Theodor Fischer. Fischer was a key figure in the Swiss art market at the period, and it is believed that more than 90% of Swiss acquisitions for Hitler's planned museum in Linz came from his gallery in Lucerne, with most of the paintings formerly owned by Jewish owners.⁴⁷

Major financial organizations were also involved in similar activities, which ranged from producing foreign currency for Germany by selling degenerate art to shipping suspiciously obtained artworks from Germany to dealers overseas.⁴⁸

⁴⁵ Schwarz, *Hitlers Sonderauftrag Ostmark*, 45.

⁴⁶ Ibid.

⁴⁷ Unabhängige Expertenkommission Schweiz--Zweiter Weltkrieg, *Switzerland, National Socialism, and the Second World War*, 349–357.

⁴⁸ Ibid., 352.

The transactions between the USA and Switzerland were particularly intense, challenging the myth that American institutions were primarily concerned with saving art from the Nazis. A network of art dealers working between the United States and Europe allowed the transit of seized art from Switzerland to the United States, where it was routinely presented in renowned museums and galleries and continues to be today.⁴⁹

The Role of Dorotheum

Although not a Nazi institution, the Viennese-based auction house Dorotheum played a crucial role in distributing confiscated items, closely collaborating with the regime, and greatly benefiting from auctioning looted art, becoming the leading auction house in the German-speaking region during those years.⁵⁰

The trade in confiscated items constituted most of the profits for Dorotheum during those years. According to some accounts, Dorotheum could have faced serious financial issues if it were not for the sale of Jewish goods.⁵¹ The authorities chose to auction confiscated items with Dorotheum also because it was more profitable than the alternatives. There were also instances where the government disregarded the opinions of experts and auctioned off objects that art historians deemed too precious to be placed in private hands.⁵² Very often, Dorotheum served as the final recorded location before the traces of an artwork were lost.⁵³

Initially, the plan was to sell all confiscated property through Dorotheum via VUGESTA, but this proved unfeasible due to the sheer volume of items involved. Instead, Dorotheum "specialized" in auctioning valuable items and artworks,⁵⁴ as well as

⁴⁹ Laurie A. Stein, "The Path of Art from Switzerland To America from the Late 1930's to the Early 1950's: A Report of Research Result," 3–6.

⁵⁰ Anderl, "„Kostbarkeiten, gemischt mit Trödel ...": die „Abwicklung“ jüdischer Kunst- und Antiquitätenhandlungen in Wien während der NS-Zeit," 37.

⁵¹ Loitfellner and Wulz, "Dorotheum und Vugesta als Institutionen der NS-Kunstenteignung," 209.

⁵² Anderl, Blaschitz, Edith, and Sabine Loitfellner, "Die Arierisierung von Mobilien und die Verwaltungsstelle für jüdisches Umzugsgut," 132.

⁵³ Loitfellner, 20.

⁵⁴ Ibid.

conducting evaluations of objects for the Gestapo and the police.⁵⁵ Due to time, space and staff constraints, Dorotheum was “conveniently” unable to adhere to the standard procedure of recording previous owners in sales documentation, especially in cases involving VUGESTA. Only for highly valuable items was this record maintained in the sales account.⁵⁶

Even Dorotheum was subject to the Führer Reserve and often had to agree on symbolic prices when selling to galleries and museum. However, this arrangement became acceptable when the Dorotheum storage reached capacity, and they started to distribute the artworks on their own initiative.⁵⁷

Complicit Art Market

The “Aryanization” of the economy ensured that Dorotheum gained a monopoly on the art market. However, between 1938 and 1940, the Vienna art market also underwent significant changes. By 1939, most Jewish-owned commercial art galleries had lost most of their valuables due to uncontrolled pillaging and various forms of judicial confiscation. The remaining “non-Aryanized” businesses were liquidated, and their assets were sold, primarily through Dorotheum.⁵⁸ Nevertheless, other smaller auction houses and art dealers also actively participated in this process, acquiring a portion of the liquidated assets, and profiting from non-market prices offered in desperation.⁵⁹

There were numerous art dealers who served as intermediaries between authorities and the market. According to Hans Herbst, a former employee of Dorotheum, art dealers would scan newspapers for advertisements of property sales by desperate Jews

⁵⁵ Anderl, Blaschitz, Edith, and Sabine Loitfellner, “Die Arisierung von Mobilien und die Verwaltungsstelle für jüdisches Umzugsgut,” 98.

⁵⁶ Ibid., 133.

⁵⁷ Loitfellner, “NS-Kunstraub Und Restitution in Österreich: Institutionen – Akteure – Nutznießer,” 19.

⁵⁸ Anderl, “„Kostbarkeiten, gemischt mit Trödel ...“: die „Abwicklung“ jüdischer Kunst- und Antiquitätenhandlungen in Wien während der NS-Zeit,” 36–38.

⁵⁹ Anderl, “„Am Wiener Platz“: Schlaglichter auf die Rolle des Wiener Kunsthandels während der NS-Zeit,” 171.

attempting to sell their belongings before emigrating. These items, usually sold for a fraction of their true value, were often initially offered to individuals close to the regime, including their families and associates.⁶⁰

A significant role on the Viennese art market of that time was played by the Munich art dealer Adolf Weinmüller, who posed competition to Dorotheum. Weinmüller expanded his business to Vienna and appropriated the business of the Jewish art dealer family Kende, renaming it to *Wiener Kunstversteigerungshaus Adolph Weinmüller*. His strong connections enabled him to handle goods confiscated from occupied territories, although he primarily specialized in Jewish collections.⁶¹ Numerous individuals were involved in similar activities, including Friedrich Pfundmayer⁶² and Franz Kieslinger, an art historian, and a renowned art appraiser.⁶³ Other notable figures included Ferdinand Spanyol, who resold items purchased through VUGESTA for profit via Dorotheum,⁶⁴ as well as Friedrich Welz, Wolfgang Gurlitt, and Maria Almas Dietrich, among others.⁶⁵

Underground Shelters and the End of the War

Even before the onset of the war, authorities were aware of the imminent danger posed by air strikes. When the war started, only less valuable artworks remained on display in museums, while the most valuable pieces were moved to safety. This started as early as September 1939. Initially, they stored the artworks in different places like monasteries and castles, such as in Gaming, Steinbach bei Göstling, Klosterneuburg, and Thürnthal.⁶⁶

⁶⁰ Anderl, 154–155.

⁶¹ Hopp, "Der Kunsthändler Adolf Weinmüller (München/Wien) und seine Rolle bei der „einheitlichen Neuordnung des Deutschen Kunsthandels“,“ 75.

⁶² Anderl, Blaschitz, Edith, and Sabine Loitfellner, "Die Arierisierung von Mobilien und die Verwaltungsstelle für jüdisches Umzugsgut," 154.

⁶³ Hopp, "Der Kunsthändler Adolf Weinmüller (München/Wien) und seine Rolle bei der „einheitlichen Neuordnung des Deutschen Kunsthandels“,“ 75.

⁶⁴ Anderl, Blaschitz, Edith, and Sabine Loitfellner, "Die Arierisierung von Mobilien und die Verwaltungsstelle für jüdisches Umzugsgut," 154.

⁶⁵ Loitfellner, "NS-Kunstraub Und Restitution in Österreich: Institutionen – Akteure – Nutznießer," 16.

⁶⁶ Haupt and Seipel, *Das Kunsthistorische Museum*, 159.

This decentralization strategy aimed to prevent the complete loss of artworks by spreading them across various sites.⁶⁷ In May 1941, Hitler's "*Sonderauftrag*" was transported to the monastery in Kremsmünster,⁶⁸ and in the second half of 1943, it was relocated, together with other collections, to the salt mines in Altaussee and Lauffen in Upper Austria. These locations were carefully chosen for their distance from air strikes, as well as for their constant temperature and favourable air moisture conditions.⁶⁹

As the war progressed, more objects were transported to the mine, including confiscated items from around the Reich as well as national treasures. Ultimately, more than 6,500 items were stored in the mines for safekeeping.⁷⁰ Just a few weeks before the end of the war, when the outcome was already clear, the authorities ordered the mine to be filled with explosives and blown up. However, due to the intervention of the leader of the Federal Monuments Authority, some valuable items were moved to Bad Aussee and Lauffen, while others were taken deeper into the mine to withstand the blast. Fortunately, the disaster was averted in the last second.⁷¹

After the end of the war, securing and retrieving the artworks from the shelters was a delicate and time-consuming operation. There was a significant risk of artworks disappearing or being destroyed. Apart from the immediate danger of plundering and destruction by the soviet army, contemporary sources also report similar behaviour from the general population.⁷²

Since most of the underground depots were in the US occupied zones, the restitution efforts in Austria were primarily overseen by the Allies, notably the American army, in accordance with the London Declaration of January 5, 1943.⁷³ The London Declaration

⁶⁷ Schallmeiner, "»Die modernen Nibelungen salzen ihre Schätze ein«. Altaussee als Bergungsort des Instituts für Denkmalpflege," 106.

⁶⁸ Schwarz, *Hitlers Museum*, 74.

⁶⁹ Schallmeiner, "»Die modernen Nibelungen salzen ihre Schätze ein«. Altaussee als Bergungsort des Instituts für Denkmalpflege," 107–109.

⁷⁰ Loitfellner, "NS-Kunstraub Und Restitution in Österreich: Institutionen – Akteure – Nutznießer," 21.

⁷¹ Schallmeiner, "»Die modernen Nibelungen salzen ihre Schätze ein«. Altaussee als Bergungsort des Instituts für Denkmalpflege," 122.

⁷² Brückler, "Bergungsmaßnahmen," 246.

⁷³ Sailer, "Rückbringung und Rückgabe," 1.

(or the *Inter-Allied Declaration against Acts of Dispossession Committed in Territories under Enemy Occupation or Control*) annulled transfers of property from occupied territories that belonged to residents of those territories and required the return of expropriated items to their countries of origin. The legitimacy of these transfers, even if deemed "official" was questioned. Many experts critiqued the real significance of the London Declaration, stating that its non-binding nature mirrored the Allies' reluctance to issue any official proclamations.⁷⁴

Recognizing the potential for selling artworks to fund escape or support underground Nazis, the American army was keen to secure the hidden objects quickly.⁷⁵ They established several Central Art Collecting Points (CACPs). Most objects discovered in Austrian salt mines were first sent to the Munich CACP.⁷⁶ However, some remained in the mines, and it took years before the last artworks were retrieved.⁷⁷

⁷⁴ O'Donnell, "The Restitution of Holocaust Looted Art and Transitional Justice," 60.

⁷⁵ Lillie, *Was einmal war*, 13.

⁷⁶ Sailer, "Rückbringung und Rückgabe," 31.

⁷⁷ Haupt and Seipel, *Das Kunsthistorische Museum*, 184–186.

Austrian Restitution Efforts

Austria's Obligations and Commitments

In her stance towards taking responsibility for the events of World War II, Austria relied on the Moscow Declaration of 1943, in which the governments of the United States, USSR, and the UK agreed to the notion that Austria was the first victim of Nazism.¹

As post-war Austria was not considered to be a legal successor of the Nazi state, the government denied complicity in the war, a position known as the Austrian victim theory, which persisted into the 1980s. And although even the Austrian State Treaty from 1955 states the country's obligation to restitution, this position significantly impacted both the general and legal attitudes towards restitution, a situation that only began to change in the early 1990s. One of the first steps towards a more honest and ethical practice of restitution was the establishment of the National Fund of the Republic of Austria for Victims of National Socialism (*Der Nationalfonds der Republik Österreich für Opfer des Nationalsozialismus*) in 1995.²

The state's restitution efforts were often criticized and deemed lazy and unprofessional.³ The lack of motivation can also be attributed to the sensitive political climate in the Second Republic, troubled by the unwanted potential return of Jewish refugees.⁴ This illustrates that Jewish citizens were still not considered Austrian and continued to be categorised as foreign, even after the war ended.⁵ In contrast, plundered artworks from persecuted Jews were now categorised as part of Austria's national cultural heritage, complicating their restitution.⁶ The Nazis were exceptionally

¹ Lessing and Azizi, "Austria Confronts Her Past," 226–227.

² Ibid., 226–229.

³ Oliver Rathkolb, "From 'Legacy of Shame' to the Auction of 'Heirless' Art in Vienna: Coming to Terms 'Austrian Style' with Nazi Artistic War Booty," 1.

⁴ Ibid., 3.

⁵ Lichtblau, "Integration, Vernichtungsversuch und Neubeginn – Österreichisch-Jüdische Geschichte 1848 bis zur Gegenwart," 537.

⁶ O'Donnell, "The Restitution of Holocaust Looted Art and Transitional Justice," 62.

skilled at concealing the Jewish provenance of these artworks, and this technique continued long after the war. A notable example of this trend is Gustav Klimt's now iconic painting of Adele Bloch-Bauer (I). After being seized from its rightful owners and displayed at the Belvedere in 1943, the painting was stripped of its original title and was merely referred to as "Portrait of a Woman with a Gold Background." Despite the well-known identity of the subject, her name was deliberately omitted, reflecting a broader pattern of erasing Jewish traces.⁷

The painting returned to the spotlight in 1998 when Maria Altmann, Adele Bloch-Bauer's niece, filed a claim for restitution, after its legal status was uncovered by journalist Hubertus Czernin. Altmann's claim was part of a wider effort to recover six Klimt paintings that had once belonged to her family. After seven years of arduous legal battles, including a case before the US Supreme Court, her claim was successful. This lengthy process was triggered by the initial rejection of her claim in 1999 by the Austrian Restitution Commission under the newly implemented Art Restitution Act. Altmann's legal battle attracted widespread attention and shone a spotlight on Austrian politics, history, and the issue of restitution.⁸

The painting, initially a personification of cultural erasure, evolved into a significant element of Austrian cultural identity and tradition, despite its troubling history. This transformation highlights how restitution cases often provoke discussions about national identity and culture.⁹ Often, restitution claims are accompanied by assertions of "justice," as these artworks are now publicly accessible and available for everyone to admire. Claimants also frequently face accusations of selfishness and a desire for

⁷ Birgit Kirchmayr, "Restituiert. Von der Unzulänglichkeit und gleichzeitigen Alternativlosigkeit des späten Zurückgabens," 183.

⁸ Her initial claim was rejected due to her aunt's decision to leave the paintings to the Belvedere (then Österreichische Galerie). However, because Adele-Bloch Bauer was not the legal owner of the artworks, although her husband Ferdinand was, he was not legally required to fulfil her wishes. After fleeing the country in 1938, the government took his estate and possessions. Caroline Renold, Alessandro Chechi, Anne Laure Bandle, Marc-André Renold, "Case 6 Klimt Paintings – Maria Altmann and Austria."

⁹ O'Donnell, "The Restitution of Holocaust Looted Art and Transitional Justice," 53.

financial gain, rather than being seen as seeking to address historical wrongs.¹⁰ While it is normal for such claims to elicit uncomfortable and contradictory feelings among the public, particularly when addressing Austria's own historical history, they can also stir hatred and antisemitism, as seen in Switzerland. In the 1990s, Swiss banks came under intense scrutiny for their proximity to Nazi Germany between 1933 and 1945, particularly with regard to dormant accounts of Holocaust victims and Nazi gold. An international dispute between the US and Switzerland resulted in a 1.25-billion-dollar settlement, which unleashed a wave of anti-Semitism in the media.¹¹

Early Restitution Measures Under Allied Occupation

Repatriating the artworks proved to be a challenging endeavour, with the CACPs collaborating closely with experts and authorities. Repatriated items were initially relocated to from Munich to Salzburg and Kremsmünster, and then handed over to the owners, if possible.¹² However, there were items with unresolved ownership. After the dissolution of the CACP in 1952, Austria was handed over 960 such paintings, which clearly had an Austrian origin.¹³

The legal side of the restitution was overseen by the Federal Ministry of Finance (*Bundesministerium für Finanzen*), or Financial Directorates (*Finanzlandesdirektionen*) and the Restitution Commissions (*Rückstellungskommissionen*). Only after a positive decision was the Federal Office for the Protection of Monuments (*Bundesdenkmalamt*) able to return the items to the rightful owners.¹⁴

Most artworks were restituted in the years immediately after the war, before the state treaty of 1955, while the allied forces still influenced politics. According to some

¹⁰ Jabloner and Schölnberger, "Wider das Vergessen. Die Kunstrückgabe in Österreich 1998 bis 2003," 37-38.

¹¹ O'Donnell, "The Restitution of Holocaust Looted Art and Transitional Justice," 55.

¹² Sailer, "Rückbringung und Rückgabe," 32.

¹³ Friemuth, Charles, and Seeleke, *Die geraubte Kunst*, 77.

¹⁴ Sailer, "Rückbringung und Rückgabe," 33.

sources, by the beginning of 1949, between 10,000 to 13,000 seized artworks were returned to their rightful owners.¹⁵

At the end of the war, several pieces of legislation which annulled the "Aryanization" laws were passed. According to one such law from September 17, 1946, people holding any suspicious or "Aryanized" assets would need to register them with the authorities.¹⁶

Between 1945 and 1949 Austria passed a total of seven restitution acts regulating the claims for restitution of seized assets.¹⁷ While the first two were dealing with the restitution of assets in the ownership of the authorities, the third was concerning the items in private hands. The latter declared that all transfers of (Jewish owned) property after the March 13, 1938, are to be presumed as forced transfers due to the political and racial persecution of the owners.¹⁸

However, according to the Third Restitution Act (*Bundesgesetz über die Nichtigkeit von Vermögensentziehungen vom 6. Februar 1947, or Drittes Rückstellungsgesetz*), if the claimants could not prove in court that the receivers of such items knew at the time of purchase, that the items were Jewish Property, then the items were not subjected to the laws on restitution. Since auction houses or private galleries almost never named the provenance of the sold items, this meant these *bona fide* purchases were de facto exempt from future restitution laws, although it was publicly well known where such items came from.¹⁹

The process of claiming ownership of an artwork was lengthy and cumbersome, hindered by the scarcity of available documents, the passage of time, and the fact that many original owners did not survive the war.²⁰ Additionally, the claimant needed detailed information about the item's exact location and its transfer history to proceed with the claim. Furthermore, if the owner no longer resided in Austria, being reunited

¹⁵ Ibid.

¹⁶ Mayer, "Restitutions after 1945 and the 1998 Art Restitution Act," 331.

¹⁷ Sailer, 33-34.

¹⁸ Anton, *Illegalen Kulturgüterverkehr*, 533-534.

¹⁹ Ibid., 537-540.

²⁰ Haslinger, "Mauerbach und der lange Weg bis zur Auktion," 43.

with the artwork was nearly impossible due to laws prohibiting the export of cultural artifacts.

In some cases, authorities engaged in unethical practices by agreeing to export requests on the condition that a portion of the collection be donated to museums. Claimants were frequently pressured into accepting these terms to recover at least part of their property. For instance, Ernst Lederer and the Rothschild family faced such pressures, resulting in the extorted "donation" of 207 artworks and 70 long-term loans to various Austrian museums.²¹

These legal frameworks are evidence of the Austrian authorities' reluctance to fully confront, acknowledge and repent for the events in which they were actively involved, an attitude further enabled by the Austrian victim theory. Despite the Allied occupation, and later by the State treaty, life after the war quickly returned to pre-war patterns. The reintegration of former Nazis into public life demonstrates that prior ideals persisted in the background, even if they were officially condemned.

However, it is impossible to believe that the end of the war resulted in such drastic change of beliefs. Considering all of this is critical to understanding the political and social context in the early days of the Second Republic. After all, it was publicly and explicitly stated on several occasions that the Austrian government did not want survivors to return, a sentiment that was also prevalent among the general population. The legal measures they implemented clearly reflected this exclusionary attitude, designed largely to serve their own interests and not to restitution.

Heirless Art

The property that remained untraced to its rightful owners by 1966 was moved to the monastery in Mauerbach. Most of these items were the remnants of the artworks of

²¹ Jabloner and Schölnberger, "Wider das Vergessen. Die Kunstrückgabe in Österreich 1998 bis 2003," 26; Loitfellner, "NS-Kunstraub und Restitution in Österreich. Institutionen – Akteure – Nutznießer," 22; Oliver Rathkolb, "From 'Legacy of Shame' to the Auction of 'Heirless' Art in Vienna: Coming to Terms 'Austrian Style' with Nazi Artistic War Booty," 2–3.

Austrian provenance, uncovered by the CACP, but their ownership could not be determined with certainty. In addition to these artworks, the Mauerbach collection also included items from other depots.²²

According to Gerhard Sailer, the Mauerbach collection included 8,433 items, comprising 657 paintings, 84 watercolours, 250 drawings, 3,343 coins, and almost 3,000 books and other printed materials.²³ Although 270 items were restituted, this process lacked the necessary provenance research, raising worries about the possibility of incorrect restitutions occurring.²⁴

Following the passing of the Final Settlement of Heirless Property Law in 1969, objects for which ownership could not be proven or claimed became state property. Austria was compelled to produce an inventory of every item stored in Mauerbach. This inventory was published in the *Wiener Zeitung* and delivered to municipalities and Austrian diplomatic offices across the world. As claimants usually lacked documentation to prove their ownership, they were expected to be able to describe the item in detail. For this reason, descriptions were deliberately omitted from these inventories.²⁵

The artworks remained inaccessible to the public, potential claimants, and even art experts.²⁶ The Austrian government did not fully disclose the number of items in the collection, and officials often claimed that the preserved artworks lacked significant artistic or historical value, a statement that proved to be false.²⁷

In 1984, Andrew Decker's article "*A Legacy of Shame: Nazi Loot in Austria*," published in the American art journal *ARTNews*,²⁸ drew international attention to the Mauerbach

²² Sailer, "Rückbringung und Rückgabe," 37–38.

²³ *Ibid.*, 38.

²⁴ Jabloner and Schölnberger, "Wider das Vergessen. Die Kunstrückgabe in Österreich 1998 bis 2003," 27.

²⁵ Haslinger, 41–42.

²⁶ Oliver Rathkolb, "From 'Legacy of Shame' to the Auction of 'Heirless' Art in Vienna: Coming to Terms 'Austrian Style' with Nazi Artistic War Booty," 5.

²⁷ Decker, "A Legacy of Shame," 57.

²⁸ Decker, "A Legacy of Shame."

Collection, prompting several partial restitution efforts in the subsequent years. In the autumn of 1996, following the transfer of the collection to the Federal Association of Jewish Religious Communities (*Israelitische Kultusgemeinde*), the remaining 1,030 artworks, including 586 paintings, were auctioned at Christie's. The auction yielded a substantial financial surplus, which was allocated to the victims of National Socialism.²⁹

Sabine Loitfellner argues that the term "heirless" is misleading when describing these objects. While their current owners may not be identifiable, that doesn't mean they don't exist – rather, historical research has not yet uncovered the original owners and their heirs.³⁰ According to some experts, the Mauerbach artworks were not entirely unrecognizable, as the backs of the paintings were marked with inscriptions, inventory numbers, and other labels. There is debate regarding whether these artworks could have been traced back to their original owners.³¹ Nonetheless, it is indisputable that, under the political climate of the time, the Austrian state did not perceive restitution as part of its responsibility and did not engage in proactive provenance research.³² Consequently, it is entirely plausible that these artworks could have been returned, had there been sufficient interest and effort in pursuing their provenance.

Austrian Restitution Efforts After 1998

The Austrian state's changed stance towards historical events did not result in any significant changes to restitution efforts. The largest incentive for reform was a worldwide uproar in late 1997, when the Museum of Modern Art (MOMA) in New York presented an Egon Schiele exhibition with 152 items from the Leopold Museum. The

²⁹ Birgit Kirchmayr, „Es ging mehr um den persönlichen Wert...“ Der NS-Kunstraub im Kontext kultureller Auslöschungspolitik,“ 1.

³⁰ Sabine Loitfellner, „Restitution und Rechtnachfolge. Transgenerationelle Rückübertragung von Eigentum,“ 125.

³¹ Loitfellner, „NS-Kunstraub und Restitution in Österreich. Institutionen – Akteure – Nutznießer,“ 23; Sabine Loitfellner, „Restitution und Rechtnachfolge. Transgenerationelle Rückübertragung von Eigentum,“ 123; Oliver Rathkolb, „From 'Legacy of Shame' to the Auction of 'Heirless' Art in Vienna: Coming to Terms 'Austrian Style' with Nazi Artistic War Booty,“ 5.

