

Article

Trace the Untraceable: Online Image Search Tools for Researching Late Antique Art

Prolet Decheva 

School of Art History and Cultural Policy, University College Dublin, D04 V1W8 Dublin, Ireland;
prolet.decheva@ucdconnect.ie

Abstract: In the context of digital humanities and access to cultural heritage online, this paper explores the discoverability of Late Antique material in some searchable museum collections and in some major archaeological and art historical image and object databases. It follows an exploratory approach by using simple keyword searches, such as ‘late antique’ or ‘byzantine’, and comparing the results with chronological searches when a date or period filter is available. Although Late Antique material often comprises a smaller number of objects compared to more popular periods like the Roman and the Renaissance, these are difficult to research due to inconsistent labelling practices and the frequent lack of a customizable date range filter. The ongoing debates on proper periodization and nomenclature also need to be taken into consideration.

Keywords: late antique art; byzantine art; online museum collections; image libraries



Citation: Decheva, P. Trace the Untraceable: Online Image Search Tools for Researching Late Antique Art. *Heritage* **2021**, *4*, 4076–4104.
<https://doi.org/10.3390/heritage4040225>

Academic Editors:
Alessandro Sebastiani and
Robin Skeates

Received: 29 August 2021
Accepted: 28 October 2021
Published: 31 October 2021

Publisher’s Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the author. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

The closure of libraries, archives and museums, or the highly restricted access to these, as well as the virtual impossibility to travel during the Covid pandemic of 2020–2021, has demonstrated the immense value of online resources for accessing various kinds of material. For students and scholars in the fields of archaeology and art history these would be, for example, fieldwork documentation, primary and secondary literature, archival material or, as is the topic of this paper, online museum catalogues and image and object databases. Even if an increasing number of major institutions make a wide variety of objects from all time periods and geographic regions accessible online, I would argue that material of interest in less prominent fields, such as Late Antique and Byzantine art, might still be hard to research. While, compared to artifacts from more popular periods, these often represent a smaller fraction of the institutionally published objects and images, it can be difficult to explore the former in an efficient manner due to the lack of proper filtering options and/or to inconsistent metadata practices. This paper discusses the discoverability of Late Antique and early Byzantine objects in some major online collections from the user’s perspective and demonstrates some frequently occurring challenges. The latter are often omitted from publications on specific image and object databases since these are frequently authored by people directly involved in the development of such databases, as publications on the archaeological Arachne and the art historical Prometheus indicate [1–5].

1.1. Literature Review

While publications interested in user behavior such as by Dobрева et al. [6], Ross and Terras [7], Ross et al. [8], Villaespesa [9] or Pandey and Cumar [10] concern individual collections [7–9] or countries [10] and provide quantitative data, studies such as those by Beaudoin and Brady [11] and Münster et al. [12] look to make more nuanced analyses. Both articles provide a good overview of previous studies of scholarly image search behaviour. The study by Münster et al. combines qualitative interviews with twenty art historians and fifteen students of art and architectural history with an analysis of 107 online image

repositories with different degrees of accessibility. These vary greatly in the quantity and quality of the digitized material and the overview shows that there is no standardization in the implementation of filtering options [12] (pp. 377–378). The authors conclude that despite the progress made in past years, the metadata quality is still lacking, with “vast amounts of images insufficiently tagged, indexed or linked” [12] (p. 380). Moreover, the study by Münster et al. points out an important shortcoming of existing repositories: scholars outside more popular areas of research, such as the Renaissance or 18th and 19th century art, face greater difficulties, while their needs and practices have been largely ignored and require further research [12] (p. 371, 380).