³² Loitfellner, „NS-Kunstraub und Restitution in Österreich. Institutionen – Akteure – Nutznießer,“ 23.

New York Times³³ uncovered that several of the artworks in the show had a problematic history, which the owner and collector Rudolf Leopold vehemently denied. Despite his denials, two paintings, Portrait of Wally and Dead City III, were lawfully confiscated in the following days. The heirs of Lea Bondi Jaray, the original owner of Portrait of Wally who had tried unsuccessfully to reclaim the painting until her death in 1969, spent 12 years in legal battles before reaching a settlement with Leopold Museum in 2010. This case, together with the Bloch Bauer case, would mark the beginning of a process that would fundamentally transform the field of provenance research and restitution, not only in Austria, but worldwide.³⁴

Washington Principles on Nazi-Confiscated Art and Art Restitution Act (*Kunstrückgabegesetz*)

The fall of the Soviet Union and a spike in large restitution actions prompted the Washington Conference on Holocaust-Era Assets in December 1998. This event resulted in the development of the Washington Principles, endorsed by 44 nations, including Austria. Although a big step in the right direction, experts warn that the term "Nazi-confiscated art" ignores a crucial aspect of the lootings: extensive "Aryanization" by citizens and regime collaborators. While the assets in question were mostly artworks, the Terezin Declaration, endorsed at the 2009 Holocaust-Era Goods Conference in Prague, broadened this category. The Terezin Declaration reaffirms the call for implementing the Washington Principles and expands their scope to include additional types of assets.³⁵

While not legally binding, the 11 Washington Principles have had a significant impact, setting ethical standards for dealing with Nazi-confiscated art. Key recommendations

³³ Judith H. Dobrzynski, "THE ZEALOUS COLLECTOR. A Special Report. A Singular Passion For Amassing Art, One Way or Another."

³⁴ Blimlinger, "Rückstellungen und Entschädigungen in Österreich 1945 bis 2008. Ein Überblick," 26.

³⁵ Marc Masurovsky, "The Current State of Nazi-Era Provenance Research, and Access to Nazi-Era Research Resources and Archives," 139; Gaudenzi and Swenson, "Looted Art and Restitution in the Twentieth Century – Towards a Global Perspective," 16; Holocaust Era Assets Conference, "Terezin Declaration."

included making archives available to researchers, establishing specific provenance research commissions, publishing registers of heirless artefacts, and urging nations to create their own legal frameworks to apply these concepts.³⁶

During the Washington Conference, on December 4, 1998, the Austrian state enacted *The Federal Law on the Restitution of Art Objects from Austrian Federal Museums and Collections* (Art Restitution Act, or *Kunstrückgabegesetz*). The law commits the Austrian state to identifying and returning all cultural movable assets from Austrian federal collections. Most importantly for our case, it regulates the restitution of heirless items that remain state property.³⁷ These items have been given over to the National Fund of the Republic of Austria for Victims of National Socialism.³⁸ The *Art Restitution Act* encouraged federal provinces to adopt their own regulations, the city of Vienna was the first to do so in 1999, with slight differences to the national law.³⁹

Following the Terezín Declaration, the Art Restitution Act was amended in 2009, expanding, among others, the scope of the objects from works of art to other movable cultural assets and expanding the territorial scope.⁴⁰

However, the Art Restitution Act still has its shortcomings. The Federal Association of Jewish Religious Communities heavily criticized the Leopold Museum in 2008, accusing it of ignoring restitution attempts by keeping troubling artworks. The Leopold Museum, despite being a private foundation, gets large amounts of government funding. Although the museum has begun provenance investigations, as a private organization, it is free of the legal restrictions of the Art Restitution Act.⁴¹ This has led

³⁶ United States Department of State, "Washington Conference Principles on Nazi-Confiscated Art"; Gaudenzi and Swenson, "Looted Art and Restitution in the Twentieth Century – Towards a Global Perspective," 16.

³⁷ Bundesgesetz über die Rückgabe von Kunstgegenständen und sonstigem beweglichem Kulturgut aus den österreichischen Bundesmuseen und Sammlungen und aus dem sonstigen Bundeseigentum (*Kunstrückgabegesetz* – KRG) paragraph 1.

³⁸ *Ibid.*, para. 4b.

³⁹ Wladika, "Zehn Jahre Provenienzforschung, Erbensuche und Restitution in den Museen der Stadt Wien – Eine vorläufige Bilanz."

⁴⁰ Bonadies, "Taking Greater Responsibility: Austria's Art Restitution Act And The Need For Further Reform," 678.

⁴¹ Thomas Trenkler, "Lex Leopold ist möglich."

to calls for the inclusion of private institutions within the scope of Austria's Art Restitution Act, with some arguing that their exclusion breaches Article 13(b) of the 1970 UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property, which Austria ratified in 2015.⁴²

Commission for Provenance Research

In February 1998, Austria formed the Commission for Provenance. The Commission's work is crucial in identifying and addressing the complex issues surrounding looted art and cultural property. This proactive group focuses on conducting systematic provenance research on objects held in federal institutions, with the goal of uncovering the history of objects confiscated under the NS Regime or later purchased. They work closely with the Art Restitution Advisory Board (*Kunstrückgabebeirat*), to whom they submit their findings.⁴³ The commission determines which cases will be investigated, and the chairman decides which cases will be presented to the advisory board.⁴⁴

The Art Restitution Advisory Board (*Kunstrückgabebeirat*)

The third paragraph of the *Art Restitution Act* regulates the establishment of the Art Restitution Advisory Board. This board convenes several times a year to review the findings and recommendations of the Commission for Provenance Research. It then forwards its decisions and recommendations to the minister responsible for the institutions holding the contested objects. While the advisory board's recommendations are non-binding, the final decision on restitution is made by the Federal Minister.⁴⁵ Federal ministers could potentially reach different legal conclusions,

⁴² Bonadies, "Taking Greater Responsibility: Austria's Art Restitution Act And The Need For Further Reform," 675–676.

⁴³ "Commission for Provenance Research," accessed July 7, 2024, <https://provenienzforschung.gv.at/en/commission-for-provenance-research/>.

⁴⁴ Ingo Zechner, "Wie Entscheidungen fallen. Kunstrestitution in der Praxis," 213.

⁴⁵ Bundesgesetz über die Rückgabe von Kunstgegenständen und sonstigem beweglichem Kulturgut aus den österreichischen Bundesmuseen und Sammlungen und aus dem sonstigen Bundeseigentum (*Kunstrückgabegesetz – KRG*) paragraph 3.

although this rarely occurs. Typically, when advice is issued, the legal heirs to the challenged objects have not yet been identified. This search is usually conducted by the Federal Association of Jewish Religious Communities in Vienna. If this search proves successful, legal proceedings for restitution are launched.⁴⁶ Interestingly, the advisory board's mandate does not include so-called "flight goods." It solely addresses restitution in circumstances where the owner was targeted by the regime.⁴⁷

Since its inception, the advisory board has issued nearly 400 recommendations.⁴⁸ However, this decision-making process is classified, and the reasons behind it are not disclosed to the public. Experts caution that this conveys the incorrect impression and decreases the credibility of the process, especially when public property is in stake.⁴⁹

⁴⁶ Ingo Zechner, "Wie Entscheidungen fallen. Kunstrestitution in der Praxis," 212.

⁴⁷ Dewey and Woodhead, "The Austrian Art Restitution Advisory Panel in an International Context," 43.

⁴⁸ Ibid.

⁴⁹ Ingo Zechner, "Wie Entscheidungen fallen. Kunstrestitution in der Praxis," 216–215.

Provenance Research

Introduction

Provenance, derived from the French term "provenir", meaning "to come from", refers to "a record of ownership of a work of art or an antique, used as a guide to authenticity or quality".¹ Provenance information typically includes several chronological components: who owned a cultural asset, when and how ownership or possession changed, where these changes occurred, and how this process can be verified. The sources for this information often come from a variety of archival materials, such as museum documentation, correspondence, inventories, notes made on the backs of artworks, purchase receipts, exhibition catalogues, and other related records.²

Traditionally, provenance has been narrowly defined as the history of an object's ownership, emphasizing an agent-centered approach (who) that focuses on key individuals or entities, such as the creator, seller, buyer, owner, or institution. However, this approach may not be appropriate for all items, particularly those that are frequently physically modified, such as books or photographs that are edited, rebound, or reframed. By widening our notion of what provenance implies and focusing on more process-based model (how and when), provenance information can evolve into a more detailed biography of the object. This expanded perspective would enable a more complex and nuanced understanding of an object's history.³

A well-documented and traceable provenance enhances an object's market value while also confirming its authenticity and rightful ownership, thereby fostering trust and transparency among collectors, dealers, auction houses and GLAM institutions.

Provenance research, the process of tracking and documenting history, ownership, and the movements of cultural artefacts, has become essential for GLAM institutions. This

¹ Stevenson and Lindberg, "Provenance."

² Andratschke, *Leitfaden zur Standardisierung von Provenienzzangaben*, 7.

³ Straughn-Navarro, "Provenance in Situ," 292.

research unavoidably exposes the larger sociopolitical context of collecting in GLAM institutions, raising significant ethical and legal considerations. According to the second principle of the ICOM Code of Ethics for Museums, museums hold collections "in trust for the benefit of society and its development", enhancing public trust also by demonstrating lawful ownership.⁴ However, provenance researchers frequently uncover uncomfortable histories of illegal and immoral acquisition of the said artefacts.

That is why provenance research is often conducted in parallel or prior to restitution inquiries, with the goal of determining if an object's ownership has been affected by historical events, such as World War II, which could call into question the legitimacy of its current possession.⁵ In Austria, provenance research is usually the first step in an otherwise very proactive approach to restitution in federal state museums, a process that took off after 1998. This research is followed by legal assessments and the establishment of legal successorship.⁶ Successful restitution, whether in material or monetary form, symbolically reaffirms historical events and acknowledges full responsibility for them.⁷

However, provenance research in GLAM institutions extends beyond addressing problematic legacies associated with colonialism or World War II and does not always aim for restitution. Provenance research contributes to our understanding of history by offering insight into the lives of previous owners, their collections and the social dynamics, personal connections, and historical events that influenced an object's journey, transforming it into a historical witness.⁸

Because of several high-profile cases, provenance research is most connected with fine art objects such as paintings and sculptures. For restitution purposes, these items are usually easier to research due to their distinct individuality. However, provenance

⁴ Internationaler Museumsrat, *ICOM Code of Ethics for Museums*, 7–8.

⁵ Marc Masurovsky, "The Current State of Nazi-Era Provenance Research, and Access to Nazi-Era Research Resources and Archives," 142.

⁶ Ingo Zechner, "Wie Entscheidungen fallen. Kunstrestitution in der Praxis," 212.

⁷ Lessing and Azizi, "Austria Confronts Her Past," 228.

⁸ Nich Pearce and Jane Milosch, "Introduction," 15.

research also deals with difficult cases, such as copies of artworks or workshops art. Artefacts like furniture, cutlery, fine prints, books, pictures, instruments, maps, textiles, and other types of homewares are also significantly more difficult to study and recover due to their higher diversity and the less identifiable character of their provenance.⁹

Challenges of Provenance Research

Provenance researchers face several obstacles, many of which will not be addressed here. I shall briefly cover certain challenges relevant to institutional practices.

Primarily conducted at the institutional level, many GLAM institutions employ full-time experts dedicated to this work. However, because provenance research is highly detailed, time-consuming and object focused, these institutions often require additional resources to conduct thorough investigations. Finance concerns are usually to blame for significantly hindering the progress in the area. Short-term projects sometimes provide additional monetary and personnel support, but given that provenance research is a long-term endeavor, substantial progress is difficult to achieve.¹⁰ Additionally, third-party funding often means that not all objects within institutions receive the equal attention they deserve.¹¹

Provenance research encompasses many different types of expertise, such as art history, law, economics and sociology.¹² Although specialists typically possess in-depth knowledge of individual cases, institutions, artists or collections, the field's multidisciplinary character demands collaboration and sharing. Overcoming institutional barriers is crucial, particularly when addressing complex issues such as Nazi-plundered art. Effective collaboration among institutions is vital for accessing fragmented records, reconstructing ownership histories, identifying transaction trends, and sharing specialized knowledge.

⁹ Fuhrmeister and Hopp, "Rethinking Provenance Research," 217.

¹⁰ Ibid.

¹¹ Lynn Rother, Fabio Mariani, and Max Koss, "Taking Care of History: Toward a Politics of Provenance Linked Open Data in Museums," para. 18.

¹² Luther, Anne, "Digital Provenance, Open Access, and Data-Driven Art History," 448.

Another significant challenge in provenance research is the availability of information. Despite the calls for greater transparency in the GLAM sector articulated in the Washington and Terezin declarations, provenance information is often not publicly accessible.¹³ Many institutions restrict access and exclude non-institutional perspectives, making it difficult for freelance provenance researchers and potential claimants to obtain necessary information.¹⁴ And while privacy concerns must be acknowledged, particularly when it comes to uncontrolled access to Nazi-related papers,¹⁵ transparency and openness in collection management are critical for the ethical stewardship of cultural property. Such transparency not only enhances an institution's reputation by dismissing notions of secrecy but also supports successful restitution efforts. As we will explore, the increasing demand for transparency in GLAM collections presents a valuable opportunity to implement new technologies and data-driven methodologies in provenance research.¹⁶

Digital Approaches to Provenance Research

Art history, compared to other humanities disciplines, has been notably slow in embracing computational tools and new technologies.¹⁷ In traditional art history, "quality" has always taken place above "quantity." However, data-driven approaches are gradually gaining traction among art historians, despite some resistance.¹⁸ Tools like MAX, a recently developed museum analytics tool, assist in cleaning, analyzing, and visualizing GLAM datasets, which is useful for researchers and students with limited technical skills. Similarly, Palladio offers capabilities for visualizing historical data, making it easier to interpret and explore complex datasets.

¹³ Foulkes, "The Art of Atonement: How Mandated Transparency Can Help Return Masterpieces Lost During World War II," 322.

¹⁴ Lynn Rother, Fabio Mariani, and Max Koss, "Taking Care of History: Toward a Politics of Provenance Linked Open Data in Museums," para. 28.

¹⁵ Lang, "Wie hat sich Provenienzforschung durch Digitalität verändert?"

¹⁶ Rother, Mariani, and Koss, "Hidden Value," 112.

¹⁷ Manovich, "Data Science and Digital Art History," 14.

¹⁸ Bender, "Distant Viewing in Art History. A Case Study of Artistic Productivity," 101–102.

Meike Hopp and Christian Fuhrmeister note that provenance research has had a poor reputation among German art historians, often dismissed as 'superfluous' and not considered innovative enough, compared to the new methodologies emerging in the field of art history.¹⁹ But the recent introduction of digital technology is slowly transforming the area, steadily gaining popularity as a growing field of study. Dedicated professorships and conferences are emerging, focusing specifically on developing methodologies and tools for digital approaches to provenance research.²⁰ Initiatives and projects such as the Getty Provenance Index, the Carnegie Museum of Art's Art Tracks, the Provenance Lab at Leuphana University in Lüneburg, Germany, and the Linked Art initiative demonstrate how innovative technological possibilities are opening new options for provenance researchers.

Digital approaches offer numerous benefits to the provenance research field, including:

Accessibility and Collaboration: Digital technologies would make larger volumes of digitized archival records more available to scholars and the public, removing geographical and institutional hurdles that previously hindered access to physical archives. This would also make it simpler for academics to collaborate internationally and across disciplines, which is a crucial consideration when undertaking provenance research. By making digitized provenance records accessible online, institutions can involve the public to help with the research.

Centralization: While not without flaws, existing centralized databases such as Lost Art improve the circulation and sharing of knowledge between institutions across the globe, consolidating a wealth of information in a single location.²¹

Transparency: Digital provenance research enhances transparency by making knowledge and findings more accessible, thereby ensuring ethical practices are followed and accountability is in line with the Washington Principles. This increased

¹⁹ Fuhrmeister and Hopp, "Rethinking Provenance Research," 221–22.

²⁰ Lang, "Wie hat sich Provenienzforschung durch Digitalität verändert?"

²¹ Fuhrmeister and Hopp, "Rethinking Provenance Research," 219.

transparency allows a broader audience to engage in provenance research and contribute to its findings.

Efficiency: Better search options, linked data, centralized sources, and automated procedures would allow researchers to analyze large amount of data more quickly and precisely.

Broader Scope: Digital technologies, especially linked data, would allow researchers to analyze a wide range of data from various sources, leading to more in-depth investigations.²²

New Quantitative Methods: Advanced statistical approaches, machine learning algorithms, and enhanced visualizations, give researchers the ability to discover complex, large-scale phenomena, patterns, and insights that would be difficult or impossible to detect manually with traditional methods.²³

Preservation of Data: Digitizing provenance information is essential for conserving valuable historical documents. At the same time, digitization allows for the examination of these records without the need for physical contact, which may contribute to their degradation.

Support to traditional approaches: Digital technologies can confirm or refute current hypotheses, as well as give different insights than traditional methodologies.²⁴ However, it is critical to carefully integrate these technologies into our research. While digital approaches can improve our knowledge by providing fresh perspectives and processing large quantities of data, they should not be considered a replacement for well-established methods.²⁵ According to the director of the Commission for Provenance Research, Pia Schölnberger, patterns don't always repeat in every single

²² Shoilee, "Knowledge Discovery for Provenance Research on Colonial Heritage Objects," 2; Lang, "Wie hat sich Provenienzforschung durch Digitalität verändert?"

²³ Lang, "Wie hat sich Provenienzforschung durch Digitalität verändert?"; Shoilee, "Knowledge Discovery for Provenance Research on Colonial Heritage Objects," 2.

²⁴ Edelstein et al., "Historical Research in a Digital Age," 408.

²⁵ Ibid., 402–403.

case, but the fundamental research questions remain. Each case has its own specifics that must be carefully considered when investigating provenance. Attention to detail is crucial, and there is a risk of losing these nuances in large-scale provenance research. This highlights the value of integrating digital approaches as a support to traditional methods.

Digitization

The first necessary step in advancing digital provenance research is digitization. GLAM institutions have been digitizing their collections for quite some time, initially focusing on internal assets management. With the introduction of internet technology, these collections became accessible online to a broader audience, including researchers, educators and students. However, contemporary digitization efforts extend beyond merely creating online collections. They now encompass the development of data management tools, specialized collaborative platforms, comprehensive datasets, virtual galleries and interactive user experience.

This digital transformation reflects a shifting role for GLAM institutions, from being mere interpreters and creators of knowledge to becoming key suppliers of information. Innovative strategies for improving user experience have resulted in the development of so-called "Labs," which serve as exploratory spaces for creating and experimenting with new ways to engage with cultural and historical data.²⁶

The Austrian National Library's ONB Labs are an excellent local example of such a lab. ONB Labs' GitHub repository includes open datasets, tools, digitized records, and code examples, inviting the public to investigate, experiment, and actively engage with the institution's resources. They also use best practices like linked open data and the International Image Interoperability Framework (IIIF) to improve the accessibility and

²⁶ Candela et al., "Reusing Digital Collections from GLAM Institutions," 251; De Boer et al., "DIVE into the Event-Based Browsing of Linked Historical Media," 1.

integration of their resources. Another example is the Rijksmuseum, a major institution with the capacity to rigorously manage and develop their linked open data.²⁷

Following the pandemic in 2020, it became evident that the GLAM industry needed to start prioritizing its digital transformation efforts. In response, the Austrian government's 2020-2024 agenda contained a strategy action for cultural heritage digitization called "*Strategie Kulturerbe digital*." This effort, established as part of the Digital Action Plan Austria (DAA) and implemented within the context of NextGenerationEU, was designed to comply with the European Commission's suggestions for building a shared European data space for cultural assets.²⁸ It encompassed initiatives such as enhancing digital competencies among staff in cultural heritage institutions, designing individualized digitization strategies for cultural heritage institutions, improving on digital engagement and outreach and supporting research initiatives with digital methodologies. The Federal Ministry of Arts, Culture, Civil Service, and Sport also established a fund to assist with the digitization of collection objects and their incorporation into Austria's cultural heritage online portal 'Kulturpool'.²⁹

To support the digital transformation, an online survey of Austrian GLAM institutions was done to investigate the opportunities and obstacles. According to the report, human and financial resources are the most significant obstacles to the efficient implementation of digital technologies within these institutions. Many respondents also complained about limited funding and a lack of government interest in long-term solutions. They emphasized the need for policies that go beyond specific projects and short-term positions, arguing for a long-term and comprehensive approach to

²⁷ Dijkshoorn et al., "The Rijksmuseum Collection as Linked Data."

²⁸ European Commission, "Commission Recommendation (EU) 2021/1970 of 10 November 2021 on a Common European Data Space for Cultural Heritage."

²⁹ Bundesministerium für Kunst, Kultur, Sport und öffentlichen Dienst and Bundesministerium für Finanzen, "Strategie Kulturerbe Digital. Digitaler Aktionsplan Austria," 7.

digitalization, especially at smaller institutions.³⁰ Experts warn that this practice is significantly impacting the success rate of provenance research.³¹

Online Collections and Provenance Research

In Austria many of the country's major cultural and historical collections have been made available through online platforms, but many of these digital collections are not yet suitable for effective (digital) provenance or restitution research for a plethora of reasons.

While according to the survey mentioned above, 62% of institutions offer online access to their collections, these platforms frequently only include a tiny portion of their complete catalogue.³² It's important to remember that these gaps are often due to the conscious decision about what to leave out and what to include.³³ There are multiple reasons for this; museums cite lack of digitization funds, privacy or copyright problems, lack of storage and resource restraints, which usually result in only the most popular, famous or "valuable" artworks being digitized.³⁴ This gap is especially problematic since it gives a false impression of a collection, essentially treating objects that are not available online as if they do not exist.³⁵

According to Anne Luther, this digital gap presents a big obstacle to a distant reading of collections, requiring total access to all material. To properly comprehend a collection, it is necessary to analyze artefacts in their larger context and investigate their paths within it.³⁶ Instead, only one individual work can be inspected at a time.³⁷ As a result, obtaining complete access frequently necessitates contacting the institutions

³⁰ Hanna Brinkmann and Eva Mayr, "Strategie Kulturerbe digital Digitaler Aktionsplan Austria. Ergebnisse der Online-Konsultation," 19–20.

³¹ Fuhrmeister and Hopp, "Rethinking Provenance Research," 216.

³² Hanna Brinkmann and Eva Mayr, "Strategie Kulturerbe digital Digitaler Aktionsplan Austria. Ergebnisse der Online-Konsultation," 10–11.

³³ Lang, "»...nicht die Ausnahme, sondern der Normalfall!« Die digitale Lücke in der Kunstgeschichte und Provenienzforschung," para. 52.

³⁴ Ibid., para. 35.

³⁵ Ibid., para. 50.

³⁶ Luther, Anne, "Digital Provenance, Open Access, and Data-Driven Art History," 455.

³⁷ Snyder, Newbury, and Berg-Fulton, "Art Tracks: Visualizing the Stories and Lifespan of an Artwork."

directly or depending on their restricted online offering, which reduces the efficacy of research.³⁸

Another challenge is the missing provenance information in online collections. While some internationally renowned institutions, such as MoMA, frequently provide detailed provenance and acquisition information, this is often not the case for Austrian GLAM institutions.

For a quick overview of the availability of provenance data in online collections, Viennese institutions included in the Art Database were analyzed. The analysis reveals significant shortcomings in transparency and accessibility regarding object provenance, particularly for problematic items. Of all the Viennese institutions included, only the Vienna Museum of Science and Technology (*Technisches Museum Wien*) and the Vienna Museum (*Wien Museum*) had problematic provenances clearly listed. And while marking problematic provenance may satisfy basic transparency requirements, it falls short of what potential claimants and researchers need. Claimants require more than just basic information about artwork; they need comprehensive details on the item's trajectory, which frequently do not correspond with the information they may have, due to the inconsistent nature of provenance records.³⁹ Researchers face additional difficulties, as they must navigate multiple websites to locate necessary information. Ideally, a consolidated database integrating data from various sources would improve access and efficiency.⁴⁰ This is why, shortly after the Washington Conference, which called for the establishment of a central registry for looted objects, the first specialized lists and databases began to emerge.

As early as 2001, the Coordination Center for Lost Cultural Assets (*Koordinierungsstelle für Kulturgutverluste*) organized a specialized conference in Magdeburg, Germany, titled "Database-Assisted Documentation of Lost Cultural Assets".⁴¹ Recognizing the

³⁸ Candela et al., "Reusing Digital Collections from GLAM Institutions," 252.

³⁹ Lynn Rother, Fabio Mariani, and Max Koss, "Taking Care of History: Toward a Politics of Provenance Linked Open Data in Museums," para. 22.

⁴⁰ Hyvönen, *Publishing and Using Cultural Heritage Linked Data on the Semantic Web*, 13.

⁴¹ Franz, "Wider das Vergessen: Deutsch-österreichische Zusammenarbeit über www.lostart.de," 295.

need of international collaboration on this issue early on, particularly in the German-speaking region, a specialized database Lost Art was developed the same year.⁴² As of 2024, this database now includes records of lost and orphaned items from eleven countries, with contributions from ten Austrian institutions. In 2020, a new online database named Proveana was launched. Developed by the former Coordination Center, now called German Lost Art Foundation (*Deutsches Zentrum Kulturgutverluste*, Magdeburg, 2015), this database expands upon the existing Lost Art database by covering four key research areas: Nazi-looted art, Nazi war booty, items confiscated by the Soviet army, particularly in the former German Democratic Republic (GDR), and objects related to colonial heritage. Its primary goal was to gather all de-centralized historical information in one place. Most data come from the internal research reports of the foundation, which have been made available online, remodeled, structured and enriched with authority files and linked data.⁴³

In the years following, other databases on this topic emerged in the German-speaking world, including the Database on the *Sonderauftrag Linz* (2008)⁴⁴ and the Munich Central Collecting Point Database (2009),⁴⁵ both published by the German Historical Museum in Munich in collaboration with other German institutions. In Austria, in addition to the Art Database, the Commission for Provenance Research and the Archive of the *Kunsthistorisches Museum* developed an online edition of the Central Depot card indexes in 2017.⁴⁶

These invaluable resources represent a significant effort, often involving years of digitizing materials from various institutions and making them available online. However, a closer examination reveals that, like online collections, few of these

⁴² Ibid., 292.

⁴³ Werner, "Proveana – Eine Datenbank für die Provenienzforschung am Deutschen Zentrum Kulturgutverluste," 21–23.

⁴⁴ Deutsches Historisches Museum, "Datenbank 'Sammlung des Sonderauftrages Linz.'"

⁴⁵ Deutsches Historisches Museum, "Datenbank zum 'Central Collecting Point München.'"

⁴⁶ Commission for Provenance Research and Archive of the Kunsthistorisches Museum Wien, "Zentral Depot Karteien Online."

resources are computationally readable.⁴⁷ To fully leverage these resources for digital approaches, they need to be converted into formats that can be easily processed and analyzed by computational tools.

Modelling of Provenance Data

Provenance Data in Museums

The way GLAM organizations document provenance differs greatly from one to another. This was especially true until 2001, when the American Alliance of Museums (AAM) released *The AAM Guide to Provenance Research*,⁴⁸ which contained a set of criteria and guidelines. However, these guidelines are basic recommendations, and many American institutions have only loosely followed them in their own systems.⁴⁹

According to these guidelines, provenance should be presented in chronological sequence. Any doubt in the information should be expressed as "possibly" or "probably," with further clarification supplied in references. Dealers, auction houses, and other intermediaries should be distinguished from private owners by including their names in brackets. Transaction methods should be documented using semicolons for direct transfers, and periods for indirect or unknown transfers.⁵⁰

Similarly, in 2018, the 'Standardization of Provenance Information' working group, operating under the Research Association for Provenance Research (*Arbeitskreis für Provenienzforschung e.V.*) in Germany, published their own standards for referencing provenance in research. These recommendations provide both "vertical" and "horizontal" textual structures for provenance records, offering different formats for listing provenance details—either as continuous text separated by semicolons in a wide format (horizontal) or with each provenance event separated by new lines in a long format (vertical). A single provenance entry corresponds to the specifics of "when,"

⁴⁷ Candela et al., "Reusing Digital Collections from GLAM Institutions," 252.

⁴⁸ Yeide, Walsh, and Akinsha, *The AAM Guide to Provenance Research*.

⁴⁹ Snyder, Newbury, and Berg-Fulton, "Art Tracks: Visualizing the Stories and Lifespan of an Artwork."

⁵⁰ Yeide, Walsh, and Akinsha, *The AAM Guide to Provenance Research*, 33–34.

"how/where," "who/where," and its source, all separated by commas, with some exceptions.⁵¹

Although the AAM Guidelines were a step in the right direction, they still envisioned a text structure that was not machine readable, like the German counterpart. However, as the number of digitized collections and databases at GLAM institutions increases, so does the need for machine-readable provenance documentation standards. Global standardization would not only allow researchers to break free from institutional constraints, but it would also considerably improve the efficiency, speed, and depth of provenance research.⁵²

Aside from selecting an appropriate structure, it would be critical to guarantee its consistent use across institutions. Currently, most institutions have their own methods for tracking provenance, making standardizing existing data a time-consuming and resource-intensive task.⁵³

Digitizing and Editing Provenance Data

The digital transformation of museum objects and archival records is a challenging endeavour, but new technologies, such as faster high-resolution scanning and Optical Character Recognition (OCR), significantly eased the process of digitization. These technologies not only capture the appearance of an object but also enhance interaction with it by providing transcriptions and other features.

OCR, for example, allows for full text search and transcription of text. Because these technologies are rapidly evolving, the use of artificial intelligence and computer vision methods may reduce the need for manual editing. However, human intervention is still required due to the complexity of data patterns in archival records, which often include a mix of printed and handwritten texts with varied handwriting styles.⁵⁴

⁵¹ Andratschke, *Leitfaden zur Standardisierung von Provenienzzangaben*, 13–14.

⁵² Luther, Anne, "Digital Provenance, Open Access, and Data-Driven Art History," 452.

⁵³ Shoilee, "Knowledge Discovery for Provenance Research on Colonial Heritage Objects," 3–4.

⁵⁴ Fletcher and Helmreich, "Digital Methods and the Study of the Art Market," 169; Rother, Mariani, and Koss, "Hidden Value."

The digital transformation of GLAM assets presents both opportunities and risks, making it a complex tradeoff. On the one hand, digitization gives items new contexts and information, increasing their accessibility and utility. On the other hand, it runs the danger of missing and oversimplifying information.⁵⁵

When used as research sources, especially in sensitive contexts like colonial or National Socialist looting, these records can lead to misinterpretation and potential legal issues. Therefore, it is essential to conduct thorough editorial work post-digitization to ensure accuracy and reliability, and reducing risks associated with misinterpretations.⁵⁶ In these materials we often stumble upon problematic historical terminology, like racist slurs. To preserve ethical standards while minimizing data interference, we can use content warnings and educational disclaimers. An optional display of sensitive content is also good practice.⁵⁷ A similar method might be adopted when dealing with old information, such as geographical names or artwork attributions.⁵⁸

In provenance research, precise terminology is crucial, not just to avoid legal misunderstandings but also to address issues of unethical ownership transfers. Certain phrases, particularly those relating to acquisition methods, might minimize or disguise unethical conduct.⁵⁹ For example, anthropological collections often include objects acquired during so-called "expeditions," which, from a historical perspective, are highly problematic. Similarly, terminology such as "*Erwerb*" or "*Kauf*" in the context of National Socialist-era acquisitions raise historical issues that must be addressed.

In addition, several German words do not have direct English translations. For example, both "*Besitz*" and "*Eigentum*" translate to ownership, yet they have distinct implications, especially in the mentioned historical context. "*Besitz*" signifies physical control over an

⁵⁵ Grana-Behrens, "Digitalbasierte ethnologische Provenienzforschung," 220–221.

⁵⁶ Sepp, "Bedingt gute Rahmenbedingungen. Zur digitalen Provenienzforschung," 364–65.

⁵⁷ Lang, "»...nicht die Ausnahme, sondern der Normalfall!« Die digitale Lücke in der Kunstgeschichte und Provenienzforschung," para. 21.

⁵⁸ Sepp, "Bedingt gute Rahmenbedingungen. Zur digitalen Provenienzforschung," 369.

⁵⁹ Lynn Rother, Fabio Mariani, and Max Koss, "Taking Care of History: Toward a Politics of Provenance Linked Open Data in Museums," para. 14.

item, but "*Eigentum*" alludes to legal ownership. Therefore, possessing an object ("*Besitz*") does not always imply being its lawful legal owner ("*Eigentum*").⁶⁰

Furthermore, incorrect, or purposefully misleading information is commonly found in provenance research, sometimes because of reliance on comments made by past owners that have historically gone uncontested.⁶¹ False or misleading information must be carefully examined. There is an increasing emphasis on investigating the origins of provenance information, rather than focusing exclusively on the content. Accurate provenance research requires an understanding of who gathered these data, as well as when and why.⁶²

Data Modelling

Digitizing and transforming tangible artefacts into digital assets are only the start. To properly grasp the potential of digitization, the use of semantic technologies is essential. The Semantic Web's interconnectivity allows users to uncover relationships between items, people, events, and locations, extending and deepening our understanding. By connecting publicly available data sources, we can enhance current information with new insights from interconnected sources.⁶³ That is why the collaboration of provenance researchers with data and computer scientists is very essential.⁶⁴

As early as 2011, the guidelines for documenting museum objects published by the German Museums Association (*Deutscher Museumsbund*) advocated for specific standards in digitizing collections. These guidelines emphasized the importance of following technical standards, respecting copyright and privacy, and using semantic

⁶⁰ Grana-Behrens, "Digitalbasierte ethnologische Provenienzforschung," 227–229; Andratschke, *Leitfaden zur Standardisierung von Provenienzanangaben*, 8.

⁶¹ Unabhängige Expertenkommission Schweiz--Zweiter Weltkrieg, *Switzerland, National Socialism, and the Second World War*, 364.

⁶² Vancisin et al., "Provenance Visualization," 1329.

⁶³ Hyvönen, *Publishing and Using Cultural Heritage Linked Data on the Semantic Web*, 8.

⁶⁴ Lang, "Wie hat sich Provenienzforschung durch Digitalität verändert?"

technologies like controlled vocabularies and standard data formats.⁶⁵ In 2023, the updated guidelines expanded to include principles of Open Access and the FAIR (Findable, Accessible, Interoperable, and Reusable) framework, further reinforcing the importance of standardized, accessible, and interoperable data in the digitization process.⁶⁶

For successful and impactful digital provenance research, institutions must offer substantial open data access, making data freely available for reuse and redistribution on the internet in a machine-readable format under an open license.⁶⁷ Unfortunately, this is not yet a standardized practice. For example, the Open Data Portal Austria⁶⁸ includes partial collections from the Vienna Museum and *the Museum Moderner Kunst Stiftung Ludwig Wien (MUMOK)*, demonstrating some progress in this area. However, there is still considerable work needed to establish open data as a widespread practice across Austrian institutions.

According to the aforementioned study, only 42% of participants reported that their institution engages in open data practices.⁶⁹ The primary concerns about opening access to institutional data revolve around legal certainty, particularly regarding data privacy and copyright.⁷⁰ However, nearly half of the institutions that do not currently practice open data have plans to implement it in the future,⁷¹ suggesting that there is a growing understanding of the need for open data access in the GLAM field, a requirement further emphasized by funding bodies.

⁶⁵ Hagedorn-Saupe and Deutscher Museumsbund, *Leitfaden für die Dokumentation von Museumsobjekten*, 13.

⁶⁶ Deutscher Museumsbund, ICOM Deutschland, and Konferenz der Museumsberatungsstellen in den Ländern, *Standards für Museen*, 32.

⁶⁷ Luther, Anne, "Digital Provenance, Open Access, and Data-Driven Art History," 451.

⁶⁸ Cooperation Open Government Data Austria, "Open Government Data," accessed October 11, 2024, <https://www.data.gv.at/en/>.

⁶⁹ Hanna Brinkmann and Eva Mayr, "Strategie Kulturerbe digital Digitaler Aktionsplan Austria. Ergebnisse der Online-Konsultation," 9.

⁷⁰ *Ibid.*, 25.

⁷¹ *Ibid.*, 20–21.

But to fully experience the benefits of semantic technologies, it is not enough to simply publish data as open. We need to find a data standard that is both FAIR and Open.⁷² The notion of Linked Open Data (LOD) extends the idea of open and FAIR data by transforming it with semantic web technologies. This approach not only makes data easily available but also ensures that it is meaningfully integrated and interconnected, creating a richer and more comprehensive network of knowledge.⁷³

Tim Berners-Lee, the inventor of the World Wide Web, introduced the concept of the "*Five Stars of Open Data*," a framework for evaluating the quality and accessibility of Linked Open Data.⁷⁴ Anne Luther later adapted this concept to further develop a scale specifically for the accessibility of GLAM data. The scale ranges from one star, where data is published under an open license, typically as a digital catalog, to five stars, where the data is linked to other datasets, providing contextualization and enabling richer connections and insights.⁷⁵

Such practices would open countless new research opportunities for the GLAM sector. Specifically for provenance research, it would enable the consolidation of information so that researchers could for instance find all the artworks that were once part of the same collection in one place. It would also make it easier to trace objects by the same author, even if they are scattered around the world, or uncover links between works that overlapped at certain points in history, such as those that appeared at the same Dorotheum auction.⁷⁶ Importantly, Linked Open Data would make provenance research more accessible and democratic, challenging the traditional gatekeeping of knowledge by institutions. With provenance records often containing data from unknown or uncertain sources, or even intentional errors, Provenance Linked Open Data (PLOD) would allow for the tracking of provenance itself. This would facilitate a transparent

⁷² Lynn Rother, Fabio Mariani, and Max Koss, "Taking Care of History: Toward a Politics of Provenance Linked Open Data in Museums," para. 36.

⁷³ Hyvönen, *Publishing and Using Cultural Heritage Linked Data on the Semantic Web*, 22–23.

⁷⁴ "5-Star Open Data," accessed June 24, 2024, <http://5stardata.info/en/>.

⁷⁵ Luther, Anne, "Digital Provenance, Open Access, and Data-Driven Art History," 450.

⁷⁶ Lynn Rother, Fabio Mariani, and Max Koss, "Taking Care of History: Toward a Politics of Provenance Linked Open Data in Museums," para. 2.

record of authorship and data lineage, helping to identify and address inaccuracies and uncertainties in the data.⁷⁷

While archives and libraries historically have more experience with these technologies, museums and galleries often lag behind.⁷⁸ The semantic transformation of data is complex and requires specialized knowledge, ideally necessitating a dedicated full-time position within an institution to manage effectively. Due to the intricacies involved in such projects, developers in the GLAM sector often opt for more common alternatives, such as REST APIs (Representational State Transfer Application Programming Interfaces), JSON (JavaScript Object Notation) formats, or CSV (comma-separated values), instead of fully embracing Semantic Web technologies. While these alternatives are frequently simpler to develop and more widely supported, they may not fully utilize the interconnectivity and contextualization that semantic technologies offer.⁷⁹

At the core of semantic technologies is the semantic triple, typically represented as an RDF (Resource Description Framework) triple, which encodes knowledge in a graph format that computers can interpret. RDF triples consist of a subject, predicate, and object, each identified by a URI (Uniform Resource Identifier), and are particularly effective for uncovering and identifying relationships between different entities. RDF triples can be expressed in various syntaxes, including RDF/XML, N-Triples, Turtle (Terse RDF Triple Language), and RDFa.⁸⁰

While RDF provides a basic framework for structuring data, it does not include vocabulary by default. However, with extensions like RDF Schema (RDFS), users can define their own vocabularies and create formal ontologies. In digital humanities,

⁷⁷ Rother, Mariani, and Koss, "Interpreting Strings, Weaving Threads: Structuring Provenance Data with AI."

⁷⁸ Claudia Andratschke, "Netzwerke erweitern. Von NS-Raubgutforschung zur Provenienzforschung in ethnologischen Sammlungen der Kolonialzeit," 307.

⁷⁹ Vega-Gorgojo, "LOD4Culture," 1–2; Knap, "Increasing Quality of Austrian Open Data by Linking Them to Linked Data Sources," 53.

⁸⁰ Hyvönen, *Publishing and Using Cultural Heritage Linked Data on the Semantic Web*, 22–23; Bizer, Heath, and Berners-Lee, "Linked Data - The Story So Far," 3.

ontologies refer to formal conceptual systems for knowledge representation. They define a set of concepts, represented as classes with properties and relationships between those concepts, all adhering to strict, computer-readable logic. Because ontologies are rigorously defined and standardized, they play a crucial role in easing the integration of multiple data sources.⁸¹ Building on RDF triples, the Web Ontology Language (OWL) provides additional depth and expressiveness to these ontologies, enabling more complex and detailed representations of knowledge.⁸²

To simplify, semantic triples are stored in databases that can be queried using a specialized query language called SPARQL. By exposing an endpoint to our database, we enable other semantic systems to access our data. This can create an extensive semantic network, enhancing information exchange, data integration across different systems and Linked Open Data.⁸³

A common example of such a database is Wikidata, a free and open general-purpose knowledge base that uses RDF triples and provides SPARQL API access.⁸⁴ It organizes information into entities, properties and relationships, mirroring the structure found in ontologies. Wikidata can be linked with other formal ontologies, integrate external identifiers from various databases, and incorporate authority controls.⁸⁵ While Wikidata can function as an authority file, there are other domain-specific lightweight ontologies that may be more suitable for certain applications. These authority files semantically categorize standardized terms, such as places, people, and artworks, and integrate them into linked open databases in the form of ontologies. For various purposes, some of the most used authority files include the Gemeinsame Normdatei (GND) standard

⁸¹ Jannidis, Kohle, and Rehbein, *Digital Humanities*, 162.

⁸² Hyvönen, *Publishing and Using Cultural Heritage Linked Data on the Semantic Web*, 63; Jannidis, Kohle, and Rehbein, *Digital Humanities*, 168–172.

⁸³ Schich et al., "Network Dimensions in the Getty Provenance Index," 173.

⁸⁴ Nuno and Antoine, "Wikidata's Linked Data for Cultural Heritage Digital Resources," 59.

⁸⁵ Vrandečić and Krötzsch, "Wikidata," 78–83.

for general terms, GeoNames for geographical locations, and the Virtual International Authority File (VIAF) for personal names.⁸⁶

In the field of cultural heritage, specialized ontologies like the Getty Vocabularies, published by The Getty Research Institute, are widely used. These include the Art & Architecture Thesaurus (AAT), the Thesaurus of Geographic Names (TGN), and the Union List of Artist Names (ULAN), each focusing on the structured modeling of visual arts, cultural heritage, and archival materials.

While not an ontology, the Getty Research Institute offers another invaluable resource for provenance researchers through its Getty Provenance Index. This extensive tool consists of numerous databases, including material from chosen dealer stock books, auction catalogues, and archive inventories from private collections, with over two million records. Of relevance to this thesis is the project German Sales Catalogs, 1900–1945, which is part of the Provenance Index. The Getty Research Institute, Heidelberg University Library, *Kunstbibliothek* of Berlin State Museums, and the Research Centre for Degenerate Art (*Forschungsstelle "Entartete Kunst"*) in Hamburg collaborated on this project, which ran from 2011 to 2015. The resulting German Sales Database currently gives access to over 11,500 fully searchable sales catalogues from German-speaking countries. The project is growing, with continual efforts to digitize.⁸⁷

While these tools often meet many of our needs, there are times when more specific uses require specialized ontologies created as extensions of these more general vocabularies. These extensions allow for a more precise and tailored representation of data, accommodating the unique requirements of certain projects or domains.⁸⁸

There is no perfect model that can completely represent the complexities of real-world occurrences; at best, it can approximate reality. The success of a model is heavily

⁸⁶ Jannidis, Kohle, and Rehbein, *Digital Humanities*, 174.

⁸⁷ The Getty Research Institute, "Search the Getty Provenance Index," accessed June 10, 2024, <https://www.getty.edu/research/tools/provenance/search.html>; arthistoricum.net, "Project description," accessed June 10, 2024, <https://www.arthistoricum.net/en/subjects/thematic-portals/german-sales/about>.

⁸⁸ Hyvönen, *Publishing and Using Cultural Heritage Linked Data on the Semantic Web*, 88.

dependent on our knowledge of the objects or concepts being represented. Therefore, the model represents our priorities and beliefs, emphasizing the qualities we believe are necessary for an accurate representation.⁸⁹

Conceptual Reference Model (CIDOC CRM) and Other Digital Provenance Initiatives

A step beyond lightweight ontologies are heavyweight ontologies, which are still in the early stages of development in the field of cultural heritage. Given the complexity and diversity of cultural heritage objects, several recent initiatives have aimed to create more robust ontologies and data models. Notable examples include the Europeana Data Model (EDM) and the CIDOC CRM.

CIDOC CRM, the most widely adopted ontology standard in this domain (ISO 21127), was developed by the CIDOC CRM Special Interest Group under the International Council of Museums (ICOM) in 1996. This standard is designed to facilitate the integration and interchange of cultural heritage data, ensuring that any cultural heritage information can be mapped to its framework. CIDOC CRM's formal ontologies provide precise definitions for describing concepts and relationships in cultural heritage documentation, enabling different information systems across institutions to exchange and interpret each other's data, or integrate data from various sources into a unified resource.⁹⁰

The CIDOC CRM is an object-oriented model and formal ontology that consists of multiple classes, representing different types of entities, and properties that describe the relationships between these classes.⁹¹ A heavyweight ontology, it aims to facilitate logical reasoning, which is particularly useful when modelling complex information

⁸⁹ Grana-Behrens, "Digitalbasierte ethnologische Provenienzforschung," 232; Jannidis, Kohle, and Rehbein, *Digital Humanities*, 100; 174–75.

⁹⁰ Doerr et al., *Definition of the CIDOC-CRM Conceptual Reference Model*, 9; Jannidis, Kohle, and Rehbein, *Digital Humanities*, 174.

⁹¹ Hyvönen, *Publishing and Using Cultural Heritage Linked Data on the Semantic Web*, 44.

such as provenance data.⁹² However, despite its strengths, CIDOC CRM frequently lacks the flexibility needed to fully capture the nuances and intricacies of provenance data. As opposed to AAM standard, which creates a chronology of events with listing owners, CIDOC-CRM is event-based, with temporal entities like Events, Items and Actors at its core.⁹³ For instance, CIDOC-CRM is developed in a way that a temporal entity, such as event, can be linked to either time, space or event entities. However, an actor entity (for instance a person), cannot be connected to a time and place.⁹⁴ This can pose challenges when transforming AAM standard into a CIDOC-CRM (based) model.⁹⁵

Modeling historical data is inherently complex due to several factors. Uncertainties related to time, place, or individuals are often indicated using terms like "possibly," "probably," "unknown," or through omissions in square brackets. While RDF Turtle notation offers the option of reification, or treating statements as resources,⁹⁶ current computer models have yet to fully address these uncertainties, as well as challenges related to missing or incomplete information. While CIDOC CRM and its extensions, such as CRMgeo, account for some temporal or spatial ambiguity, for example, closeness to a location can be modelled with a property "approximates," and time, such as May 1941, can be modelled with time span categories involving "begin of the begin" and "end of the end",⁹⁷ we need more sophisticated data modeling methods to more accurately capture the complexities of information in historical records. These are often full of statements, such as "perhaps", "circa", "probably". Additionally, complex scenarios like ownership transfers, different types of transactions, and extensive event backstories are often reduced to comments or annotations. However, these nuances

⁹² Jannidis, Kohle, and Rehbein, *Digital Humanities*, 174.

⁹³ Mariani, "Introducing VISU: Vagueness, Incompleteness, Subjectivity, and Uncertainty in Art Provenance Data," 67.

⁹⁴ Ibid.