1.2. The Value of Examining the Use of Digital Image Libraries by Scholars of Less Prominent Disciplines

As the article by Münster et al. demonstrates, examining the use of online repositories by students and scholars of less popular disciplines, such as Late Antique and Byzantine art history and archaeology, could be particularly valuable. This is further emphasized by the place of these disciplines with respect to more prominent fields. While, for example, the material culture of pre-Christian Greece and Rome and the art of the Renaissance belong to the standard curriculum in archaeology and art history and are known categories among the general public, this is not the case with Late Antique and Byzantine art. Introductory art history publications in English often give it much less space than Western art (see Nelson [13]), and it is still largely absent from mainstream narratives (see Angelov [14] and Cameron [15]). Moreover, the term ‘byzantine’ has a long history of negative stereotyping [14] (p. 5), and the “Gibbonian aversion to Byzantium”, observed by Cameron [15] (p. 18), and to post-classical art is still present outside of English-speaking scholarship (see also Marsili and Orlandi [16] (p. 154)). Thus, it is not surprising that Late Antique and Byzantine artifacts are largely absent from institutional art historical and archaeological databases and not taken into consideration when developing standardized ontologies (cf. Rannharter and Teetor [17] (p. 217)). Relevant metadata is crucial in making an object or image findable in an online repository. As recently discussed by Knaus, avoiding synonyms and defining clear terminologies are key factors in ensuring that the searcher will find the largest amount of relevant results [18] (pp. 54–55).

1.3. Metadata Standards in the Field of Archaeology and Art History and Their Applicability for Less Prominent Fields of Research

More than one metadata standard relevant for art history and archaeology deserves mention; for instance, there is the CIDOC Conceptual Reference Model [19], the Visual Resources Association Core (VRA Core) or the Categories for the Description of Works of Art (CDWA) [20], while guidelines such as the Getty Vocabularies provide useful tools for creating consistent terminologies [21]. Introductory materials on metadata and formal ontologies are freely available online via projects such as the ARIADNEplus Training Hub or PARTHENOS [22,23]. However, existing thesauri cannot always be employed to describe Late Antique and Byzantine artifacts, since many of these have been developed for classical archaeology and Western art, as observed by Rannharter and Teetor [17] (p. 217). Applying them to Late Antique and Byzantine objects is in certain cases either not possible or could lead to confusion since the same term can have “a different meaning in a different cultural context” [17] (p. 217). Thus, less prominent fields of research still need to be taken into consideration to improve the available thesauri [17] (p. 218). Furthermore, it is far from standard practice to label an object in an online repository as ‘late antique’ and the term itself is an object of continuous redefinition, as discussed below. While the question of proper nomenclature is relevant to other fields as well, as the debates surrounding ‘Islamic art’ exemplify (see Lewis [24], Shalem [25] and Shaw [26]), and scholars in fields outside of the study of Late Antiquity and Byzantium might encounter similar problems, the usability of the discussed repositories for other areas of art history and archaeology would go beyond the scope of this paper. Each field has its own traditions, nomenclature and specific needs that should be addressed separately.

In general, the problems associated with the exploration and discoverability of material using online resources are well known (see, for example, recent studies by Freire et al. [27] and Fafalios et al. [28]). A number of authors propose various solutions in order to improve the metadata, such as social tagging (see Commare [29]), crowdsourcing metadata (see Earle [30], Payant et al. [31] and Salmi et al. [32]), metadata aggregation (see Freire et al. [27]) or Community Reusable Semantic Metadata (see Avgousti et al. [33]), while the concepts of Linked Data and Linked Open Data aim to improve the connecting and sharing data on the web [34,35]. For a more detailed overview of these and other metadata standards used for cultural heritage objects, see Riley [34]. However, few of the discussed repositories provide information on the implemented metadata standards and tools for terminological control and examining these would require a different methodology. Moreover, while some databases openly follow Linked Open Data strategies, e.g., Europeana [36,37], and a number of museums and cultural heritage institutions make significant efforts to increase interoperability (see IIF [38]), examining these in detail would also go beyond the scope of this paper.

2. Materials and Methods

Two sets of tools for discovering and researching Late Antique material are examined: online museum collections (Section 3.1) and discipline-oriented object and image databases (Section 3.2). Adopting the terminology used by Broder this paper is interested primarily in informational and not in navigational queries [39] (pp. 5–6). While Broder discusses websites in general, here these terms are used in the context of searching for archaeological or art historical artifacts: a navigational search implies that the searcher knows of the existence of a particular artifact (e.g., the Hagia Sophia), while, in contrast, in an informational search they are looking for objects that are unfamiliar to them according to certain criteria (e.g., Late Antique architecture in the Balkans).

2.1. The Online Repositories under Examination

The repositories discussed in this paper are listed in Appendix A. Although these lists are not exhaustive, they present a selection of some major museums, which were chosen for housing Late Antique and Byzantine material among their heterogeneous collections and because they are freely available and searchable online. The second type of repositories are open access art historical and archaeological databases used in the English and German speaking worlds. Databases requiring a license, e.g., Prometheus Bildarchiv [40] or Artstor [41], and medium-specific databases as well as specialized museums, such as the Byzantine and Christian Museum at Athens, are omitted due to their either limited access or their specialized nature. While the discussed museums house vast heterogeneous collections from a variety of regions and time periods, many art historical and archaeological online databases have more specific foci and are thus briefly summarized at the beginning of Section 3.2. The structure of these repositories as perceived by the end user via their available search filters is presented in Appendix B. In contrast to online museum collections (Table A1), the structure of discipline-oriented databases is less homogeneous and more difficult to compare (Table A2).

2.2. Types of Conducted Searches and Search Terms Used

Due to the lack of standardization and the great variety of search filters on both museum collections and databases, and because a keyword-based search is a preferred method among many users (cf. Münster et al. [12] (p. 375)), this article documents the number of results (objects or images) based on simple keyword searches. For this, a limited set of search terms/keywords is used. Due to the different types of material available in the different repositories, the chosen keywords are general terms used to describe Late Antique and Byzantine artifacts, namely, ‘Late Antique’, ‘Byzantine’ and ‘early Christian’. For repositories offering a customizable date filter, the results of a keyword search in combinations with the date filter are included. Moreover, some repositories label an object

as ‘Late Antique’ or ‘Byzantine’ within filter categories such as ‘Culture’ or ‘Period’. In these cases, the number of results listed within such categories is included. Queries in more than one language are conducted on multilingual repositories. Comparing the number of results based on these different search strategies can demonstrate inconsistencies within a repository and allow general observations. However, the number of results based on full text keyword searches can be difficult to interpret, since a keyword can occur in multiple places and record different types of metadata, such as description or bibliography, and a simple keyword search will not always provide relevant results. Nevertheless, significant differences in the number of results within a repository according to the search strategies used can be an indication of inconsistent metadata. Numerical comparisons between individual repositories are not attempted. In contrast to online museum collections listing objects, some discipline-oriented databases list images, and the same object can be depicted on more than one image. Furthermore, objects listed in a searchable museum collection occur only once since museums digitize their own holdings, while the same object can be listed on more than one discipline-oriented database.