⁹⁵ Lynn Rother, Fabio Mariani, and Max Koss, "Taking Care of History: Toward a Politics of Provenance Linked Open Data in Museums," para. 40.

⁹⁶ Jannidis, Kohle, and Rehbein, *Digital Humanities*, 172.

⁹⁷ Mariani, "Introducing VISU: Vagueness, Incompleteness, Subjectivity, and Uncertainty in Art Provenance Data," 69–70.

are challenging to represent in rigid data structures, making it difficult to fully capture the depth and richness of provenance data.⁹⁸

Several initiatives have been developed to address these shortcomings, with the goal of building sophisticated models and frameworks that can better describe and represent the complex specifics of provenance and historical data. One of them is Linked Art, a collaborative initiative to improve upon the CIDOC CRM model by developing an open data standard for describing cultural heritage objects and collections using linked open data. The consortium, led by Robert Sanderson and centered on Yale University, includes numerous institutions from the US and Europe. The initiative places particular emphasis on provenance of an object, providing accurate tracking of changes in historical ownership and status.⁹⁹ In this case, a provenance record is a chain of events, with sub-activities, such as acquisition (from buyer to seller), and payment (from seller to buyer).¹⁰⁰ However, one of the big shortcomings of this project is the fact that the model omits uncertainty and data provenance.¹⁰¹

The Art Tracks project at the Carnegie Museum of Art in Pittsburgh, Pennsylvania, which lasted from 2014 to 2017, was a pioneering attempt in converting provenance information into a computer-readable format while keeping it accessible for conventional methods. Focusing on a single collection of old master paintings at their museum, the project attempted to produce a CIDOC-CRM based digital provenance standard and provide open-source tools to organize and standardize unstructured textual provenance data, as well as to innovate how provenance information was

⁹⁸ Andratschke, *Leitfaden zur Standardisierung von Provenienzzangaben*, 15; Yeide, Walsh, and Akinsha, *The AAM Guide to Provenance Research*, 33; Mariani, "Introducing VISU: Vagueness, Incompleteness, Subjectivity, and Uncertainty in Art Provenance Data"; Edelstein et al., "Historical Research in a Digital Age," 419.

⁹⁹ Linked.Art, "Linked Art Subset of CIDOC-CRM," accessed September 8, 2024, <https://linked.art/model/profile/>; Page et al., "Linked Art: Networking Digital Collections and Scholarship."

¹⁰⁰ Mariani, "Introducing VISU: Vagueness, Incompleteness, Subjectivity, and Uncertainty in Art Provenance Data," 67.

¹⁰¹ Ibid., 68.

presented to museum visitors.¹⁰² To perform information extraction from a textual standard, they tried to use Natural Language Processing (NLP) methods, which came with its downsides. The models were not trained on historical data, but mostly on contemporary news corpuses, which turned out to be insufficient for the task at hand. Instead, they had to rely on data that was already formatted according to the AAM standard. According to the developers, strict adherence to the CIDOC-CRM standard would have resulted in a radical change to the understanding of historical data and history itself, so their standard is only loosely based on the CIDOC-CRM but mostly follows the AAM standard.¹⁰³

Similarly, the team behind The Provenance Lab at Leuphana University Lüneburg in Germany concentrated on establishing specialized data models for describing provenance data by building on existing CIDOC CRM standards. Lead by a provenance research expert Lynn Rother, the group has implemented significant technological advancements, such as the use of more complex NLP methods and artificial intelligence to convert textual provenance information into computer-readable formats. Their research involves both the conceptual and technical issues of modelling provenance data, with inconsistency, uncertainty and missing information at their core.¹⁰⁴

However, their work is also based on pre-structured textual data that has already been standardized according to AAM guidelines, making NLP tasks such as sentence boundary detection, span categorization, named entity recognition, relationship extraction and part-of-speech tagging more straightforward. By using well-structured training data, belonging to only one institution, they were able to build reliable models for extracting entities and classifying relationships between them. The restructured provenance was then transferred into a tabular format with each row representing a

¹⁰² Snyder, Newbury, and Berg-Fulton, "Art Tracks: Visualizing the Stories and Lifespan of an Artwork."

¹⁰³ Ibid., chap. 5.

¹⁰⁴ Rother, Mariani, and Koss, "Hidden Value"; Rother, Mariani, and Koss, "Interpreting Strings, Weaving Threads: Structuring Provenance Data with AI"; Mariani, Rother, and Koss, "Teaching Provenance to AI"; Lynn Rother, Fabio Mariani, and Max Koss, "Taking Care of History: Toward a Politics of Provenance Linked Open Data in Museums."

provenance event and columns representing attributes like parties, location, time, and method of transfer.¹⁰⁵

It is important to remember that the datasets they worked with were provided in English, allowing them to take full advantage of NLP libraries such as Python's SpaCy. For example, SpaCy's English model provides extensive entity recognition tags, while its German counterpart provides a much more limited set, which highlights how language constraints can affect the use of NLP tools. For the Art Database dataset, these options would only be available after extensive standardization or translation of the data.

All these examples show that the use of machine learning techniques in the context of GLAM data has improved tremendously and is becoming more popular for a variety of tasks. However, one of the most significant challenges is the large amount of training data required to obtain adequate results, as well as the emphasis on historical rather than present training corpora.

One solution might be to use Large Language Models (LLM) to perform tasks like extraction, annotation, tagging or entity recognition. Not only would this save a lot of time, but it might also replace manual labor by producing results that are as precise as well.¹⁰⁶ Experiments using models, such as OpenAI's GPT-3, have yielded promising results. Donna Yates and her team's experiments have mostly focused on illicit art market transactions, but the ideas also apply to provenance studies.¹⁰⁷

While theoretical frameworks are being developed, several GLAM institutions in the German-speaking world have already started putting these ideas into practice.

¹⁰⁵ Rother, Mariani, and Koss, "Hidden Value," 126.

¹⁰⁶ Gilardi, Alizadeh, and Kubli, "ChatGPT Outperforms Crowd Workers for Text-Annotation Tasks."

¹⁰⁷ Graham, Yates, and El-Roby, "Investigating Antiquities Trafficking with Generative Pre-Trained Transformer (GPT)-3 Enabled Knowledge Graphs."

Between 2019 and 2022, the Berlin State Museum digitized and published their acquisition and accession logs online, though currently available only as PDFs.¹⁰⁸ Another interesting project is being conducted in their numismatic collections, where they started to systematically connect the collection items metadata to authority control files. As a part of their undertakings, they have created an authority file portal, online since 2019, which provides also authority files as a csv download or an API connection, and a common digital coin cabinet, encompassing multiple institutions from different countries. As a part of their special project *"Normdaten und Münzerwerbungen zwischen 1933 und 1945"*, they put even more focus on the identifying provenance of items in their collections and modeling the results them with the principles of Linked Open Data. A special publication encompasses this project, dealing with the undertaking from different perspectives, especially their efforts to deal with the problems of modelling data according to the principles of semantic web.¹⁰⁹

¹⁰⁸ Staatliche Museen zu Berlin, "Provenance and Collections Publishing the Acquisition and Accession Logs of the Staatliche Museen Zu Berlin Online," accessed August 10, 2024, <https://www.smb.museum/en/research/research-projects/provenance-and-collections/>.

¹⁰⁹ Bernhard Weisser, "Digitale Provenienzforschung am Münzkabinett der Staatlichen Museen zu Berlin. Erwerbungen zwischen 1933 und 1945."

Applying Digital Methods: Scraping, Cleaning, and Analyzing Art Database

The Art Database

The Art Database of the National Fund of the Republic of Austria for Victims of National Socialism (*Kunst-Datenbank des Nationalfonds der Republik Österreich für Opfer des Nationalsozialismus*) has been online since 2006 and was developed in collaboration with respective ministries, federal museums, Viennese museums, the Commission for Provenance Research, the Viennese Restitution Commission, and the Jewish Community of Vienna.¹

The database consolidates information on cultural objects held by GLAM institutions that are owned by the Republic of Austria or the City of Vienna. These objects lack a clear provenance, with indications that they may have been seized between 1938 and 1945. The database functions as an open register to assist in the ongoing search for their rightful owner.²

The first successful restitution case involving the Art Database demonstrates that this register contains a vast amount of valuable information that enables provenance researchers to effectively pursue restitution efforts. In 2008, the Commission for Looted Art in Europe identified a painting by Adriaen van Ostade on the database's website that had once belonged to the collector Bruno Jellinek. The painting had a complex history of ownership; it was initially confiscated by the VUGESTA, then transferred to the Dorotheum, and was ultimately sold to the *Kunsthistorisches Museum* for 16,000 Reichsmarks and successfully returned to the owners in the end.³

¹ Seidinger, Fritsch, and Lessing, "Die Tätigkeit des Nationalfonds der Republik Österreich für Opfer des Nationalsozialismus im Rahmen der Kunstrückgabe - Die Kunst-Datenbank des Nationalfonds," 247.

² Ibid., 248.

³ Hannah M. Lessing and Maria Luise Lanzrath, "Rückgabe und Verwertung. Aspekte der Kunstrestitution in der Arbeit des Nationalfonds der Republik Österreich für Opfer des Nationalsozialismus," 105–106.

However, the database was not intended as a research tool for provenance researchers, but rather as an online registry in line with the requirements of the Washington Principles. Its primary purpose is to serve as a resource for potential claimants to identify objects that may have been seized between 1938 and 1945, enabling them to directly contact the National Fund or the appropriate institutions for further assistance.⁴

[illegible]

Figure 1: An example of an object page that displays metadata and provenance information, <https://www.kunstdatenbank.at/detailansicht-objekt/7706>.

The database is static and simplistic, lacking advanced search capabilities. The items in the database are not linked to authority files, such as GND or Wikidata, or online

⁴ Seidinger, Fritsch, and Lessing, "Die Tätigkeit des Nationalfonds der Republik Österreich für Opfer des Nationalsozialismus im Rahmen der Kunstrückgabe - Die Kunst-Datenbank des Nationalfonds," 252.

collections of the respective institutions, requiring manual crosschecking, which is time-consuming, and further complicated by the fact that entries in the Art Database sometimes display different information than the online collection. This could be because the material has been collected and indexed by researchers from various institutions, using different terminology.⁵

For example, a small painting by Gabriel Ferrier, characterized by quick brushstrokes that suggest it is more of a study than a finished work, clearly portrays a tumbling childlike figure. A subtle hint of white wings implies that the figure is probably a putto, a nude childlike figure, sometimes with wings, that often appears in mythological and religious scenes. In the online collection of the Belvedere Gallery, the work is indeed titled as "*Liegender Putto*" (Lying Putto), however the Art Database names this artwork "*Liegender Männerakt*" (Lying Male Nude). While the distinction may seem minor, it signifies an entirely different iconographic interpretation of the scene, ultimately complicating the process of finding the artwork in its original online collection on the Belvedere website.



Figure 2: Object entry for *Liegender Putto* in the online collection of the Belvedere Gallery, Vienna, <https://sammlung.belvedere.at/objects/2498/liegender-putto>.

⁵ Ibid., 249.

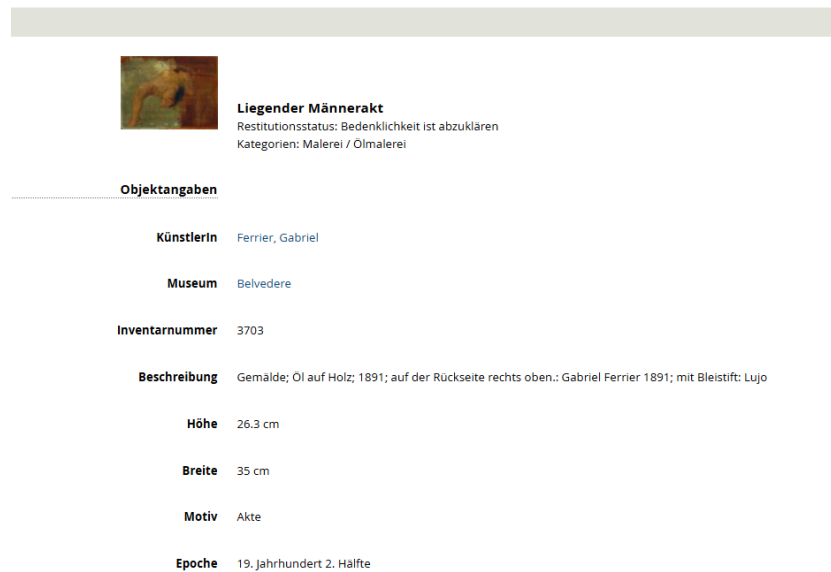


Figure 3: Screenshot of the same object from the Art Database, showing differences in metadata, <https://www.kunstdatenbank.at/detailansicht-objekt/8959>.

This example highlights another issue with the Art Database-it sometimes contains conflicting or incomplete information about objects. The painting in question was transferred from the Vienna Military Museum (*Heeresgeschichtliches Museum*) to the Belvedere in 1940. The exact date of this transaction is a significant detail for provenance researchers but unfortunately omitted from the Art Database entry. The Belvedere entry specifies the year of creation (1891), which is clearly marked on the front of the painting, while the Art Database records the period of creation as the second half of the 19th century (*19. Jahrhundert 2. Hälfte*). While the artwork is available as an IIF image on the Belvedere website, its low-resolution counterpart on the Art Database website is of little help to researchers. The reduced image quality may explain why the Art Database includes a more detailed description to compensate for the loss of information, however, this remains insufficient.

Another example of the inconsistency and incompleteness of the Art Database entries is an 1897 portrait of an elderly woman by the Viennese painter Eugenie Breithut-Munk, also from the Belvedere. While Belvedere's online collection includes details of the artist, year of creation and even provenance, the corresponding entry in the Art

Database provides no information about the artwork. Additionally, it only refers to the artist as "Munk," failing to include the full name.

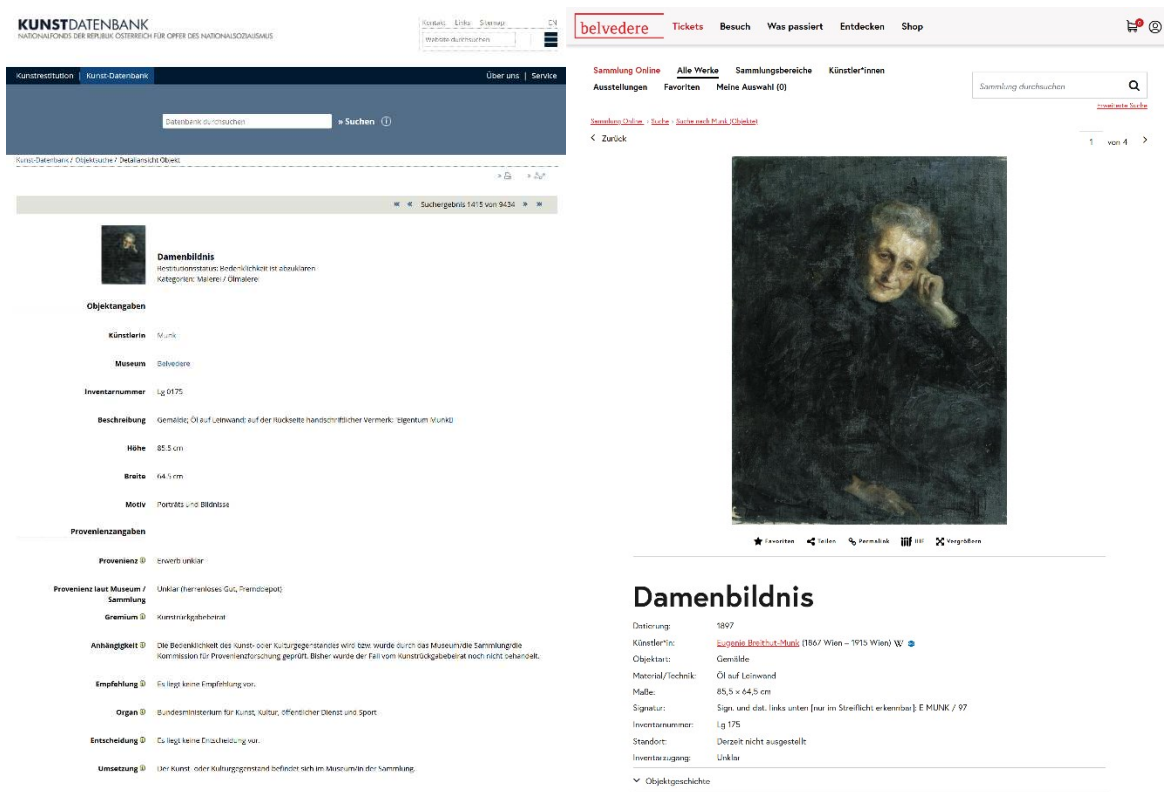


Figure 4: Side-by-side comparison of object entries for a portrait of a woman by Eugenie Breithut-Munk. The screenshot from the Art Database on the left, the entry from the Belvedere Online Collection on the right, <https://sammlung.belvedere.at/objects/8892/damenbildnis>, <https://www.kunstdatenbank.at/detailansicht-objekt/6143>.

While discrepancies between different databases regarding the same object are not uncommon due to data interchange and integration challenges,⁶ the gaps in the Art Database are too significant to be dismissed as mere technical limitations; they cause considerable information gaps. These issues may derive from the Art Database entries not reflecting the latest research on the objects. Given that the database has been online since 2006, and considering the significant advancements made by institutions and the Commission for Provenance Research since then, many entries are likely to contain outdated information. Such is the case with the Belvedere portrait of innkeeper Barbara Meyer, painted by Johann Baptist Reiter in 1836. In April 2024, the Art

⁶ Lang, "»...nicht die Ausnahme, sondern der Normalfall!« Die digitale Lücke in der Kunstgeschichte und Provenienzforschung," para. 25.

Restitution Advisory Board annulled the acquisition of the painting by the Belvedere at the auction held by the Viennese auction house Weinmüller in March 1939 and authorized the transfer of ownership to the heirs of art dealer and original owner Robert Kauder.⁷ As with previous cases, the corresponding entry in the online collection provides more up-to-date information about the actual owners than the Art Database. However, the Belvedere entry omits details regarding the problematic auction purchase, an important fact that should not be hidden from the gallery's website.

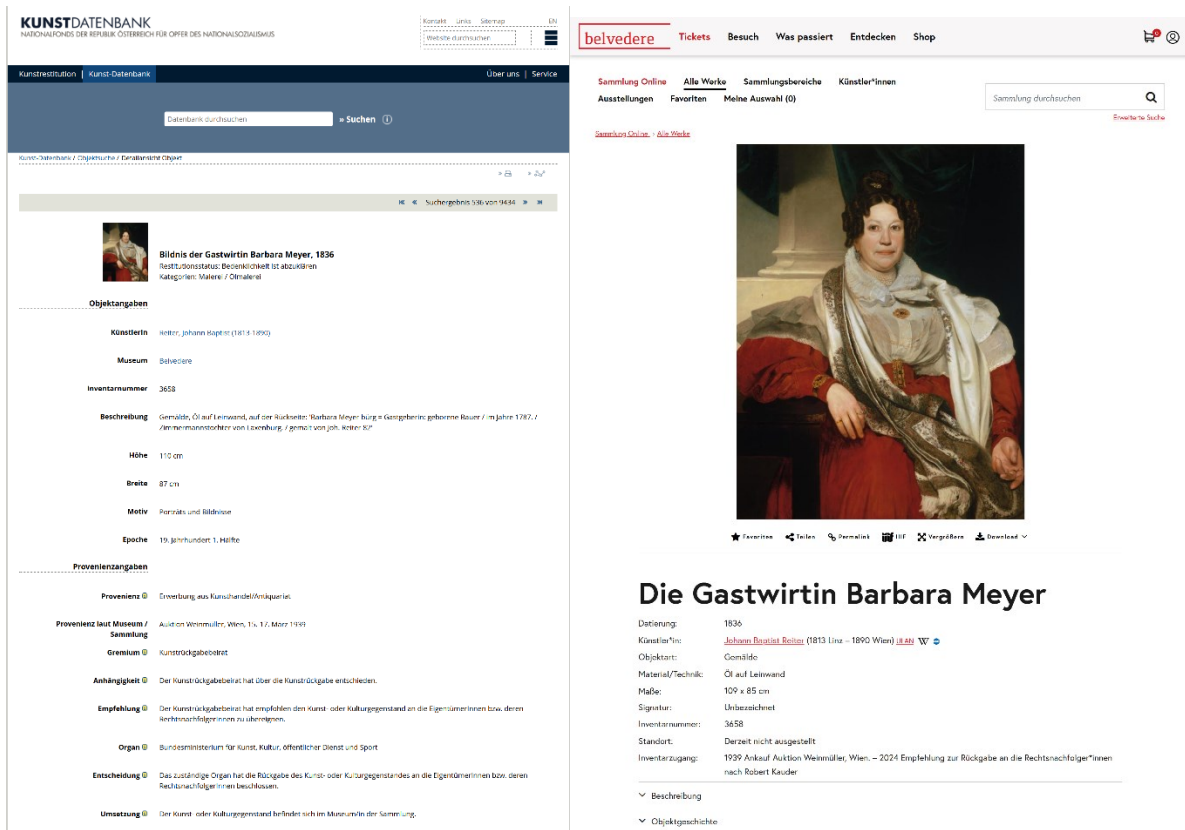


Figure 5: Side-by-side comparison of object entries for the portrait of Barbara Meyer by Johann Baptist Reiter. The screenshot from the Art Database on the left, the entry from the Belvedere Online Collection on the right, <https://sammlung.belvedere.at/objects/2456/die-gastwirtin-barbara-meyer>, <https://www.kunstdatenbank.at/detailansicht-objekt/7507>.

It is entirely possible that the gallery has ceased publishing artworks on the Art Database website, as the official Belvedere website reports more restitutions than the Art Database. This may not be an isolated issue; many online collections often lack entries for works that are listed in the Art Database. For instance, institutions like

⁷ Kommission für Provenienzforschung, "Restitutionsbericht „Robert Kauder“."

Weltmuseum in Vienna seem to have no items available online from the 113 entries listed in the Art Database. While entire collections are difficult to publish, it is unusual that particularly problematic items, those that would benefit most from being made public, are excluded from online collections.

All these cases demonstrate that linking data could prevent many of these issues from persisting. For transparent and international provenance research, best practice would involve connecting these items to corresponding entries in online collections and similar databases, through information exchange technologies and the semantic web. This would also mean that the Lost Art database could have access to the Art Database information. As a growing and serious resource for provenance research in a German speaking area, Lost Art integration would mean a bigger audience and outreach for Austrian restitution efforts, especially considering transboundary nature of provenance research. Currently, there are only 1025 Austrian heirless items listed on the Lost Art website. Among the thirteen participating Austrian institutions, four are based in Vienna. Notably, none of the participating Viennese institutions are federal museums; they are all city-owned institutions. This includes the City Museums, the City Library and Vienna Jewish Museum, the only one that is not included in the Art Database.

It remains unclear why Austria's major federal museums have not decided to include their problematic objects in the Lost Art database. Interestingly however, the *Kunsthistorisches Museum* decided to publish their missing artworks on the website. Many of these entries feature high-quality photographic material of the lost artworks, many of them lost after being recovered in salt mines after the end of the war. This indicates that the website is well known to the Museum, and that they make use of it, but not for provenance research on the objects from their collection.

The primary reason federal institutions do not share their problematic collections on the Lost Art database is most likely legal difficulties. The Art Database is controlled by Austria's National Fund and contains state-owned artefacts. In contrast, the Lost Art

Database is managed by the German Lost Art Foundation, founded by the German federal and regional governments.

Methodology

Data Mining

Given the lack of similar resources specifically tailored for Austrian institutions, the Art Database was selected for an exploratory analysis of the current state of digital provenance research in Austria, with the aim of converting it into a format suitable for analysis. Prior to its publication in 2006, much of this information was neither centralized nor freely available to the public.

Since the database lacked an accessible API endpoint and no database dump was available upon request, I decided to systematically web scrape the database using the Python programming language. Data was collected from publicly available sites, and while explicit consent was not obtained, ethical scraping practices were adhered to. The data scraping was conducted in the last week of June 2024.