2.3. Issues of Definition Regarding the Search Terms Used

The start and end dates of Late Antiquity and the issue of its distinction from the ‘Byzantine’ period are a topic of ongoing debate among Byzantinists, historians and art historians (see Agapitos [42], Cameron [43], Jurković [44]). Under the term ‘Byzantine’ a specialist would expect to find objects associated with the Eastern Roman empire and roughly dated between the 4th and the 15th centuries, as described in the Getty Art and Architecture Thesaurus (AAT) [45]; under ‘early Christian’, objects predominantly dated between the 3rd and 8th–9th centuries and associated with the rise of Christianity [46,47]. In contrast, ‘Late Antique’ is a more inclusive term with less clear boundaries, referring to Roman artifacts from the 3rd century onwards and overlapping with the term ‘early Christian’ but expanding beyond the borders of the Roman Empire; it is also used for objects from Jewish or Islamic contexts [43,48,49]. Thus, these terms can be used almost synonymously, with ‘early Christian’ being the more strictly defined term, while ‘Byzantine’ expands chronologically and ‘Late Antique’ geographically/culturally. This has implications for the discoverability of material on online repositories. For example, more results for the keyword ‘early Christian’ than for ‘Late Antique’ could be an indication of inconsistent metadata. This could also be the case, if the results for the keyword ‘Late Antique’ are fewer than the results for the keyword ‘Byzantine’ in combination with the date filter. However, if a repository follows the guidelines provided by the AAT strictly, ‘early Christian’ will refer only to material from the Western Mediterranean and it should not be included under the term ‘Byzantine’ [45]. Since few repositories disclose the thesauri they are using or the logic behind their labelling practices, an interpretation of the different number of results for the three search terms within a repository is not attempted. For comparison with the results for material associated with more popular fields, the keywords and, when available, period filters ‘Roman’ and ‘Renaissance’ [50,51] are used in an analogous manner.

2.4. Alternative Search Method Based on Chronology Alone

A further search strategy for finding Late Antique material is using only the date filter, when available, without any keywords. Since this paper discusses online repositories, it follows the time limits set by the online image database *Manar Al-Athar*: 250–750 CE [52]. The repositories offering a date filter are listed in Tables A3 and A5. The number of results for the period 27 BCE–249 CE (corresponding to the Roman Imperial period) and 1400–1600 CE (the Renaissance) are compared to the period 250–750 CE. However, especially for online museum collections housing artifacts from all over the world, this strategy would include material beyond Europe and the Mediterranean region as well. Nevertheless, significant differences in the number of results for the different date ranges could still serve as orientation.

Further general observations are discussed in each section. The major findings are presented in text tables. Comparative and further findings are presented in tables in Appendix B.

3. Results

3.1. Online Museum Collections

3.1.1. General Observations

Many leading museums have digitized a large part of their collections and made them freely accessible online. In contrast to archaeological and art historical databases they offer digitized catalogue entries of their own holdings only. This can be problematic when researching Late Antique and Byzantine material because a number of smaller, specialized museums, such as the Ikonenmuseum Recklinghausen, housing a large collection of Byzantine icons [53], as well as some major museums with Late Antique and Byzantine collections, such as the Museo dell'alto Medioevo in Rome or the Bargello in Florence, do not offer searchable online catalogues [54,55]. This ultimately makes some objects (and museums) more visible and thus easier to find and study than others and poses a challenge when researching objects belonging to the same original context but dispersed in different collections. The floor mosaics excavated in the 1930s in ancient Antioch (modern day Antakya in Turkey) are a good example of this. As Barsanti has demonstrated, floor mosaics that once decorated a single house are now in numerous collections with multiple museums dividing between themselves even the floor of a single room [56]. While some of the Antioch mosaics are easily accessible via the respective museum online collections, others are not. Investigating objects such as these becomes more difficult when their original context is not specified on the museum's website. For example, the online catalogue entry of a mosaic fragment now in the Princeton University Art Museum (object no. y1940-437 a-e) does not mention that it is originally from the so called 'House of the Boat of Psyche', cf. [56] (p. 35), and instead indicates solely 'Turkey, Antioch' as the place of excavation [57]. This complicates the study of an object's original context. Furthermore, archival images from the time of excavation are available via the Princeton Archaeological Archives (IDs 1507, 1508, 1520–1522) but these are not linked to the museum entries, although both repositories belong to the same institution.

3.1.2. Results Based on Keyword Searches

Regarding the discoverability of material based on keyword searches, only a small number of objects can be found using the simple keyword 'late antique' (Table 1). Major institutions, such as the MET and the British Museum (BM), for example, offer only 310 and 1316 results, respectively, while more than half of the collections number less than a hundred. In contrast, searching for 'byzantine' objects provides a much higher number of results overall. However, not all collections offer a customizable date filter, allowing the exclusion of chronologically irrelevant material. Moreover, almost half of the discussed collections offer a non-customizable period filter such as 'Late Antique' or 'Byzantine', allowing for comparisons with the simple keyword searches (Tables A1 and A3). However, the number of results differ significantly. For example, if the BM offers 1316 results via a keyword search for 'late antique', these increase to 19,810 when using the period filter instead. The outcome is the opposite for the term 'byzantine': a simple keyword search finds 15,909 objects but the period filter 'Byzantine' lists only 4179. Even considering that using simple keywords could lead to finding irrelevant results as well, since these can occur in the metadata for an object from different cultures or time periods, as discussed in Section 3.2, a difference of over 10,000 results based on search strategy alone should be an indication of inconsistent metadata practices. This kind of discrepancy occurs on all collections equipped with a period filter but seems less pronounced (Table 1). Combining the simple keyword 'byzantine' with a customizable date filter, when available, and limiting the search to the period 250–750 CE or using the keyword 'early Christian' always provides a different number of results than using 'late antique' both as a keyword and as a period.

While this could be an indication of inconsistent labelling, it could also be because the three terms do not overlap completely, and the exact chronology of Late Antiquity is still open to debate (cf. Section 2). However, a clear indication of inconsistent metadata practices can be observed on multilingual collections. The online collections of the Kunsthistorisches Museum (KHM) in Vienna and of the Staatliche Museen zu Berlin (SMB) allow searching in both English and German. In both cases, however, the use of English instead of German leads to a lower number of results, for example, three for the keyword ‘late antique’ on KHM but 43 for the equivalent ‘spätantik*’ (the asterisk is used to account for the different grammatical forms).

Table 1. Searching for Late Antique material on online museum collections (February 2021).

Site	Browse by Time Period ¹	Browse by Search Term ²	Number of Results	Total Number of Listed Items ³	Share
British Museum, London	250–750 CE ⁴	-	-	4,500,000	-
	-	late antique	1316		0.03%
	Late Antique	-	19,810		0.44%
	-	byzantine	15,909		0.35%
	Byzantine	-	4179		0.09%
	-	early christian	4455		0.10%
	250–750 CE	byzantine	9407		0.21%
Cleveland Museum of Art	250–750 CE	-	1254	63,754	1.97%
	-	late antique	1		0.00%
	-	byzantine	275		0.43%
	-	early christian	32		0.05%
	250–750 CE	byzantine	105		0.16%
Getty Museum, Los Angeles ⁵	-	late antique	83	15,7493	0.05%
	-	byzantine	564		0.36%
	-	early christian	80		0.05%
	-	late antique	3		0.00%
Harvard Art Museums, Cambridge, MA ⁵	Late Antique period	-	8	235,878	0.00%
	-	byzantine	3319		1.41%
	Byzantine period	-	912		0.39%
	-	early christian	5		0.00%
	-	early christian	5		0.00%

Table 1. Cont.

Site	Browse by Time Period ¹	Browse by Search Term ²	Number of Results	Total Number of Listed Items ³	Share
Kunsthistorisches Museum, Vienna (KHM)	250–750 CE	-	2974	23,963	12.41%
	-	late antique	3		0.01%
	-	spätantik*	43		0.18%
	Spätantik	-	27		0.11%
	Spätantike Zeit	-	4		0.02%
	-	byzantine	18		0.08%
	-	byzantinisch*	39		0.16%
	Byzantinisch-provinziell	-	2		0.01%
	-	early christian	3		0.01%
	-	frühchristlich*	6		0.03%
	Christliche Zeit	-	3		0.01%
	250–750 CE	byzantinisch*	8		0.03%
	250–750 CE	-	2357	439,557	0.54%
Museum of Fine Arts, Boston	-	late antique	19		0.00%
	-	byzantine	1515		0.34%
	-	early christian	33		0.01%
	250–750 CE	byzantine	440	55,692	0.10%
Princeton University Art Museum	250–750 CE	-	1617		2.90%
	-	late antique	323		0.58%
	Late Antique	-	275		0.49%
	-	byzantine	6120		10.99%
	Byzantine	-	88		0.16%
	-	early christian	58		0.10%
	250–750 CE	byzantine	840	261,679	1.51%
Staatliche Museen zu Berlin (SMB)	250–750 CE	-	17,760		6.79%
	-	late antique	0		0.00%
	-	spätantik*	14		0.01%
	-	byzantine	278		0.11%
	-	byzantinisch*	2530		0.97%
	-	early christian	2		0.00%
	-	frühchristlich*	141		0.05%
	250–750 CE	byzantinisch*	934		0.36%