In my process, I adhered to best practices by using the Anaconda virtual environment management tool, which ensures a smooth and conflict-free coding environment with various dependencies. For web scraping, I chose Scrapy, an open-source and collaborative web crawling framework known for its speed, flexibility, and extensive capabilities. Scrapy's key feature is its use of "spiders", custom classes with specific instructions on how to crawl sites and extract data. In addition to Scrapy, I utilized libraries such as lxml for HTML parsing, the Json library, and Pandas for data manipulation. The scraping script is available in a GitHub repository.⁸

Web Scraping

To efficiently scrape content from the web page, I began by analyzing the page structure to identify and access key HTML elements containing crucial information.

⁸ Marja Nikolic, "Web Scraper for the Art Database," Github, accessed February 1, 2025, <https://github.com/Nik-Mar/KunstDB>.

Data fields such as title, restitution status, medium, artist, home institution, and provenance were extracted using a combination of CSS selectors and XPath expressions. Each extraction process was customized to match the specific HTML structure of the museum's database, ensuring accurate and comprehensive data retrieval.

Scrapy also has an interactive shell, which proved useful for testing CSS and XPath selectors before including them into the web scraper. This functionality enabled immediate testing and perfecting of selectors.

Ethical concerns were a significant focus throughout the web scraping process. I avoided scraping during busy hours, and a user agent was supplied. Additionally, scraping was conducted in compliance with the site's terms of service. The spider was designed to respect the robots.txt file to ensure that scraping did not overload the server or violate any access policies and Scrapy's AutoThrottle extension was utilized to automatically adjust the speed and number of requests based on webpage capacity and response time. The advantage of this was that the website was not swamped with scraper queries, but the process took longer. However, because there was no time pressure, the scraping was conducted in batches over the course of a week.

I conducted a dynamic approach to systematically retrieve data from webpages. Firstly, I identified the pagination system, where different subpages of the dataset could be accessed by modifying a specific URL parameter (e.g., page=1, page=2, etc.). To automate the scraping procedure, I used Python's for loop, which iteratively updated the page number in the URL, scraped the data and saved it as a dictionary. At the end of scraping, the dictionary was converted to JSON format and saved locally.

Although the web page is a simple static HTML site, several challenges were encountered. One notable issue was the inconsistent structure of the webpage, where different artworks were organized with varying elements and categories. This inconsistency required careful handling to ensure that data from all artworks was accurately and comprehensively extracted.

In web scraping, having unique IDs or classes for each element simplifies the extraction process. However, the Art Database website's layout presented a challenge: it was structured as a grid with identical classes for elements on each side of the grid. Specifically, the left side of the grid provided categories for the information displayed on the right side, but both sides used the same identifiers. This meant that elements on both sides of the grid shared identical classes, complicating the extraction process. To overcome this, elements were scraped separately into two lists—one for the categories on the left and one for the corresponding data on the right. These lists were then combined into a dictionary, with the left-side list serving as keys and the right-side list as values, ensuring accurate pairing and handling of the data despite the shared identifiers.

To ensure accuracy, the data was frequently manually validated by cross-referencing it with a randomly selected webpage from the database.

Data Cleaning and Preprocessing

The scraped dataset corresponds to version 2.2RC1 of the database, updated on March 25, 2024. It is stored in a JSON file and has been converted into a tabular format for postprocessing. Due to the very messy state of the data, cleaning was performed using a combination of Python libraries, including Pandas, along with tools like Microsoft Excel and Open Refine. The analysis was conducted in Jupyter Notebook, utilizing Python libraries such as Pandas, Matplotlib, and NumPy.

The dataset primarily consisted of string variables, which required minimal cleaning for the initial analysis. However, due to the web scraping techniques used, certain string variables have been embedded within lists or split over multiple lists. To fix this, I created custom functions to extract and combine these string data. In addition, I standardized the text data by removing leading and trailing whitespaces as well as replacing multiple consecutive spaces with one. Columns indicating dimensions, such as width and length, were transformed from strings to numerical data types for use in quantitative analysis.

The dataset contained 149 empty records. These records were removed from the working dataset after it was determined that they corresponded to entries whose URLs had been set to inactive. Although such removal respects legal norms, notably in terms of privacy and copyright, removing or deactivating database records does not promote transparency and presents a difficulty for provenance researchers since it results in knowledge gaps.⁹

After removing these rows, the dataset included 9295 full records, each representing a cultural object, with twenty-four columns, capturing various description categories from the HTML website. These columns include:

- Basic Information: URL, Title, Artist, Museum, Inventory Number, Description, Height, Width, Motif, and Period.
- Provenance Information: Restitution Status, Former Owner (according to museum/collection), Classified Provenance, Provenance (according to museum/collection), Committee, Pendency, Recommendation, Body, Decision, Committee in Charge, Decision, Implementation, Imprint, and Annotations.

Analyzing different aspects of the dataset proved to be highly challenging for several reasons. Accessing information in a clear and structured manner would require extensive data cleaning and standardization. As previously mentioned, the data hosted in the Art Database originates from a variety of museum information management systems, with each institution adhering to its own set of rules and standards for recording and describing information. When aggregated, this data presents significant challenges for large-scale analysis. To address this issue, it would be necessary to develop a set of standardized cleaning rules and apply them to each institution's data individually, ensuring consistency and structure across the entire dataset.

Data cleaning often involves dilemmas regarding how to standardize data without losing valuable information. For example, the column "*Epoche*" in the dataset indicated

⁹ Lang, "»...nicht die Ausnahme, sondern der Normalfall!« Die digitale Lücke in der Kunstgeschichte und Provenienzforschung," paras. 30–31.

the period when an object was created. While some values, like *"20. Jahrhundert"* (20th Century), can be easily converted into machine-readable data, other values such as *"Barock"* (Baroque) or *"Jugendstil/Art Deco, 20. Jahrhundert"* present more complex challenges. These entries involve semantic interpretations of time periods, such as the Baroque era, which lacks a precise period, or *"Jugendstil"*, which we cannot simply reduce to a broad time range, since multiple art styles coexisted at the same time.

However, for the needs of this project, I decided to accept potential loss of information and map each period to a specific time range by defining start and end years. This approach required significant manual intervention, but given the relatively small size of the dataset, it was manageable. Once the mapping was completed, the start and end dates were converted into a computer-readable format, allowing for computational analysis.

I exported the dataset to Microsoft Excel for manual post-processing after doing the preliminary data cleaning and column splitting in Python. Certain columns, especially those with comprehensive provenance data, included complex and crucial details relevant to my research. Because these columns included a large amount of natural language that needed to be meticulously cleaned and standardized, they required a substantial amount of manual labor.

I chose to prioritize simplicity by omitting complexities when cleaning these columns. For instance, column *"KünstlerIn"* contained a plethora of problematic entries such as *'unbekannter wiener maler'* (unknown Viennese painter), *'unbekannter meister (philipp otto roos-nachfolger)'* (unknown master, follower of Philipp Otto Roos), and *'anonym kopie nach: clouet, françois (ca. 1505/10 - 1572)'* (anonymous copy after François Clouet). Additionally, due to the diverse nature of recorded objects, the "artist" column did not always correspond to individual artists. It also included roles such as editors, translators, institutions, collectors, illustrators, and writers. A particular challenge also arose with shared authorship, where multiple entities were credited for a single object, complicating accurate cleaning. This column also contained different levels of certainty.

Many artworks are attributed to artists with only partial certainty which can be expressed in many different ways-either with words, such as "*zugeschrieben*" (attributed to), or with question marks.

A similar approach was taken for the provenance information column. My modeling strategy focused on extracting key entities, such as individuals and institutions, to reconstruct a transaction timeline. This information was then divided across multiple columns, labeled as "provenance1", "provenance2", and so on, to capture each stage of the object's history in a structured format. If available, the time of transaction was also recorded.

After performing extensive data cleaning and modelling, I exported the data to Open Refine.¹⁰ This open-source program provides an intuitive user interface for handling complex cleaning tasks, involving NLP techniques, such as string clustering. By utilizing various clustering algorithms, it can identify identical entities even when spelled differently or in different languages. This was particularly useful given the numerous name variations resulting from the multicultural nature of the late Austro-Hungarian monarchy. After names have been standardized and cleaned, they were ready to be reconciled.

OpenRefine's reconciliation service is one of the most powerful and widely used features of the software. Data reconciliation involves matching data to standardized entities in external linked data repositories like Wikidata, GND, or Getty. This ensures that the information is accessible across different systems, easily interpretable by both humans and computers, supporting interoperability and integration with other systems.

For the purposes of this thesis, I choose to reconcile the entities twice: against Wikidata and against GND, which is widely used in the German-speaking world. Very ambiguous entries, such as "*Hoffman*" or "*L.E.*" had to be excluded from the reconciliation process.

¹⁰ Antonin Delpuch et al., "OpenRefine/OpenRefine."

Sanity checks were performed to disqualify bad matches, and very often, manual corrections had to be applied to extract the right entity from the database. All of this was manageable given the size of the dataset; however, this approach may not be possible if we had more data.

As anticipated, reconciling names from provenance columns proved to be more difficult than reconciling artist names, demonstrating the limits of existing digital tools for provenance research. Although some people are known by their name, provenance researchers have not yet linked them to their identity. One of the challenges is the ambiguity or commonality of certain names, such as Fritz Hoffman. Identifying the true owner of an item with such a name,¹¹ especially from historical records, and tracing their heirs would be an enormous task. Not only is the name frequently appearing in historical documents, but the specific item in question—a book—was also quite common at the time, making the identification process even more difficult.

At present, identifying these individuals requires a meticulous historical research methodology, involving the examination of scattered archival documents such as registry books, Holocaust victim databases, court and administrative files, address or telephone directories, and Gestapo or VUGESTA files, and particularly the Property Transaction Office records. Many of these documents are not digitized, often due to privacy concerns, which further complicates the research process. This lack of digitization makes it challenging to access and cross-reference the necessary information, significantly slowing down the identification of original owners and their heirs.¹²

¹¹ The item is recorded under number 130 in the Art Database. "Die Eherne Mark, Ferdinand Krauss," accessed January 30, 2025, <https://www.kunstdatenbank.at/detailansicht-objekt/930>.

¹² A very useful list of all available sources can be found on the website of the Jewish Community of Vienna; Department for Restitution Affairs of the Jewish Community Vienna, "Research Guide," accessed August 10, 2024, https://www.restitution.or.at/rechercheleitfaden_e.html.

Limitations of the Dataset

In the ideal case, our dataset could provide insights into the collecting practices and artistic preferences of the period. By identifying which artists' works were most frequently confiscated, we could gain a deeper understanding of the cultural politics of the Nazi regime. However, after spending some time with the data, it became clear that this dataset is insufficient to support our theories.

While the dataset is relatively comprehensive, containing nearly 10,000 records, it does not fully capture the entire scope of the phenomenon addressed in this thesis. Tens of thousands of objects were stolen in Austria alone during this period, and many were restituted shortly after the war. Thus, the dataset reflects only a fraction of the total number of objects involved in this historical context. Additionally, private GLAM institutions are not included in this dataset, as they operate under different legal frameworks for restitution in Austria. Similarly, objects in private possession are not included in the dataset as well. Tracing these items is particularly challenging, as they often leave few archival traces, typically documented only in internal gallery records or auction catalogs.¹³ These exclusions limit the dataset's scope, potentially leading to a misrepresentation of the phenomenon.

Although an English version of the website is available, the data was scraped from the German version. This choice was made because the original historical data is in German. While translating the database is essential for reaching an international audience and accommodating claimants who may not speak German, the translation process can introduce biases and gaps, potentially altering the nuances and context of the original data. The implementation of controlled vocabulary which would standardize terminology and keep translation inconsistencies to a minimum would partially resolve this issue in the future.¹⁴

¹³ Effinger and Sepp, "Handexemplare des Auktionshauses Hugo Helbing als (digitale) Quelle für die Forschung," 102.

¹⁴ Lang, "»...nicht die Ausnahme, sondern der Normalfall!« Die digitale Lücke in der Kunstgeschichte und Provenienzforschung," paras. 27–28.

When using the Art Database, it is also important to recognize that it has already undergone partial restructuring and cleaning, introducing a degree of data loss and bias. Classifying items into one of the available sixteen provenance categories is challenging, as it is difficult to fit complex histories into simple categories. Objects often have long and convoluted trajectories before ending up in collections, making it impractical to assign them to just one category. For example, an object might have experienced multiple ownership changes and varying legal statuses, reflecting a complex provenance that cannot be fully captured by a single classification.

During the conception of the database, special attention was given also to classifying objects according to their restitution status. There are eight possible categories, such as "Dubiousness to be clarified" (*Bedenklichkeit ist abzuklären*), "Restitution rejected" (*Rückgabe nicht empfohlen*), or "Return to the heirs has occurred" (*Rückgabe an ErblInnen erfolgt*). These categories were developed to account for differences in decision-making processes between the Art Restitution Advisory Board and the Viennese Commission for Restitution, which influenced how objects were categorized and documented.

One key distinction is that the Viennese Commission for Restitution first classifies objects based on their restitution potential, even before conducting in-depth provenance research. Once the classification is completed, provenance research and the search for legal successors take place side by side. Only after both processes are finalized does the Viennese Commission decide on restitution. In comparison, under national law, the search for legal owners takes place only after the object has been recommended for restitution.

Another essential difference is that the Viennese Commission does not automatically consider objects purchased between March 13, 1938, and May 8, 1945, at Dorotheum or on the art market as immediately eligible for restitution. Instead, such items are classified as generally suspicious, requiring further proof. In contrast, acquisitions from

VUGESTA or purchases from Julius Fargel, an appraiser for the Property Transaction Office and Gestapo, automatically qualify for restitution research.

These procedural differences explain the slight variation in categories under the recommendation section. For collections owned by the Austrian Republic, items are explicitly recommended to be returned to legal successors or owners, whereas the Viennese Commission allows for exceptions if the rightful owners cannot be identified.¹⁵

Due to these distinctions we must remember that the publication of objects in the database does not automatically mean that an object's provenance is questionable or subject to restitution laws.¹⁶ Currently, there are 5725 open cases listed on the website with their questionable status yet to be resolved, which represents almost 60% of all cases listed.

¹⁵ Seidinger, Fritsch, and Lessing, 249; Wladika, "Zehn Jahre Provenienzforschung, Erbensuche und Restitution in den Museen der Stadt Wien - Eine vorläufige Bilanz," 267.

¹⁶ Seidinger, Fritsch, and Lessing, "Die Tätigkeit des Nationalfonds der Republik Österreich für Opfer des Nationalsozialismus im Rahmen der Kunstrückgabe - Die Kunst-Datenbank des Nationalfonds," 248.

Exploratory Analysis

The dataset encompasses 9,295 objects from seventeen different Austrian institutions, such as federal museums, City of Vienna museums, and provincial state museums. The Austrian Museum of Folk Life and Folk Art (*Österreichisches Museum für Volkskunde*) is also part of the dataset, even though it is not classified within the main museum categories. Although owned by a private association, it has been included due to its provenance research activities conducted in compliance with the Art Restitution Act since 2014, and its collaboration with the Commission for Provenance Research. Additionally, the University of Vienna is part of the dataset because it transferred its heirless artifacts to the National Fund in 2017.

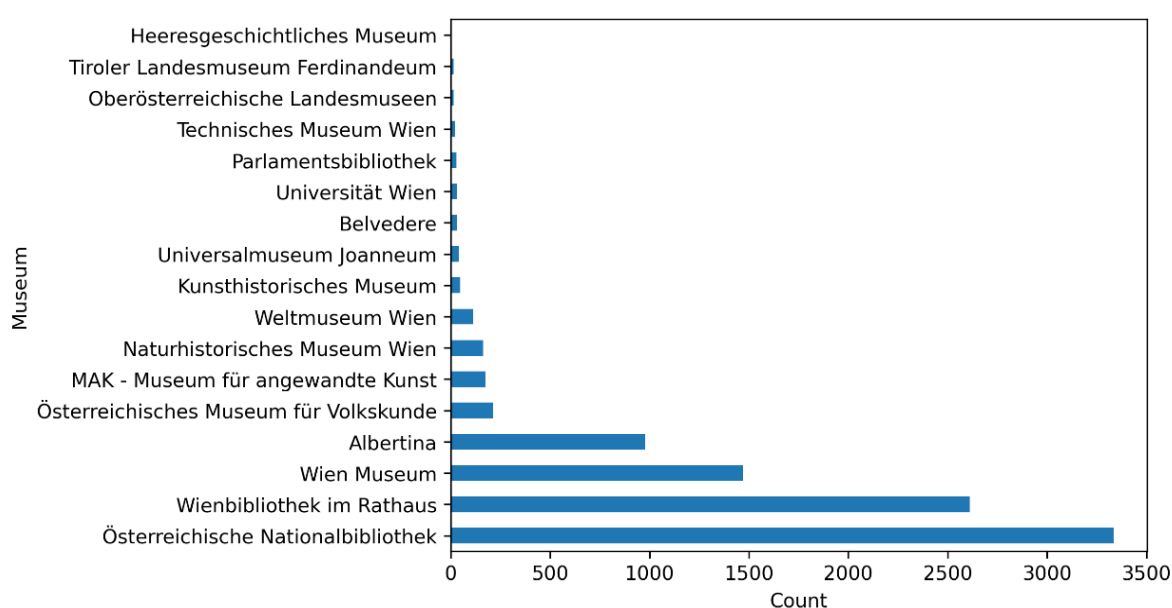


Figure 6: Distribution of objects in the Art Database by GLAM institutions

Most objects in the dataset originate from the Austrian National Library (*Österreichische Nationalbibliothek*), which holds 3,335 items, followed by the Vienna City Library (*Wienbibliothek im Rathaus*) with 2,610 items. Given the nature of these institutions, it is not surprising that manuscripts, photographic materials, and various prints make up half of the dataset, with an additional 22% comprising books. These types of objects were widely used and distributed, making their restitution particularly

challenging. It is likely that not all previous owners, especially for books, will ever be identified. These items often lack visible ownership marks like ex libris or dedications and are generally not of significant monetary value, further indicating that the looting was not driven by the objects' monetary worth.¹

Another large group in the dataset is drawings, which account for 10% of all artifacts, followed by paintings. The dataset also includes a wide range of smaller objects, such as furniture, clothing, jewelry, instruments, coins, and handicrafts. This diversity highlights the extensive scale of the plunder that occurred.

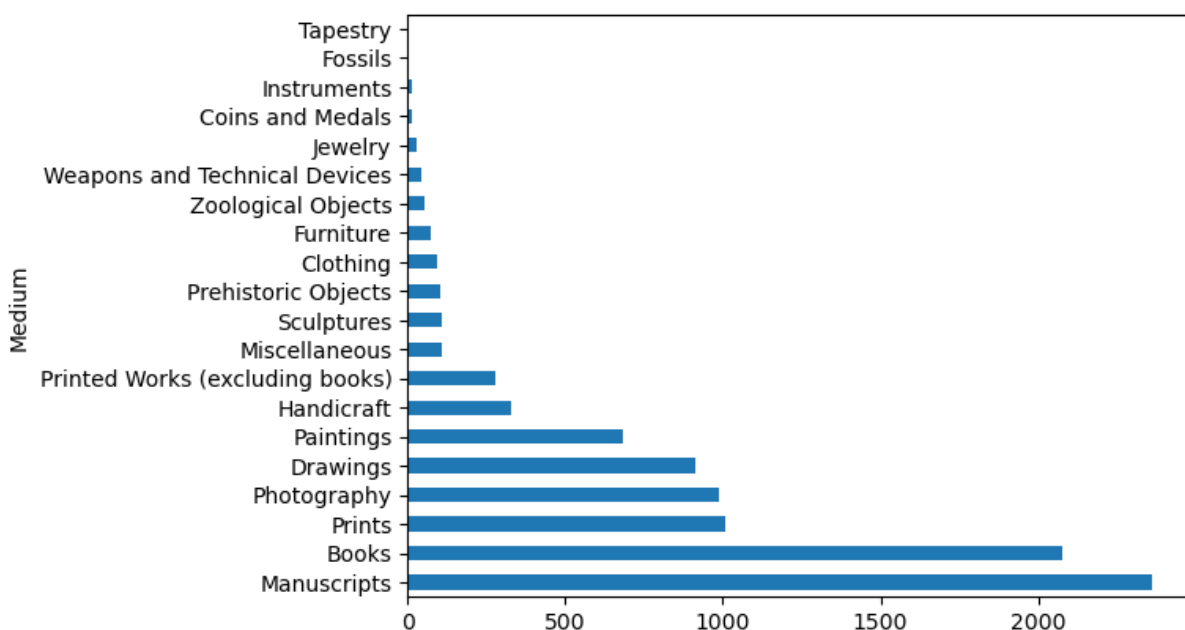


Figure 7: Distribution of objects in the Art Database by their medium

Approximately half of the items in the collection lack a known creation date. However, over 70% of the pieces with established dates encompass the later part of the nineteenth and early twentieth century. This era appears to dominate the collection, with printed materials, drawings, books, and photographic works making up most of the entries. The oldest dated objects in the database are handicrafts and sculptures.

To focus on the visual artists most represented in the collection, I excluded books, private letters, and manuscripts from the dataset. Unsurprisingly, photographers made

¹ Jabloner and Schölnberger, "Wider das Vergessen. Die Kunstrückgabe in Österreich 1998 bis 2003," 36.

up a sizable portion of the remaining entries. Within traditional fine arts, however, certain artists appeared to be significantly over-represented, potentially suggesting a particular preference for their work.

The artists Friedrich Gauermann and Theodor von Hörmann are notably over-represented in the collection, with 78 and 94 works, respectively. This is primarily because their works were purchased in bulk by Albertina from auction houses like Adolf Weinmüller and Dorotheum. However, these acquisitions reflect a strategic decision to acquire large volumes of artwork whenever feasible, rather than a deliberate preference for certain artists. In fact, most of the artists appearing in the bar chart below share similar stories. Among the names at the top of the list, we find representatives of the Viennese Biedermeier, such as Josef Danhauser, as well as more modern artists like Ernst Stöhr and Alfred Kubin, artists who were far removed from the prevailing art ideals of the time. Mostly consisting of drawings or prints, purchased in bulk by the same institution through the same auctions, these acquisitions highlight the institutional emphasis on quantity over artistic preference.

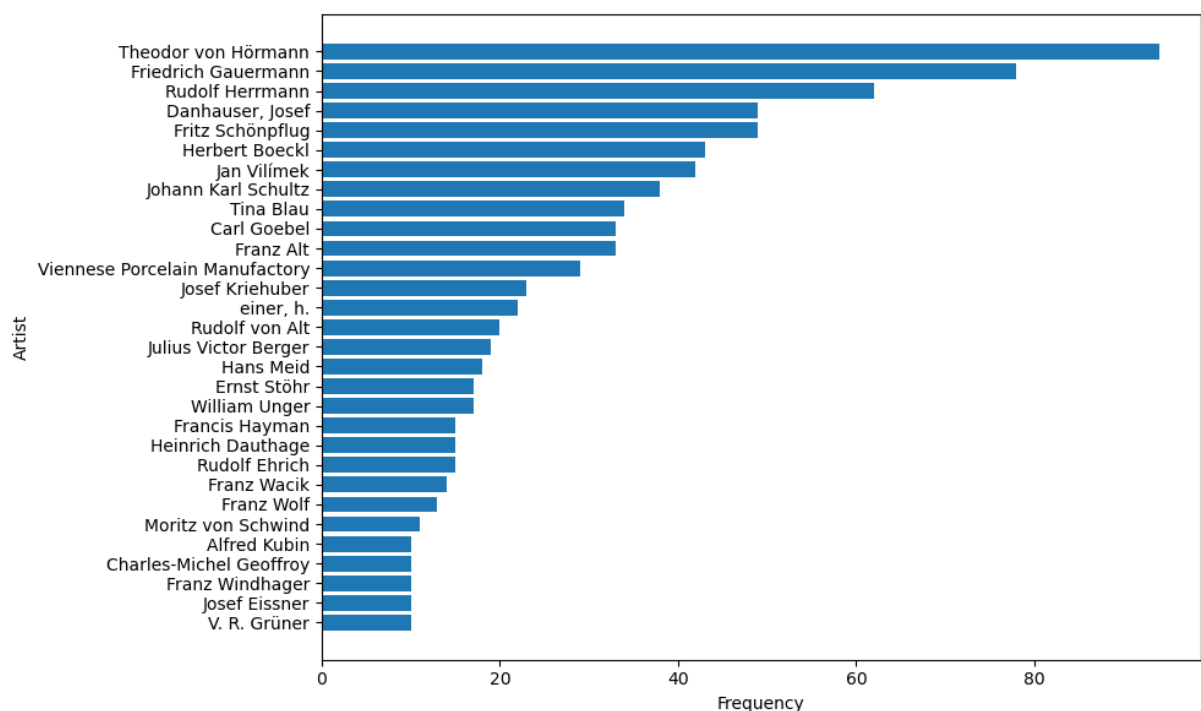


Figure 8: Most common artists in the Art Database

Each object is classified into one of sixteen groups based on its provenance, following various official restitution reports. The largest group consists of items donated from private collections (2,411 objects, or nearly 26%), with approximately 1850 of these belonging to the personal archive of the Richter, privately donated to the Vienna City Library in 1947. This group of objects also includes other collections that ended up in the libraries through personal donations, such as personal correspondence of Michael Holzmann.