Table 1. Cont.

Site	Browse by Time Period ¹	Browse by Search Term ²	Number of Results	Total Number of Listed Items ³	Share
The Metropolitan Museum of Art, New York (MET) ⁵	A.D. 1–500 ⁶	-	6209	406,000	1.53%
	-	late antique	310		0.08%
	-	byzantine	3153		0.78%
	-	early christian	269		0.07%
	A.D. 1–500 ⁶	byzantine	448		0.11%
Victoria and Albert Museum, London	250–750 CE	-	4582	1,230,805	0.37%
	-	late antique	529		0.04%
	-	byzantine	1067		0.09%
	-	early christian	280		0.02%
	250–750 CE	byzantine	210		0.02%

¹ Custom date range or period filter, if filtering option available (cf. Table A3). ² The languages used are English and German, according to the site. The search terms used are 'late antique' ('spätantik' in German), 'byzantine' ('byzantinisch' in German) and 'early christian' ('frühchristlich' in German). When using the term 'byzantine' on sites that do not feature a time period filter, the results include post-Late Antique material. ³ Information provided by site or via blank search. ⁴ Filter does not work without search term. ⁵ No customizable date filter available. ⁶ The MET allows only for filtering according to a predefined, non-customizable date range. The range 'A.D. 1–500' seems closest to the Late Antique period, although it includes objects from the Roman imperial period. * The asterisk (*) is used to account for the different grammatical forms.

In addition, different museums might label objects belonging to the same context differently. For example, the MET labels objects like a 5th century weight in the shape of a bust of an empress as 'Byzantine' (Figure 1), while the British Museum labels a similar object, belonging to the same type, culture and time period, as 'Late Roman' (Figure 2).

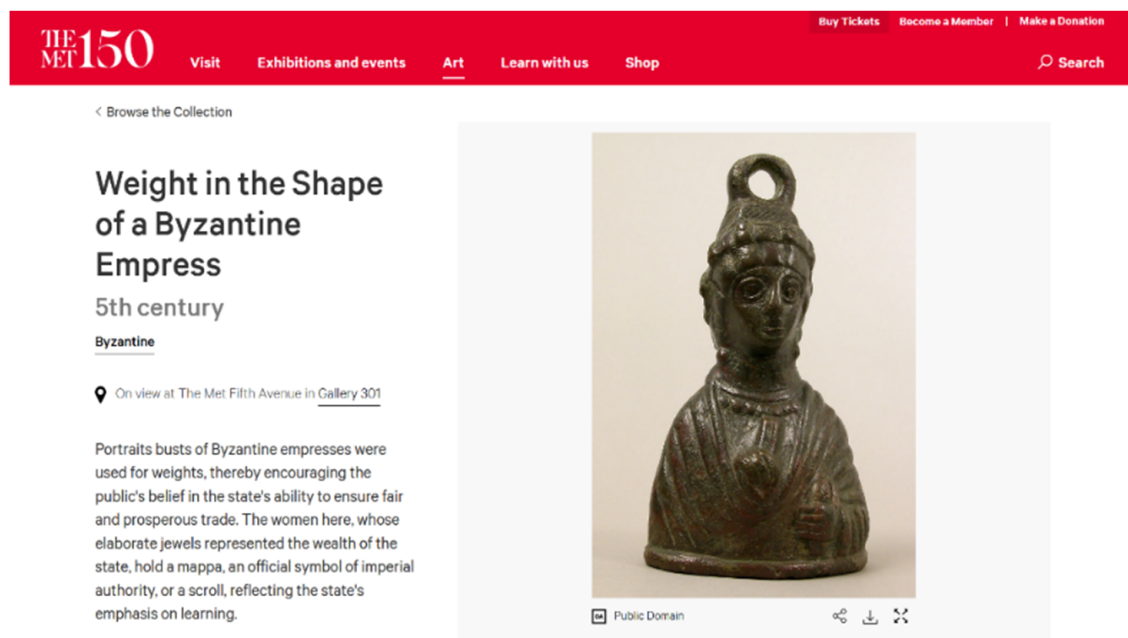


Figure 1. MET Collection Online: weight in the shape of a bust of an empress, 5th century, copper alloy, 18.5 × 10.2 × 5.9 cm, 1206 g, nr. 69.103 (Screenshot, 27 November 2020).

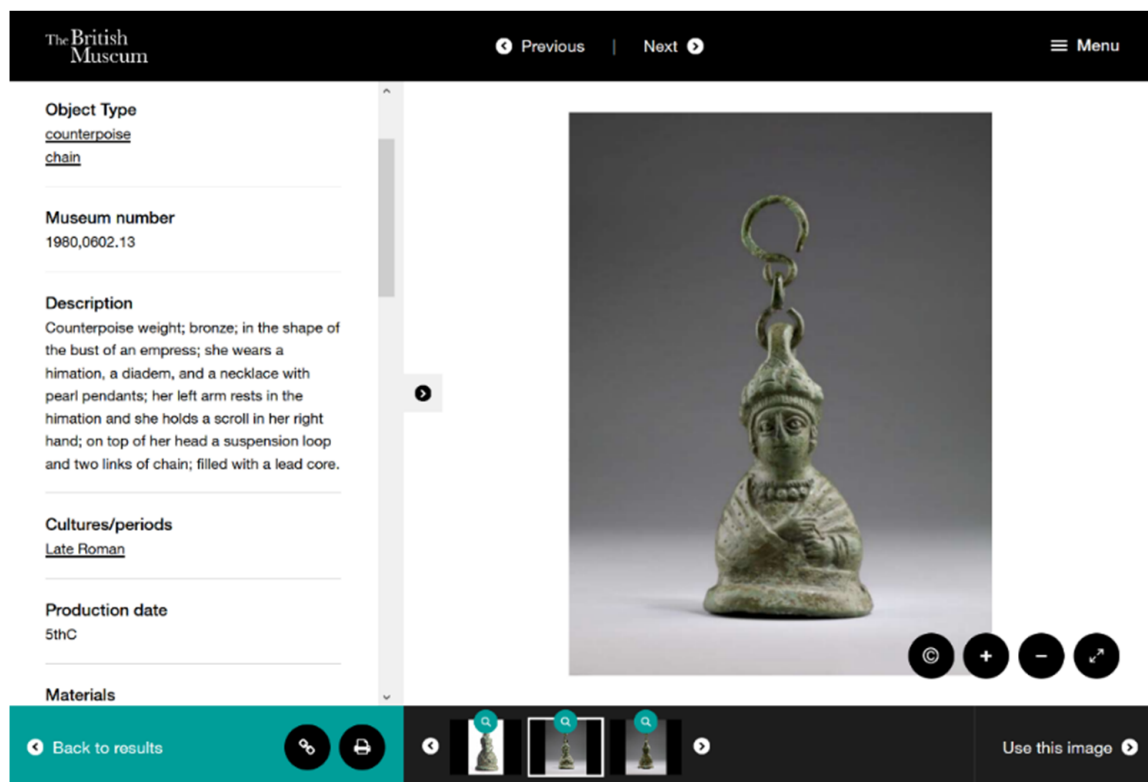


Figure 2. British Museum online collection: weight in the shape of a bust of an empress, 5th century, copper alloy, lead, 14.7 × 8.4 cm, 1834.80 g, nr. 1980,0602.13 (Screenshot, 27 November 2020).