The second largest group of objects, accounting for 21% (or 1,966 items), was acquired from VUGESTA or Gestapo, while 14% were obtained through Dorotheum auction sales between 1938 and 1945. These represent the most common sources of transactions for the institutions. It is also worth noting that acquiring objects through these institutions often meant that traces of previous owners were effectively erased, especially for items like prints, books, photographs, or drawings. Paintings, on the other hand, sometimes had information on the back or frame, which could provide clues about their previous owners.

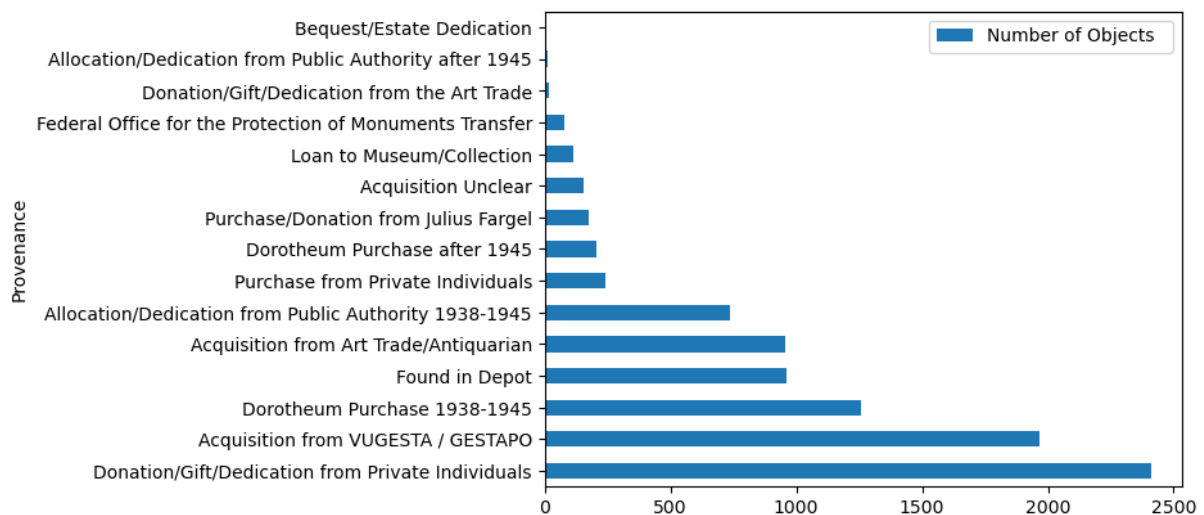


Figure 9: Distribution of Art Database objects by provenance

At the early stages of the project, it became evident that this dataset had the potential to reconstruct a social network which could reveal the intricate relationships among key figures in Vienna's cultural scene during the Second World War. This network could grow over time and evolve into a comprehensive knowledge graph through linked

data. Additional sources, such as Lost Art, could help fill gaps, create new nodes, and connect previously unlinked information, helping to extend our understanding.²

To reconstruct the social network, I first transformed the data into the necessary format. With Python, I created two datasets: one for edges and one for nodes. The nodes dataset contained entities, such as individuals and institutions, each assigned a unique ID to ensure consistency and accuracy. The edges dataset represented the relationships between these entities. Once the data was properly formatted, I loaded it into Gephi, an open-source network visualization tool.³ Gephi's powerful capabilities and simple UI make it easy to visualize networks and explore the connections inside the data.

To analyze the network's topology and the roles of its nodes, I computed several critical metrics. Betweenness centrality measures how often paths pass through a node, indicating its role as a bridge or intermediary within the network. I also calculated closeness centrality, which reflects a node's proximity to all others, thereby highlighting its connectivity and influence.

Not surprisingly, the Austrian National Library, "*Sonderauftrag*" ("*Führermuseum*"), Collection Agency A (*Sammelstelle A*),⁴ Gestapo, and Dorotheum are the top five nodes with the highest betweenness centrality. These entities direct the flow of transactions within the network and operate as its main intermediaries. Many of these nodes also exhibit high closeness centrality, suggesting their strong influence. This implies their involvement in the looting operation as both brokers, facilitating transactions between different groups, and central entities maintaining significant connections with others.

² Zuckerman, "Tracking Looted Art with Graphs: A Case Study," 1.

³ Bastian, Heymann, and Jacomy, "Gephi."

⁴ The Austrian State Treaty of 1955 mandated the formation of Collection Agencies A and B, with the goal of recording and organizing the transfer of heirless objects to so-called "receiving organizations". Allgemeiner Entschädigungsfonds für Opfer des Nationalsozialismus, "Berichte der Sammelstellen A und B (1957-1969)."

Direct transfers of private possessions to GLAM institutions without intermediaries were relatively rare.

The low graph density may also suggest that the looting operation was organized into separate subnetworks centered around specific clusters. To explore this further, a community detection analysis was performed, revealing eight communities, each focused around specific institutions. The cluster visualization highlighted these distinct and weakly connected subgroups. Limited connections between these institution-based clusters point to poor information flow among GLAM institutions, suggesting again that once an object reached a GLAM institution, it rarely changed locations again.

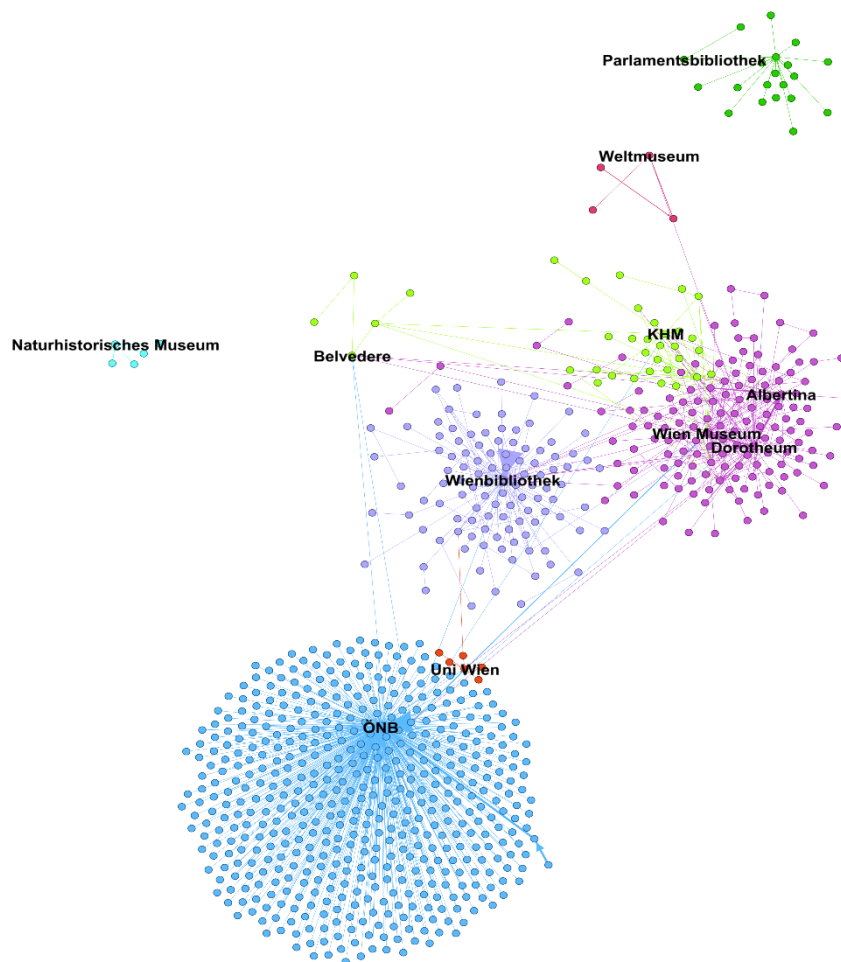


Figure 11: Gephi visualization of social network clusters, showing subgroups.

More interconnectedness was shown in Clusters 1 and 4, which were centered on well-known organizations like the Dorotheum, Albertina, Vienna Museum, and

Kunsthistorisches Museum. Local private art galleries like Gilhofer & Ranschburg, C. G. Boerner, Adolf Weinmüller, and V. A. Heck play a particularly significant role in this subgraph, particularly when it comes to providing resources to institutions. Because of their high proximity centrality, the subgraph demonstrates how these private galleries were able to carefully place themselves inside the network with easy access to several other nodes.

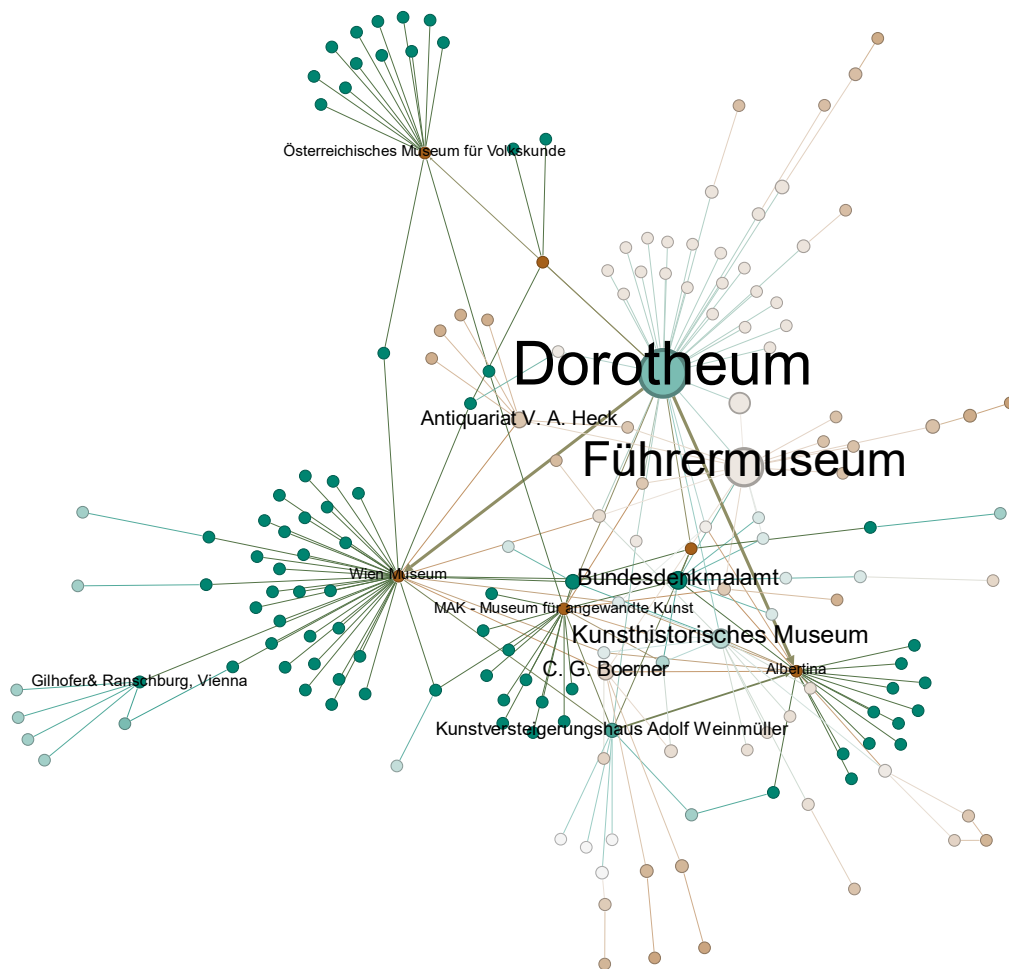


Figure 12: Gephi visualisation of clusters 1 and 4. Node size reflects betweenness centrality (larger nodes indicate higher values), while node colour represents closeness centrality (green for high closeness).

Interpreting the findings of this network research should be done with caution since this brief analysis provides only a rough indication of potential outcome with higher quality data. The graph's low density suggests that there is not enough data for a comprehensive network analysis. Even though some of the network are supported by existing literature, more data would be needed to draw more thorough conclusions.

Numerous edges and nodes are obviously missing, which might cause misinterpretation. As an example, we might overestimate how crucial certain organizations, like the Austrian National Library, were to the plundering operation. Its prominence in the data may give the false impression that it played a central role, when in fact, the high number of edges connected to the library reflects the nature of its collection, which is mostly made up of numerous and smaller, everyday items like books and letters. Therefore, the frequency of connections to the library does not purely indicate intense involvement in looting.

Due to the absence of transaction dates for most items, time, which is a critical element in provenance research, was excluded from this network analysis. Ideally, producing time-stamped graphs would provide valuable insights into the evolution of relationships and transactions over time. Furthermore, it is noteworthy that some transactions represented in the graph occurred post-war.

Case Study: Herz von Hertenried Collection from the Austrian National Library

Network visualization also revealed a large influx of items to the Austrian National Library from the *Österreichische Lichtbildstelle*, likely following its integration into the library in 1938.⁵ A closer examination showed that this group of 561 items represents a substantial portion of the photographic material listed in the Art Database. This collection is linked to the art collector and engineer Karl Herz von Hertenried (1863–1930).

While this photographic material is not available on the Art Database site, some of it is published on the online collection of the Austrian National Library. The photographic material depicts the rich interior of Hertenried's apartment in the first district in Vienna and the carefully documented art collection he kept there. Many photographs in Hertenried's collection show art objects like paintings, drawings, and sculptures

⁵ Wiki Wien Geschichte, "Bildarchiv Der Österreichischen Nationalbibliothek."

attributed to renowned artists such as Rudolf von Alt, Adolf Hirémy-Hirschl, and Carl Spitzweg.

Little is known about Karl Herz von Hertenried, son of Julius Herz, a Jewish German railway engineer who was granted the noble title Ritter von Hertenried in 1887. Contemporary sources often mention Julius's passion for art. He was supposedly friends with Rudolf von Alt,⁶ and focused on collecting paintings from the Munich and Vienna schools. Following Julius's passing in 1910, Karl inherited this collection.⁷ The collection was put up for auction at renowned Viennese auction house C. J. Wawra after Karl's own death in 1930, together with the collection of Leopold Hutter. Announcements for the auction appeared in contemporary sources, and some newspapers noted that museums were considering participating in the sale.⁸

A digitized version of the auction catalog is available on the Heidelberg University Library's website; however, some manual browsing was required, as Karl Herz von Hertenried's name was omitted, replaced instead with the ambiguous term "*Alt-Wiener Besitz*" (old Viennese ownership).⁹

Examining reproductions in the auction catalog reveals recognizable artworks from the walls of Herz von Hertenried's Viennese apartment. For example, Heinrich Maria von Hess's portrait of Bertel Thorvaldsen, listed as item 236 and shown on the catalog's last page, however most likely a copy, can be seen in a 1920 photograph of Herz von Hertenried's bedroom wall.¹⁰ Similarly, a portrait of a man by Baroque painter Jan

⁶ Margarethe Poch-Kalous, "Die Mäzene der Gemäldegalerie der Akademie der bildenden Künste in Wien," 14.

⁷ "Der Tod eines Wiener Kunstsammlers," 12.

⁸ "Große Wiener Auktionen," 4–5.

⁹ C. J. Wawra, *Versteigerung der Kunstsammlung des verstorbenen Herrn Kommerzialrat Leopold Hutter und einer Sammlung aus Alt-Wiener Besitz*.

¹⁰ *Wien 1, Stadiongasse 4*, 1920, photograph, 1920, ÖNB Bildarchiv und Grafiksammlung, https://data.onb.ac.at/rep/BAG_18257876.

Kupecky, cataloged as item 241 and reproduced on page 94, is visible in another apartment photo, positioned beside the fireplace.¹¹



Figure 13 and 14: Kupecky's portrait is visible in the upper left corner of Hertenried's room. Interior photograph from 1915 (ÖNB), showcasing the object 4295 from the Art Database, https://data.onb.ac.at/rep/BAG_18257883, <https://www.kunstdatenbank.at/detailansicht-objekt/4295>.

It is not clear whether the photographs were taken by Karl Herz von Hertenried himself or by someone else. In the Art Database, eighty-five of these photographs are attributed to "László, S. P.", though unfortunately, these entries do not include image reproductions. A search for this name in the Austrian National Library's online collection reveals two male portraits, one of which is titled "*Selbstportrait. Halbe Figur mit Hut, halb rechts*",¹² corresponding to object number 4160 in the Art Database.¹³ Similarly as the two paintings before, this oil painting, dated to Berlin 1907, is recognizable on two Hertenried's interior photos: in one from 1909 ambiguously titled

¹¹ Wien 1, Stadiongasse 4, 1915, photograph, 1915, ÖNB Bildarchiv und Grafiksammlung, https://data.onb.ac.at/rep/BAG_18257883.

¹² László, S. P., *Selbstportrait: (Halbe Figur mit Hut, halb rechts)*. Ölgemälde, signiert und datiert Berlin 1907., 1907, ÖNB Bildarchiv und Grafiksammlung, <http://data.onb.ac.at/rec/baa14209790>.

¹³ "Selbstportrait. Halbe Figur mit Hut, halb rechts," accessed June 10, 2024, <https://www.kunstdatenbank.at/detailansicht-objekt/4160>.

"His photo studio in Rome (Via Margutta 83)",¹⁴ and another from Hertenried's apartment in Stadiongasse 4 in Vienna from 1915.¹⁵



Figure 15 and 16: Zsigmond László Jr.'s 1907 self-portrait is visible in the upper right corner of a photograph depicting a studio in Rome, taken in 1907, ÖNB-Bildarchiv und Grafiksammlung, <http://data.onb.ac.at/rec/baa14209790>, https://data.onb.ac.at/rep/BAG_18257904.

Uncovering the identity of László, S. P. proved challenging. Initial clues pointed to a renowned British Hungarian portraitist Philip de László, who briefly resided in Vienna in the early 1900s. Judging by one of the interior photographs from the Austrian National Library,¹⁶ Herz von Hertenried has been in possession of his 1896 portrait of Zsigmond László, Jr. (1872 - 1911), which is part of the de Laszlo's catalogue raisonné and kept in a private collection.¹⁷

¹⁴ "Karl von Herz-Hertenried; Sein Fotostudio in Rom (Via Margutta 83)," 1909, ÖNB Bildarchiv und Grafiksammlung, https://data.onb.ac.at/rep/BAG_18257904.

¹⁵ *Wien 1, Stadiongasse 4*, 1915, photograph, 1915, ÖNB Bildarchiv und Grafiksammlung, <http://data.onb.ac.at/rec/baa18257897>.

¹⁶ *Wien 1, Stadiongasse Nr. 4*, 1920, photograph, 1920, ÖNB Bildarchiv und Grafiksammlung, https://data.onb.ac.at/rep/BAG_18257855.

¹⁷ "László Jr, Zsigmond, 1896," The De Laszlo Archive Trust, accessed November 10, 2024, <https://www.delaszlocatalogueraisonnee.com/catalogue/the-catalogue/laszlo-jr-zsigmond-110970>.



Figure 17 and 18: Portrait of Zsigmond László Jr. and its placement in Herz von Hertenried's apartment in 1920.
<https://www.delaszlocatalogueraisonne.com/catalogue/the-catalogue/laszlo-jr-zsigmond-110970>,
https://data.onb.ac.at/rep/BAG_18257855.

The Catalogue Raisonné entry confirms that the identity of László, S. P. is indeed Zsigmond László Jr. The two male portraits from Herz von Hertenried's apartment are self-portraits by Zsigmond László Jr. Following his departure from a career in the Austro-Hungarian navy, László Jr. dedicated himself to painting, spending brief periods in Munich and Rome to further his artistic development.¹⁸ These portraits appear in interior images taken between 1915 and 1920, suggesting that Herz von Hertenried obtained at least part of Zsigmond László Jr.'s work after his early death in 1911. The two men could have known one another personally, which is entirely possible given the photograph of László Jr.'s Rome studio in Herz von Hertenried's private collection.

The question remains whether these photographs were taken by him directly, or were made to catalogue his rich collection, perhaps for auction purposes after his death. We can only speculate how the rich photographic collection of Herz von Hertenried came into the *Lichtbildstelle*, which was later integrated into the Austrian National Library following the Anschluss in 1938. Although Herz von Hertenried died in 1930, and his collection was sold off in the same year, the note in the provenance record of the

¹⁸ Ibid.

Austrian National Library still reads "*Herz von Hertenried, via Lichtbildstelle, aus jüd. Besitz*". The question is if the reference to Jewish ownership refers to the original Karl Herz von Hertenried's possession or to the owners who got a hold of these possessions after his death before the photographs came to the *Lichtbildstelle*.

This demonstrates that without the Art Database, connecting these items from Herz von Hertenried's photographic collection would have been challenging, despite their shared provenance and the fact that they are all kept in the Austrian National Library. This underscores the importance of consistently providing provenance information, as it offers a fuller picture of these objects' historical context and reveals the story of the collection and the individuals behind it.

Conclusion

The restitution of objects seized by the Nazis in the years between 1938 and 1945 remains a significant issue in Austria, even 80 years after the conclusion of the Second World War. Due to Austria's initial stance as the first victim of Nazism the country did not come to grips with its complicity for the events of war well into the late 20th century. Consequently, for more than fifty years, Austrian restitution efforts were marked by dishonesty and indifference of the authorities and GLAM institutions likewise. It was not until the late 1990s, following controversies involving the Leopold Museum, that the Austrian government established a legal framework, that although not without flaws, is now regarded as one of the exemplary ones worldwide. Austria was among the 44 nations that endorsed the 1998 Washington Principles on Nazi-Confiscated Art. These principles established a global standard for addressing the issues of looted art and conducting provenance research. Newly established organizations such as Commission for Provenance Research, the Art Restitution Advisory Board and National Fund of the Republic of Austria for Victims of National Socialism have also played an instrumental role in advancing provenance research in Austria.

The field of provenance research has established itself as an indispensable part of GLAM life, however many experts warn that its methodologies are falling behind other similar fields. Despite significant progress made since the late 1990s in Austria, ongoing challenges persist, such as limited funding, shortage of staff, the need for very specialized knowledge, time-intensive work, limited information access, and the often bureaucratic and uncertain outcomes of historical investigations. Digital approaches can help address some of these challenges by improving the sustainability of processes, accessibility of information, interinstitutional and multidisciplinary collaboration, information centralization, transparency, and efficiency. Computational methods, paired with semantic technologies, such as open linked data, could further enhance the results of research. When these digital approaches are used side by side with a

traditional historical approach, the accuracy and efficiency of provenance research increases. The study and advancement of digital provenance are crucial not only for addressing the enduring injustices associated with Nazi-looted art but also for supporting the continuous efforts in reclaiming colonial heritage.

Part of my research examined how open and transparent institutions are about an object's provenance. Only a few museums openly display information on the provenance of an object; most do not include it in their online collection, not even when an object has been published in the Art Database as potentially problematic. While provenance research can reveal uncomfortable truths about illegal or unethical acquisitions in these institutions, withholding this information weakens transparency and trust. Institutions benefit from honest practices; otherwise, it may seem that their provenance efforts are driven by obligation rather than genuine commitment.

While English-speaking regions are increasingly integrating Open, FAIR, and linked data into GLAM workflows, inviting public to explore their collections computationally, Austrian institutions have been slower to adopt these standards. One of the primary aims of this thesis was to investigate the potential for incorporating digital tools and workflows into provenance research with particular focus on Viennese institutions. A key part of this study took a closer look at Austria's main online resource in the field, the Art Database of the National Fund for Victims of National Socialism, and its potential for computational research. Furthermore, since it primarily functions as an open register for identifying rightful owners, my purpose was also to evaluate its compliance with the Washington Principles, which advocate transparency and dissemination of information on provenance research and problematic objects.

When comparing the National Fund's Art database with Germany's Lost Art, it is clear that the Austrian database falls short of current standards and practices. Even for a basic user, the resource is difficult to work with due to the lack of advanced search capabilities. Its static nature suggests that it has not been greatly updated since its launch in 2006. Furthermore, my research has revealed conflicting or incomplete

information about objects, particularly when comparing the database entries with the corresponding online collection entries. It appears as though the database publishers were content with the bare minimum, avoiding anything which could invite public scrutiny. The underlying perspective appears to be that provenance research is primarily the responsibility of the state, rather than the public. Consequently, we are only granted limited access and this reluctance to embrace new technologies and workflows significantly slows progress in the field in Austria.

The practical part of my research entailed transforming the Art Database into a computationally accessible resource. A direct database dump was not available when requested, and the reasons, whether legal or ethical, remain speculative. Instead, efforts have focused on scraping the online database, cleaning the data, and converting it into linked data. The procedure was slow and time-consuming, highlighting the challenging nature of trying to model archival and historical data. While manageable for a single person and a dataset of under 10,000 entries, the data cleaning and preparation process would become impractical with significantly larger datasets, a common occurrence in the GLAM institutions. Therefore, it is crucial to develop internal expertise in semantic technologies within the IT departments of GLAM institutions and to engage specialists in this field.

Ideally, the data quality would allow for analysis of looting in Vienna. However, due to the diverse nature of objects and varying institutional standards, inconsistencies in the data posed a challenge. Extensive cleaning and standardization were necessary to ensure consistency and structure across the dataset, with some loss of information inevitable.

Unsurprisingly, books and manuscripts present by far the most numerous group of items in the database and among the hardest to retrace. Those searching for famous names among other items in the database will likely be disappointed, as what remains are harder-to-trace objects. Most items lack significant monetary value and, in the case of artworks, vary widely in artistic quality.

The attempt to reconstruct a social network of looting in Vienna revealed significant data limitations. The dataset represents only a fraction of the total objects affected and therefore fails to capture the full scope of looting. To recreate such a network, greater data accessibility from institutions is needed. Additionally, many items from private collections or non-state GLAM institutions are missing, as they fall outside the scope of the Austrian Art Restitution Act, a major point of criticism.

That is why, at present, only broad hypotheses, supported by existing literature, could be verified through statistical analysis. However, even a low-quality dataset has yielded verifiable and interesting results. The social network visualization revealed an influx of approximately 560 photographs from *Österreichische Lichtbildstelle* to the Austrian National Library. A significant number of these items were linked to the personal art collection of Karl Herz von Hertenried. Given that the Austrian National Library has published only a couple of these items in their online collection, and that without indicating the provenance of these items, the Art Database emerges as the sole resource that connects these photographs. Utilizing the data provided on the Art Database website and the Austrian National Library, I was able to manually reconstruct a small portion of the history surrounding this collection, which remains largely unknown today.

This underscores the potential wealth of information that could be uncovered if both the Art Database and the Austrian National Library adopted open linked data principles. The network could evolve into a comprehensive knowledge graph, further enriched by integrating the Getty Provenance Index, Lost Art, and German Sales digitized catalogues, increasing its depth and scope.

Restitution is not going to become any easier with the passage of time. That is why new technologies are crucial in moving the discipline forward, keeping it relevant and keeping the conversation going. As we approach the 80th anniversary of the end of the Second World War, it is vital that we do not forget the history behind these objects and remind institutions and governments of their responsibility.

Literature

"5-Star Open Data." Accessed June 24, 2024. <http://5stardata.info/en/>.

Albert Lichtblau. "Integration, Vernichtungsversuch und Neubeginn – Österreichisch-jüdische Geschichte 1848 bis zur Gegenwart." In *Österreichische Geschichte: Geschichte der Juden in Österreich*, edited by Eveline Brugger and Herwig Wolfram, 447–566. Wien: Ueberreuter, 2013.

Allgemeiner Entschädigungsfonds für Opfer des Nationalsozialismus. "Berichte der Sammelstellen A und B (1957-1969)." Accessed June 10, 2024. <https://www.entschaedigungsfonds.org/schlussbericht-der-sammelstellen-1957-1969>.

Anderl, Gabriele. "'Am Wiener Platz': Schlaglichter auf die Rolle des Wiener Kunsthandels während der NS-Zeit." In *NS-Kunstraub in Österreich und die Folgen*, edited by Gabriele Anderl and Alexandra Caruso, 171–211. Innsbruck: Studien-Verl, 2005.

Anderl, Gabriele., ed. *"Arisierung" von Mobilien*. Veröffentlichungen der Österreichischen Historikerkommission, Bd. 15. Wien: Oldenbourg, 2004.

Anderl, Gabriele. "„Kostbarkeiten, gemischt mit Trödel ...“: die „Abwicklung“ jüdischer Kunst- und Antiquitätenhandlungen in Wien während der NS-Zeit." In *Enteignete Kunst*, edited by Verena Pawlowsky and Harald Wendelin, 36–58. Raub und Rückgabe-Österreich von 1938 bis heute, Bd. 3. Wien: Mandelbaum, 2006.

Anderl, Gabriele, Blaschitz, Edith, and Sabine Loitfellner. "Die Arisierung von Mobilien und die Verwaltungsstelle für jüdisches Umzugsgut." In *"Arisierung" von Mobilien*, edited by Clemens Jabloner, 11–245. Vermögensentzug während der NS-Zeit sowie Rückstellungen und Entschädigungen seit 1945 in Österreich 15. Wien München: Oldenbourg, 2004.

Anderl, Gabriele and Caruso, Alexandra. "Einleitung." In *NS-Kunstraub in Österreich und die Folgen*, edited by Gabriele Anderl and Alexandra Caruso, 11–25. Innsbruck: Studien-Verl, 2005.

Andratschke, Claudia. *Leitfaden zur Standardisierung von Provenienzzangaben*. 2. Auflage. Hamburg: Arbeitskreis Provenienzforschung e.V, 2019. https://wissenschaftliche-sammlungen.de/files/4515/2585/6130/Leitfaden_APFeV_online.pdf.

Anton, Michael. *Illegaler Kulturgüterverkehr*. Rechtshandbuch Kulturgüterschutz und Kunstrestitutionsrecht. Berlin: de Gruyter, 2010.

- Antonin Delpuch, Tom Morris, David Huynh, Weblate (bot), Stefano Mazzocchi, Jacky, Thad Guidry, et al. "OpenRefine/OpenRefine: OpenRefine 3.8.5." Zenodo, October 29, 2024. <https://doi.org/10.5281/ZENODO.14009876>.
- arthistoricum.net. "Project description." Accessed June 10, 2024. <https://www.arthistoricum.net/en/subjects/thematic-portals/german-sales/about>.
- Bastian, Mathieu, Sebastien Heymann, and Mathieu Jacomy. "Gephi: An Open Source Software for Exploring and Manipulating Networks." *Proceedings of the International AAAI Conference on Web and Social Media* 3, no. 1 (March 19, 2009): 361–362. <https://doi.org/10.1609/icwsm.v3i1.13937>.
- Bender, K. "Distant Viewing in Art History. A Case Study of Artistic Productivity." *International Journal for Digital Art History* No 1 (2015). <https://doi.org/10.11588/DAH.2015.1.21639>.
- Bernhard Weisser. "Digitale Provenienzforschung am Münzkabinett der Staatlichen Museen zu Berlin. Erwerbungen zwischen 1933 und 1945." *Geldgeschichtliche Nachrichten* 57 (2022): 260–267.
- Birgit Kirchmayr. "„Es ging mehr um den persönlichen Wert...“ Der NS-Kunstraub im Kontext kultureller Auslöschungspolitik." *EForum Zeitgeschichte Österreich*, no. 3/4 (2001). www.eforum-zeitgeschichte.at.
- Birgit Kirchmayr. "Restituiert. Von der Unzulänglichkeit und gleichzeitigen Alternativlosigkeit des späten Zurückgabens." In *Restituiert: 25 Jahre Kunstrückgabegesetz in Österreich*, edited by Birgit Kirchmayr and Pia Schölnberger, 177–87. Schriftenreihe der Kommission für Provenienzforschung 9. Wien: Czernin Verlag, 2023.
- Bizer, Christian, Tom Heath, and Tim Berners-Lee. "Linked Data - The Story So Far." *International Journal on Semantic Web and Information Systems* 5, no. 3 (July 1, 2009): 1–22. <https://doi.org/10.4018/jswis.2009081901>.
- Blimlinger, Eva. "Rückstellungen und Entschädigungen in Österreich 1945 bis 2008. Ein Überblick." In ... *wesentlich mehr Fälle als angenommen*, edited by Gabriele Anderl, Christoph Bazil, Eva Blimlinger, Oliver Kühschelm, Monika Mayer, Anita Stelzl-Gallian, and Leonhard Weidinger, 17–33. Wien: Böhlau Verlag, 2009. <https://doi.org/10.7767/boehlau.9783205118862.17>.
- Bonadies, Victoria. "Taking Greater Responsibility: Austria's Art Restitution Act And The Need For Further Reform." *American University International Law Review* 34, no. 3 (2019): 671–699.

Brückler, Theodor. "Bergungsmaßnahmen." In *Kunstraub, Kunstbergung und Restitution in Österreich 1938 bis heute*, 212–259. Wien: Böhlau Verlag, 1999. <https://doi.org/10.7767/boehlau.9783205125778.212>.

Bundesgesetz über die Rückgabe von Kunstgegenständen und sonstigem beweglichem Kulturgut aus den österreichischen Bundesmuseen und Sammlungen und aus dem sonstigen Bundeseigentum (Kunstrückgabegesetz – KRG), No. BGBl. I Nr. 181/1998 (2025).

Bundesministerium für Kunst, Kultur, Sport und öffentlichen Dienst and Bundesministerium für Finanzen, eds. "Strategie Kulturerbe Digital. Digitaler Aktionsplan Austria," 2023. <https://www.bmkoes.gv.at/dam/jcr:418639e8-05d5-44b4-a5e0-fe12b517a742/Strategie-Kulturerbe-digital.pdf>.

C. J. Wawra. *Versteigerung der Kunstsammlung des verstorbenen Herrn Kommerzialrat Leopold Hutter und einer Sammlung aus Alt-Wiener Besitz: Gemälde alter und moderner Meister, farbige englische Kupferstiche, Silber, Porzellan, französische, deutsche und englische Möbel, Teppiche, Textilien etc.; 24. und 25. November 1930*. Wien, 1930. https://digi.ub.uni-heidelberg.de/diglit/wawra1930_11_24.

Candela, Gustavo, María Dolores Sáez, MPilar Escobar Esteban, and Manuel Marco-Such. "Reusing Digital Collections from GLAM Institutions." *Journal of Information Science* 48, no. 2 (April 2022): 251–267. <https://doi.org/10.1177/0165551520950246>.

Caroline Renold, Alessandro Chechi, Anne Laure Bandle, Marc-André Renold. "Case 6 Klimt Paintings – Maria Altmann and Austria." Platform ArThemis. Art-Law Centre, University of Geneva. Accessed October 4, 2024. <https://plone.unige.ch/art-adr/cases-affaires/6-klimt-paintings-2013-maria-altmann-and-austria>.

Caruso, Alexandra. "Raub in geordneten Verhältnissen." In *NS-Kunstraub in Österreich und die Folgen*, edited by Gabriele Anderl and Alexandra Caruso, 90–109. Innsbruck: Studien Verlag, 2005.

Claudia Andratschke. "Netzwerke erweitern. Von NS-Raubgutforschung zur Provenienzforschung in ethnologischen Sammlungen der Kolonialzeit." In *Provenienzforschung zu ethnografischen Sammlungen der Kolonialzeit. Positionen in der aktuellen Debatte*, by Larissa Förster, Iris Edenheiser, Sarah Fründt, and Heike Hartmann, 295–310. Humboldt-Universität zu Berlin, 2018. <https://edoc.hu-berlin.de/handle/18452/19769>.

Clemens Jabloner. "The legacy of Nazi-expropriation in Austria: The impact of the Historical Commission on research and restitution." In *Forschungen zum Nationalsozialismus und dessen Nachwirkungen in Österreich: Festschrift für Brigitte Bailer*, edited by Wolfgang Neugebauer and Christine Schindler, 257–

268. Clemens Jabloner. Wien: Dokumentationsarchiv des Österr. Widerstandes, 2012.
- "Commission for Provenance Research." Accessed July 7, 2024. <https://provenienzforschung.gv.at/en/commission-for-provenance-research/>.
- Commission For Provenance Research. "Lexicon of Austrian Provenance Research." Accessed October 8, 2024. <https://www.lexikon-provenienzforschung.org/en>.
- Commission for Provenance Research. "Restitution Reports." Accessed October 10, 2024. <https://provenienzforschung.gv.at/en/empfehlungen-des-beirats/restitutionsbericht/>.
- Commission for Provenance Research and Archive of the Kunsthistorisches Museum Wien. "Zentral Depot Karteien Online." Accessed October 8, 2024. <https://www.zdk-online.org/>.
- "Commission Publication Series." Accessed October 10, 2024. <https://provenienzforschung.gv.at/en/commission-for-provenance-research/commission-publication-series/>.
- Cooperation Open Government Data Austria. "Open Government Data." Accessed October 11, 2024. <https://www.data.gv.at/en/>.
- Czernin, Hubertus. *Die Fälschung: der Fall Bloch-Bauer*. Wien: Czernin, 1999.
- De Boer, Victor, Johan Oomena, Oana Inel, Lora Aroyo, Elco Van Staverenc, Werner Helmich, and Dennis De Beurs. "DIVE into the Event-Based Browsing of Linked Historical Media." *SSRN Electronic Journal*, 2015. <https://doi.org/10.2139/ssrn.3198924>.
- Decker, Andrew. "A Legacy of Shame." *ARTnews* 83 (1984): 55–76.
- Department for Restitution Affairs of the Jewish Community Vienna. "Research Guide." Accessed August 10, 2024. https://www.restitution.or.at/rechercheleitfaden_e.html.
- Deutscher Museumsbund, ICOM Deutschland, and Konferenz der Museumsberatungsstellen in den Ländern, eds. *Standards für Museen: Leitfaden*. Berlin: Deutscher Museumsbund, 2023.
- Deutsches Historisches Museum. "Datenbank 'Sammlung des Sonderauftrages Linz.'" Accessed October 11, 2024. <https://www.dhm.de/datenbank/linzdb/indexe.html>.

Deutsches Historisches Museum. "Datenbank zum 'Central Collecting Point München.'" Accessed October 11, 2024. https://www.dhm.de/datenbank/ccp/dhm_ccp.php?lang=de.

Deutsches Zentrum Kulturgutverluste. *Fotografien*. Dresden: Sandstein Verlag, 2023.

Deutsches Zentrum Kulturgutverluste. "Lost Art-Datenbank." Accessed October 11, 2024. <https://www.lostart.de/de/start>.

Deutsches Zentrum Kulturgutverluste. "Periodikum „Provenienz & Forschung“." Accessed January 25, 2025. <https://kulturgutverluste.de/mediathek/publikationen/periodikum-provenienz-forschung>.

Deutsches Zentrum Kulturgutverluste. "Reihe „Working Paper Deutsches Zentrum Kulturgutverluste“." Accessed January 25, 2025. <https://kulturgutverluste.de/mediathek/publikationen/working-paper>.

Deutsches Zentrum Kulturgutverluste. "Schriftenreihe „Provenire“." Accessed January 25, 2025. <https://kulturgutverluste.de/mediathek/publikationen/schriftenreihe-provenire>.

Dewey, Anne, and Charlotte Woodhead. "The Austrian Art Restitution Advisory Panel in an International Context." In *Restituiert: 25 Jahre Kunstrückgabegesetz in Österreich*, edited by Birgit Kirchmayr and Pia Schölnberger. Schriftenreihe Der Kommission Für Provenienzforschung 9. Czernin Verlags GmbH, 2023.

"Die Eherne Mark, Ferdinand Krauss." Accessed June 10, 2024. <https://www.kunstdatenbank.at/detailansicht-objekt/930>.

Dijkshoorn, Chris, Lizzy Jongma, Lora Aroyo, Jacco Van Ossenbruggen, Guus Schreiber, Wesley Ter Weele, and Jan Wielemaker. "The Rijksmuseum Collection as Linked Data." Edited by Harith Alani. *Semantic Web* 9, no. 2 (January 24, 2018): 221–230. <https://doi.org/10.3233/SW-170257>.

Doerr, Martin, Chryssoula Bekiari, George Bruseker, Christian-Emil Ore, Stephen Stead, and Athanasios Velios, eds. *Definition of the CIDOC Conceptual Reference Model v7.1.1 (Version v7.1.1)*. The CIDOC Conceptual Reference Model Special Interest Group, 2021. http://www.cidoc-crm.org/sites/default/files/CIDOC%20CRM_v.7.1%20%5B8%20March%202021%5D.pdf.

Edelstein, Dan, Paula Findlen, Giovanna Ceserani, Caroline Winterer, and Nicole Coleman. "Historical Research in a Digital Age: Reflections from the Mapping the Republic of Letters Project." *The American Historical Review* 122, no. 2 (April 1, 2017): 400–424. <https://doi.org/10.1093/ahr/122.2.400>.

- Effinger, Maria, and Theresa Sepp. "Handexemplare des Auktionshauses Hugo Helbing als (digitale) Quelle für die Forschung." In *Wenn Bilder sprechen. Provenienzforschung zu Max Liebermann und seinem Netzwerk*, 102–114, 2022. <https://doi.org/10.11588/ARTHISTORICUM.1118.C15361>.
- European Commission. "Commission Recommendation (EU) 2021/1970 of 10 November 2021 on a Common European Data Space for Cultural Heritage," November 10, 2021. <http://data.europa.eu/eli/reco/2021/1970/oj>.
- Exner, Gudrun, and Peter Schimany. "Die Volkszählung von 1939 in Österreich und die Erfassung der österreichischen Juden." In *Bevölkerungsforschung und Politik in Deutschland im 20. Jahrhundert*, edited by Rainer Mackensen, 137–160. Wiesbaden: VS Verlag für Sozialwissenschaften, 2006. https://doi.org/10.1007/978-3-531-90427-6_8.
- Fletcher, Pamela, and Anne Helmreich. "Digital Methods and the Study of the Art Market." In *The Routledge Companion to Digital Humanities and Art History*, edited by Kathryn Brown, 1st ed., 167–177. Routledge Art History and Visual Studies Companions. New York: Routledge, 2020. <https://doi.org/10.4324/9780429505188-15>.
- Foulkes, Lucia. "The Art of Atonement: How Mandated Transparency Can Help Return Masterpieces Lost During World War II." *Boston College International and Comparative Law Review* 38, no. 2 (May 18, 2015): 305.
- Franz, Michael. "Wider das Vergessen: Deutsch-österreichische Zusammenarbeit über www.lostart.de." In *NS-Kunstraub in Österreich und die Folgen*, edited by Gabriele Anderl and Alexandra Caruso, 291–296. Innsbruck: Studien Verlag, 2005.
- Friemuth, Cay, Robert Lonsdale Charles, and Kurt Seeleke. *Die geraubte Kunst: der dramatische Wettlauf um die Rettung der Kulturschätze nach dem Zweiten Weltkrieg: Entführung, Bergung, und Restitution europäischen Kulturgutes 1939-1948: mit dem Tagebuch des britischen Kunstschutzoffiziers Robert Lonsdale Charles*. Braunschweig: Westermann, 1989.
- Fuhrmeister, Christian, and Meike Hopp. "Rethinking Provenance Research." *Getty Research Journal* 11 (January 2019): 213–231. <https://doi.org/10.1086/702755>.
- Gaudenzi, Bianca, and Lisa Niemeyer. "Between Material Culture and 'Living Room Art': Historicizing the Restitution of Fascist-Looted Art." *International Journal of Cultural Property* 28, no. 3 (August 2021): 333–341. <https://doi.org/10.1017/S0940739122000029>.

- Gaudenzi, Bianca, and Astrid Swenson. "Looted Art and Restitution in the Twentieth Century – Towards a Global Perspective." *Journal of Contemporary History* 52, no. 3 (July 2017): 491–518. <https://doi.org/10.1177/0022009417692409>.
- Gilardi, Fabrizio, Meysam Alizadeh, and Maël Kubli. "ChatGPT Outperforms Crowd Workers for Text-Annotation Tasks." *Proceedings of the National Academy of Sciences* 120, no. 30 (July 25, 2023): e2305016120. <https://doi.org/10.1073/pnas.2305016120>.
- Graham, Shawn, Donna Yates, and Ahmed El-Roby. "Investigating Antiquities Trafficking with Generative Pre-Trained Transformer (GPT)-3 Enabled Knowledge Graphs: A Case Study." *Open Research Europe* 3 (June 20, 2023): 100. <https://doi.org/10.12688/openreseurope.16003.1>.
- Grana-Behrens, Daniel. "Digitalbasierte ethnologische Provenienzforschung: Chancen und Herausforderungen am Beispiel WissKI der Bonner Amerikas-Sammlung (BASA-Museum)." In *Digitalisierung ethnologischer Sammlungen*, edited by Hans Peter Hahn, Oliver Lueb, Katja Müller, and Karoline Noack, 215–238. Transcript Verlag, 2021. <https://doi.org/10.1515/9783839457900-013>.
- Hagedorn-Saupe, Monika and Deutscher Museumsbund, eds. *Leitfaden für die Dokumentation von Museumsobjekten: von der Eingangsdokumentation bis zur wissenschaftlichen Erschließung*. Berlin: Dt. Museumsbund, 2011. https://www.smb.museum/fileadmin/website/Institute/Institut_fuer_Museumsforschung/Publikationen/Materialien/LeitfadenDokumentation.pdf.
- Hanna Brinkmann and Eva Mayr. "Strategie Kulturerbe digital Digitaler Aktionsplan Austria. Ergebnisse der Online-Konsultation." Universität für Weiterbildung Krems. Accessed January 25, 2025. <https://www.bmkoes.gv.at/dam/jcr:807eebed-f571-4a0c-b10d-72ca6cef3331/strategie%20kulturerbe%20digital%20umfrage%20ergebnisse.pdf>.
- Hannah M. Lessing and Maria Luise Lanzrath. "Rückgabe und Verwertung. Aspekte der Kunstrestitution in der Arbeit des Nationalfonds der Republik Österreich für Opfer des Nationalsozialismus." In *Restituert: 25 Jahre Kunstrückgabegesetz in Österreich*, edited by Birgit Kirchmayr and Pia Schölnberger, 104–119. Schriftenreihe der Kommission für Provenienzforschung 9. Wien: Czernin Verlag, 2023.
- Haslinger, Kurt. "Mauerbach und der lange Weg bis zur Auktion: 1969-1996." In *Kunstraub, Kunstbergung und Restitution in Österreich 1938 bis heute*, edited by Theodor Brückler, 39–52. Wien: Böhlau Verlag, 1999. <https://doi.org/10.7767/boehlau.9783205125778.39>.

- Haupt, Herbert. *Jahre der Gefährdung: das Kunsthistorische Museum 1938-1945*. Wien: Das Museum, 1995.
- Haupt, Herbert, and Wilfried Seipel. *Das Kunsthistorische Museum: die Geschichte des Hauses am Ring: hundert Jahre im Spiegel historischer Ereignisse*. Wien: C. Brandstätter, 1991.
- Holocaust Era Assets Conference. "Terezin Declaration," June 30, 2009. https://holocausteraassets.eu/files/200000215-35d8ef1a36/TEREZIN_DECLARATION_FINAL.pdf.
- Holzbauer, Robert. "NS-Kunstraub in Österreich. Von 1938 bis heute. Ein Überblick." In *Art goes law: Dialoge zum Wechselspiel zwischen Kunst und Recht*, edited by Dietmar Pauer, 233–252. Studien zu Politik und Verwaltung 83. Wien Köln: Böhlau, 2005.
- Hopp, Meike. "Der Kunsthändler Adolf Weinmüller (München/Wien) und seine Rolle bei der „einheitlichen Neuordnung des Deutschen Kunsthandels“." In *Kunst sammeln, Kunst handeln*, edited by Eva Blimlinger and Monika Mayer, 65–78. Wien: Böhlau Verlag, 2012. <https://doi.org/10.7767/boehlau.9783205791997.65>.
- Hopp, Meike. "Provenienzforschung und digitale Forschungsinfrastrukturen in Deutschland: Tendenzen, Desiderate, Bedürfnisse." In (k)ein Ende in Sicht, edited by Eva Blimlinger and Heinz Schödl, 37–62. Wien: Böhlau Verlag, 2018. <https://doi.org/10.7767/9783205201274.37>.
- Hyvönen, Eero. *Publishing and Using Cultural Heritage Linked Data on the Semantic Web*. Synthesis Lectures on Data, Semantics, and Knowledge. Cham: Springer International Publishing, 2012. <https://doi.org/10.1007/978-3-031-79438-4>.
- Ingo Zechner. "Wie Entscheidungen fallen. Kunstrestitution in der Praxis." In *Enteignete Kunst*, edited by Verena Pawlowsky and Harald Wendelin, 209–220. Raub und Rückgabe-Österreich von 1938 bis heute, Bd. 3. Wien: Mandelbaum, 2006.
- Internationaler Museumsrat, ed. *ICOM Code of Ethics for Museums*. Paris: ICOM, 2017.
- Jablonek, Clemens, and Pia Schönlberger. "Wider das Vergessen. Die Kunstrückgabe in Österreich 1998 bis 2003." In *Restituiert: 25 Jahre Kunstrückgabegesetz in Österreich*, edited by Birgit Kirchmayr and Pia Schönlberger, 25–40. Schriftenreihe der Kommission für Provenienzforschung 9. Wien: Czernin Verlag, 2023.
- Jannidis, Fotis, Hubertus Kohle, and Malte Rehbein, eds. *Digital Humanities*. Stuttgart: J.B. Metzler, 2017. <https://doi.org/10.1007/978-3-476-05446-3>.

- Judith H. Dobrzynski. "THE ZEALOUS COLLECTOR. A Special Report. A Singular Passion For Amassing Art, One Way or Another." *The New York Times*, December 24, 1997.
- "Karl von Herz-Hertenried; Sein Fotostudio in Rom (Via Margutta 83)," 1909. ÖNB Bildarchiv und Grafiksammlung. https://data.onb.ac.at/rep/BAG_18257904.
- Knap, Tomáš. "Increasing Quality of Austrian Open Data by Linking Them to Linked Data Sources: Lessons Learned." In *The Semantic Web*, edited by Harald Sack, Giuseppe Rizzo, Nadine Steinmetz, Dunja Mladenić, Sören Auer, and Christoph Lange, 9989:243–254. Lecture Notes in Computer Science. Cham: Springer International Publishing, 2016. https://doi.org/10.1007/978-3-319-47602-5_42.
- Kommission für Provenienzforschung. "Restitutionsbericht „Robert Kauder“,“ March 12, 2024. https://provenienzforschung.gv.at/beiratsbeschluesse/Kauder_Robert_2024-03-12.pdf.
- Konstantin Ferihumer. "Die Gegenwart der Vergangenheit. NS-Provenienzforschung und ihre gesellschaftliche Bedeutung als Teil österreichischer Vergangenheitspolitik." In *Restituiert: 25 Jahre Kunstrückgabegesetz in Österreich*, edited by Birgit Kirchmayr and Pia Schölnberger, 59–75. Schriftenreihe der Kommission für Provenienzforschung 9. Wien: Czernin Verlag, 2023.
- Lang, Sabine. "»...nicht die Ausnahme, sondern der Normalfall!« Die digitale Lücke in der Kunstgeschichte und Provenienzforschung." *Zeitschrift für digitale Geisteswissenschaften* 8 (2023). https://doi.org/10.17175/2023_002.
- Lang, Sabine. "Wie hat sich Provenienzforschung durch Digitalität verändert?" *Retour* (blog), August 7, 2023. <https://retour.hypotheses.org/2916>.
- László, S. P. *Selbstportrait: (Halbe figur mit Hut, halb rechts)*. Ölgemälde, signiert und datiert Berlin 1907. 1907. ÖNB Bildarchiv und Grafiksammlung. <http://data.onb.ac.at/rec/baa14209790>.
- Laurel Zuckerman. "Linked Data and Holocaust Era Art Markets: Gaps and Dysfunctions in the Knowledge Supply Chain." In *Proceedings of the International Conference Collect and Connect: Archives and Collections in a Digital Age*, edited by Andreas Weber, Maarten Heerlien, Eulalia Gasso Miracle, and Katy Wolstencroft, 2810:13–24. Leiden, the Netherlands, November 23–24, 2020, 2021. <https://ceur-ws.org/Vol-2810/paper2.pdf>.
- Laurie A. Stein. "The Path of Art from Switzerland To America from the Late 1930's to the Early 1950's: A Report of Research Result," 2002. <https://www.scribd.com/doc/51566381/Stein-Pyritz-Swiss-Government-Report>.

- Lessing, Hannah, and Fiorentina Azizi. "Austria Confronts Her Past." In *Holocaust Restitution*, edited by Michael J. Bazyler and Roger P. Alford, 226–236. New York: University Press, 2020. <https://doi.org/10.18574/nyu/9781479845620.003.0025>.
- Lichtblau, Albert. "Integration, Vernichtungsversuch und Neubeginn – Österreichisch-Jüdische Geschichte 1848 bis zur Gegenwart," 2013.
- Lillie, Sophie. *Was einmal war: Handbuch der enteigneten Kunstsammlungen Wiens*. Die Bibliothek des Raubes 8. Wien: Czernin Verlag, 2003.
- Linked.Art. "Linked Art Subset of CIDOC-CRM." Accessed September 8, 2024. <https://linked.art/model/profile/>.
- Lisa Frank. "'Wenn es uns nicht zusteht, werden wir es den rechtmäßigen Eigentümern zurückgeben'. Private Initiativen zur Restitution." In *Restituert: 25 Jahre Kunstrückgabegesetz in Österreich*, edited by Birgit Kirchmayr and Pia Schölnberger, 76–88. Schriftenreihe der Kommission für Provenienzforschung 9. Wien: Czernin Verlag, 2023.
- Löffler, Emily. "'Living Room Art' and the Material Culture of Provenance: Retracing Bourgeois Everyday Life and Art Collecting Practices through Restitution Files." *International Journal of Cultural Property* 28, no. 3 (August 2021): 369–388. <https://doi.org/10.1017/S0940739121000321>.
- Loitfellner, Sabine. "NS-Kunstraub und Restitution in Österreich. Institutionen – Akteure – Nutznießer." In *Enteignete Kunst*, edited by Verena Pawlowsky and Harald Wendelin, 13–25. Raub und Rückgabe-Österreich von 1938 bis heute. Wien: Mandelbaum, 2006.
- Loitfellner, Sabine, and Monika Wulz. "Dorotheum und Vugesta als Institutionen der NS-Kunstenteignung." In *>Kunst >Kommunikation >Macht: Sechster Österreichischer Zeitgeschichtetag 2003*, edited by Ingrid Bauer and Peter Gutschner, 209–13. Innsbruck Wien München Bozen: Studien Verlag, 2004.
- Luther, Anne. "Digital Provenance, Open Access, and Data-Driven Art History." In *The Routledge Companion to Digital Humanities and Art History*, edited by Kathryn Brown, 448–58. Routledge Art History and Visual Studies Companions. New York: Routledge, 2020.
- Manovich, Lev. "Data Science and Digital Art History." *International Journal for Digital Art History* No 1 (2015). <https://doi.org/10.11588/DAH.2015.1.21631>.
- Marc Masurovsky. "The Current State of Nazi-Era Provenance Research, and Access to Nazi-Era Research Resources and Archives." In *Provenance Research Today: Principles, Practice, Problems*, edited by Arthur Tompkins, 136–149. London: Lund Humphries in association with IFAR, 2020.

Margarethe Poch-Kalous. "Die Mäzene der Gemäldegalerie der Akademie der bildenden Künste in Wien." *Wiener Geschichtsblätter*, 1967.

Mariani, Fabio. "Introducing VISU: Vagueness, Incompleteness, Subjectivity, and Uncertainty in Art Provenance Data." In *Proceedings of the Workshop on Computational Methods in the Humanities 2022, Lausanne, Switzerland, June 9-10, 2022*, 63–84, 2022. <https://ceur-ws.org/Vol-3602/paper5.pdf>.

Marja Nikolcic. "Web Scraper for the Art Database." Github. Accessed June 10, 2024. <https://github.com/Nik-Mar/KunstDB>.

Mayer, Monika. "Restitutions after 1945 and the 1998 Art Restitution Act." In *Das Belvedere: 300 Jahre Ort Der Kunst*, edited by Stella Rollig and Christian Huemer, 331–335. Boston: De Gruyter, 2023.

Neues Wiener Journal. "Große Wiener Auktionen." November 19, 1930.

Neues Wiener Tagblatt. "Der Tod eines Wiener Kunstsammlers." July 20, 1930.

Nich Pearce and Jane Milosch. "Introduction." In *Collecting and Provenance: A Multidisciplinary Approach*, edited by Jane Milosch and Nick Pearce, 15–20. Lanham: Rowman & Littlefield, 2019.

Nuno, Freire, and Isaac Antoine. "Wikidata's Linked Data for Cultural Heritage Digital Resources: An Evaluation Based on the Europeana Data Model." In *Proceedings of the International Conference on Dublin Core and Metadata Applications*. Dublin Core Metadata Initiative, 2020. <https://doi.org/10.23106/DCMI.952141718>.

O'Donnell, T. "The Restitution of Holocaust Looted Art and Transitional Justice: The Perfect Storm or the Raft of the Medusa?" *European Journal of International Law* 22, no. 1 (February 1, 2011): 49–80. <https://doi.org/10.1093/ejil/chr004>.

Oliver Rathkolb. "From 'Legacy of Shame' to the Auction of 'Heirless' Art in Vienna: Coming to Terms 'Austrian Style' with Nazi Artistic War Booty." Washington DC, 1997. https://www.demokratiezentrum.org/wp-content/uploads/2022/10/rathkolb_artloot.pdf.

"Open Art Data. Linking Databases To Detect Looted Art." Accessed November 17, 2024. <https://www.openartdata.org/>.

"PAESE. Provenienzforschung Zu Außereuropäischen Sammlungen Und Der Ethnologie in Niedersachsen." Accessed November 11, 2024. <https://www.postcolonial-provenance-research.com/en/>.

Page, Kevin R, Emmanuelle Delmas-Glass, David Beaudet, Samantha Norling, Lynn Rother, and Thomas Hänsl. "Linked Art: Networking Digital Collections and

- Scholarship." In *Digital Humanities 2020 Book of Abstracts*, 504–509. Alliance of Digital Humanities Organizations (ADHO), 2020. https://dh2020.adho.org/wp-content/uploads/2020/07/139_LinkedArtNetworkingDigitalCollectionsandScholarship.html.
- Pammer, Michael. *Jüdische Vermögen in Wien 1938*. Edited by Clemens Jabloner. Veröffentlichungen der Österreichischen Historikerkommission, Bd. 8. Wien München: Oldenbourg, 2003.
- Rother, Lynn, Fabio Mariani, and Max Koss. "Hidden Value: Provenance as a Source for Economic and Social History." *Jahrbuch Für Wirtschaftsgeschichte / Economic History Yearbook* 64, no. 1 (May 25, 2023): 111–142. <https://doi.org/10.1515/jbwg-2023-0005>.
- Rother, Lynn, Fabio Mariani, and Max Koss. "Interpreting Strings, Weaving Threads: Structuring Provenance Data with AI." Edited by Katharina Günther and Stefan Alschner. *Sammlungsforschung Im Digitalen Zeitalter: Chancen, Herausforderungen Und Grenzen*, Kulturen des Sammelns, 2024, 93–103. <https://doi.org/10.15499/KDS-005-008>.
- Rother, Lynn, Fabio Mariani, and Max Koss. "Teaching Provenance to AI: An Annotation Scheme for Museum Data." In *AI in Museums*, edited by Sonja Thiel and Johannes C. Bernhardt, 163–172. Transcript Verlag, 2023. <https://doi.org/10.1515/9783839467107-014>.
- Rother, Lynn, Fabio Mariani, and Max Koss. "Taking Care of History: Toward a Politics of Provenance Linked Open Data in Museums." Edited by Erin Canning and Emily Fry. *Perspectives on Data*, December 19, 2022. <https://doi.org/10.53269/9780865593152>.
- Sabine Loitfellner. "Restitution und Rechtnachfolge. Transgenerationelle Rückübertragung von Eigentum." In *Restituert: 25 Jahre Kunstrückgabegesetz in Österreich*, edited by Birgit Kirchmayr and Pia Schölnberger, 120–135. Schriftenreihe der Kommission für Provenienzforschung 9. Wien: Czernin Verlag, 2023.
- Safrian, Hans. "Expediting Expropriation and Expulsion: The Impact of the 'Vienna Model' on Anti-Jewish Policies in Nazi Germany, 1938." *Holocaust and Genocide Studies* 14, no. 3 (2000): 390–414. <https://doi.org/10.1093/hgs/14.3.390>.
- Sailer, Gerhard. "Rückbringung und Rückgabe: 1945-1966." In *Kunstraub, Kunstbergung und Restitution in Österreich 1938 bis heute*, edited by Theodor Brückler, 31–38. Wien: Böhlau Verlag, 1999. <https://doi.org/10.7767/boehlau.9783205125778.31>.
- Schallmeiner, Anneliese. "»Die modernen Nibelungen salzen ihre Schätze ein«. Altaussee als Bergungsort des Instituts für Denkmalpflege." In *Bergung von*

- Kulturgut im Nationalsozialismus: Mythen - Hintergründe - Auswirkungen*, edited by Pia Schölnberger and Sabine Loitfellner, 103–127. Wien: Böhlau Verlag, 2015. <https://doi.org/10.7767/9783205201564>.
- Schich, Maximilian, Christian Huemer, Piotr Adamczyk, Lev Manovich, and Yang-Yu Liu. "Network Dimensions in the Getty Provenance Index," 2017. <https://doi.org/10.48550/ARXIV.1706.02804>.
- Schlussbericht der Historikerkommisison der Republik Österreich Vermögensentzug während der NS-Zeit sowie Rückstellungen und Entschädigungen seit 1945 in Österreich*. 1. Auflage. Göttingen: Böhlau Verlag Wien, 2003.
- Schwarz, Birgit. *Hitlers Museum: Die Fotoalben Gemäldegalerie Linz. Dokumente zum "Führermuseum."* Wien: Böhlau Verlag, 2004. <https://doi.org/10.7767/9783205113522>.
- Schwarz, Birgit. *Hitlers Sonderauftrag Ostmark: Kunstraub und Museumspolitik im Nationalsozialismus*. Schriftenreihe der Kommission für Provenienzforschung, Band 7. Wien: Böhlau Verlag, 2018. <https://vr-elibrary.de/doi/10.7767/9783205206965>.
- Seidinger, Michael R., Claire Fritsch, and Hannah M. Lessing. "Die Tätigkeit des Nationalfonds der Republik Österreich für Opfer des Nationalsozialismus im Rahmen der Kunstrückgabe - Die Kunst-Datenbank des Nationalfonds." In ... *wesentlich mehr Fälle als angenommen*, edited by Gabriele Anderl, Christoph Bazil, Eva Blimlinger, Oliver Kühschelm, Monika Mayer, Anita Stelzl-Gallian, and Leonhard Weidinger, 246–252. Wien: Böhlau Verlag, 2009. <https://doi.org/10.7767/boehlau.9783205118862.246>.
- "Selbstportrait. Halbe Figur Mit Hut, Halb Rechts." Accessed June 10, 2024. <https://www.kunstdatenbank.at/detailansicht-objekt/4160>.
- Sepp, Theresa. "Bedingt gute Rahmenbedingungen. Zur digitalen Provenienzforschung." *Kunstchronik. Monatsschrift für Kunstwissenschaft* Jg. 76 Nr. 7 (January 9, 2024): 363–370. <https://doi.org/10.11588/KC.2023.7.102131>.
- Shoilee, Sarah Binta Alam. "Knowledge Discovery for Provenance Research on Colonial Heritage Objects." Edited by Olaf Hartig and Oshani Seneviratne. *Doctoral Consortium at International Semantic Web Conference 2022, ISWC-DC 2022, CEUR Workshop Proceedings*, 2022. <http://www.scopus.com/inward/record.url?scp=85134496458&partnerID=8YFLogxK>.
- Snyder, Travis, David Newbury, and Tracey Berg-Fulton. "Art Tracks: Visualizing the Stories and Lifespan of an Artwork," 2015.

<https://mw2015.museumsandtheweb.com/paper/art-tracks-visualizing-the-stories-and-lifespan-of-an-artwork/index.html>.

Staatliche Museen zu Berlin. "Provenance and Collections Publishing the Acquisition and Accession Logs of the Staatliche Museen Zu Berlin Online." Accessed August 10, 2024. <https://www.smb.museum/en/research/research-projects/provenance-and-collections/>.

Statistisches Jahrbuch der Stadt Wien. 1930 - 1935. Vol. 3. Magistrat der Stadt Wien, MA 23 - Wirtschaft, Arbeit und Statistik, 1935.

Stevenson, Angus, and Christine A. Lindberg, eds. "Provenance." In *New Oxford American Dictionary*. Oxford University Press, 2010. https://www.oxfordreference.com/view/10.1093/acref/9780195392883.001.0001/m_en_us1281369.

Straughn-Navarro, Rachel. "Provenance in Situ. Documenting Information of Origins Across GLAM Contexts." *International Information & Library Review* 48, no. 4 (October 2016): 287–293. <https://doi.org/10.1080/10572317.2016.1243964>.

Tadge, Jennifer. "Digitale Fallstricke in der Provenienzforschung: Erfahrungen aus der Projektarbeit im Landesmuseum Natur und Mensch Oldenburg." In *Digitalisierung ethnologischer Sammlungen*, edited by Hans Peter Hahn, Oliver Lueb, Katja Müller, and Karoline Noack, 153–164. Transcript Verlag, 2021. <https://doi.org/10.1515/9783839457900-009>.

The De Laszlo Archive Trust. "László Jr, Zsigmond, 1896." Accessed November 10, 2024. <https://www.delaszlocatalogueraisonne.com/catalogue/the-catalogue/laszlo-jr-zsigmond-110970>.

The Getty Research Institute. "Search the Getty Provenance Index." Accessed June 10, 2024. <https://www.getty.edu/research/tools/provenance/search.html>.

Thomas Trenkler. "Lex Leopold ist möglich." *Der Standard*, November 26, 2008. <https://www.derstandard.at/story/1227287154341/lex-leopold-ist-moeglich>.

Unabhängige Expertenkommission Schweiz--Zweiter Weltkrieg, ed. *Switzerland, National Socialism, and the Second World War: Final Report*. Zürich: Pendo, 2002.

United States Department of State. "Washington Conference Principles on Nazi-Confiscated Art," December 3, 1998. <https://www.state.gov/washington-conference-principles-on-nazi-confiscated-art/>.

Vancisin, Tomas, Loraine Clarke, Mary Orr, and Uta Hinrichs. "Provenance Visualization: Tracing People, Processes, and Practices through a Data-Driven Approach to

- Provenance." *Digital Scholarship in the Humanities* 38, no. 3 (August 31, 2023): 1322–1339. <https://doi.org/10.1093/llc/fqad020>.
- Vega-Gorgojo, Guillermo. "LOD4Culture: Easy Exploration of Cultural Heritage Linked Open Data." Edited by Bo Fu, Patrick Lambrix, and Catia Pesquita. *Semantic Web*, June 15, 2023, 1–30. <https://doi.org/10.3233/SW-233358>.
- Vrandečić, Denny, and Markus Krötzsch. "Wikidata: A Free Collaborative Knowledgebase." *Communications of the ACM* 57, no. 10 (September 23, 2014): 78–85. <https://doi.org/10.1145/2629489>.
- Werner, Sabrina. "Proveana – Eine Datenbank für die Provenienzforschung am Deutschen Zentrum Kulturgutverluste." *Bibliotheksdienst* 57, no. 1 (January 27, 2023): 19–27. <https://doi.org/10.1515/bd-2023-0006>.
- Wien 1, Stadiongasse 4. 1915. Photograph. ÖNB Bildarchiv und Grafiksammlung. https://data.onb.ac.at/rep/BAG_18257883.
- Wien 1, Stadiongasse 4. 1915. Photograph. ÖNB Bildarchiv und Grafiksammlung. <http://data.onb.ac.at/rec/baa18257897>.
- Wien 1, Stadiongasse 4. 1920. Photograph. ÖNB Bildarchiv und Grafiksammlung. https://data.onb.ac.at/rep/BAG_18257876.
- Wien 1, Stadiongasse Nr. 4. 1920. Photograph. ÖNB Bildarchiv und Grafiksammlung. https://data.onb.ac.at/rep/BAG_18257855.
- Wiki Wien Geschichte. "Bildarchiv Der Österreichischen Nationalbibliothek," 2023. https://www.geschichtewiki.wien.gv.at/index.php?title=Bildarchiv_der_%C3%96sterreichischen_Nationalbibliothek&oldid=914072.
- Wladika, Michael. "Zehn Jahre Provenienzforschung, Erbensuche und Restitution in den Museen der Stadt Wien - Eine vorläufige Bilanz." In *wesentlich mehr Fälle als angenommen*, edited by Gabriele Anderl, Christoph Bazil, Eva Blimlinger, Oliver Kühschelm, Monika Mayer, Anita Stelzl-Gallian, and Leonhard Weidinger, 263–280. Wien: Böhlau Verlag, 2009. <https://doi.org/10.7767/boehlau.9783205118862.263>.
- Yeide, Nancy H., Amy Walsh, and Konstantin Akinsha. *The AAM Guide to Provenance Research*. Washington, DC: American Association of Museums, 2001.
- Zechner, Ingo. "Zweifelhaftes Eigentum. Fußnoten zur Kunstrestitution in Österreich." In *NS-Kunstraub in Österreich und die Folgen*, edited by Gabriele Anderl and Alexandra Caruso, 235–246. Innsbruck: Studien Verlag, 2005.

Zuckerman, Laurel. "Tracking Looted Art with Graphs: A Case Study," 2021.
https://graphentechnologien.hypotheses.org/files/2022/01/Tracking_Looted_Art_with_Graphs_A_Case_etc-Zuckerman.pdf.

List of Figures

Figure 1: An example of an object page that displays metadata and provenance information.	66
Figure 2: Object entry for Liegender Putto in the online collection of the Belvedere Gallery, Vienna.	67
Figure 3: Screenshot of the same object from the Art Database, showing differences in metadata.	68
Figure 4: Side-by-side comparison of object entries for a portrait of a woman by Eugenie Breithut-Munk.	69
Figure 5: Side-by-side comparison of object entries for the portrait of Barbara Meyer by Johann Baptist Reiter.	70
Figure 6: Distribution of objects in the Art Database by GLAM institutions.	82
Figure 7: Distribution of objects in the Art Database by their medium.	83
Figure 8: Most common artists in the Art Database.	84
Figure 9: Distribution of Art Database objects by provenance.	85
Figure 10: Gephi visualization of the social network.	87
Figure 11: Gephi visualization of social network clusters, showing subgroups.	88
Figure 12: Gephi visualisation of clusters 1 and 4.	89
Figure 13 and 14: Kupecky's portrait is visible in the upper left corner of Hertenried's room.	92
Figure 15 and 16: Zsigmond László Jr.'s 1907 self-portrait is visible in the upper right corner of a photograph.	93
Figure 17 and 18: Portrait of Zsigmond László Jr. and its placement in Herz von Hertenried's apartment in 1920.	94