3.1.3. Results Based on Chronological Searches

Even if a comparison based on keyword searches is problematic, it seems that museums house a larger number of objects from more popular time periods, and it is often the case when comparing the number of results when using the period filters. For example, the BM finds 248,533 objects when selecting the period filter 'Roman' but only 19,810 when selecting 'Late Antique' (Tables 1 and A4). This seems to be confirmed when comparing the share of objects based on custom date range searches without a keyword (Table 2), even if objects outside of Europe and the Mediterranean might be included in these as well. The share of objects dated between 250 and 750 CE ranges between 0.14% and 12.41%. In contrast, the share of objects for the time span 27 BCE–249 CE (corresponding to the Roman imperial period) ranges between 0.32% and 23.12%, and, for 1400–1600 CE, between 1.93% and 16.95%. In absolute numbers, all discussed online museum collections with a customizable date filter house 27,687 objects potentially belonging to the Late Antique period but two or three times more objects from the other two periods (62,819 objects for 27 BCE–249 CE and 91,224 for 1400–1600 CE). While this could be an indication of the overrepresentation of more popular time periods, it could also be a result of multiple other factors, such as the availability of surviving material, the history of excavations and of collecting, modern collection practices, etc.

Table 2. Comparing the share of objects dated to 250–750 CE with the share of objects from more popular time periods in online museum collections with a custom date range filter (February 2021).

Site ¹	Browse by Custom Date Range	Number of Results	Total Number of Listed Items	Share
Cleveland Museum of Art	250–750 CE	1254	63,754	1.97%
	27 BCE–249 CE	202		0.32%
	1400–1600 CE	7169		11.24%
Kunsthistorisches Museum, Vienna (KHM)	250–750 CE	2974	23,963	12.41%
	27 BCE–249 CE	5541		23.12%
	1400–1600 CE	4062		16.95%
Museum of Fine Arts, Boston	250–750 CE	2357	439,557	0.54%
	27 BCE–249 CE	9935		2.26%
	1400–1600 CE	8474		1.93%
Princeton University Art Museum	250–750 CE	1617	55,692	2.90%
	27 BCE–249 CE	1183		2.12%
	1400–1600 CE	2146		3.85%
Staatliche Museen zu Berlin (SMB)	250–750 CE	17,760	261,679	6.79%
	27 BCE–249 CE	21,123		8.07%
	1400–1600 CE	13,528		5.17%
Victoria and Albert Museum, London	250–750 CE	1725	1,239,668	0.14%
	27 BCE–249 CE	24,825		2.00%
	1400–1600 CE	55,845		4.50%
Sum all museums	250–750 CE	27,687	-	-
	27 BCE–249 CE	62,819		
	1400–1600 CE	91,224		

¹ The British Museum is excluded because the date filter is not usable without a keyword.

3.2. Archaeological and Art Historical Databases

3.2.1. Brief Descriptions of the Repositories under Examination

In contrast to online museum collections, art historical and archaeological image and object databases include artifacts belonging to a vast multitude of collections, as well as works of architecture and whole sites like the Forum Romanum. Since they can have more specialized foci, these are briefly summarized.

While the Kunsthistorisches Institut in Florenz (KHI) and the Bibliotheca Hertziana in Rome specialize in Italian art from the Late Antique period onwards [58,59], the Warburg Institute Iconographic Database (WI-ID) and Lexicon Iconographicum Mythologiae Classicae (LIMC) focus on iconography and on mythological topics [60–62]. Late Antique material can be found in larger, cooperative projects between multiple institutions or countries, such as the German-based Bildindex der Kunst & Architektur, giving access to more than 1.8 million works of art and architecture predominantly from Europe but also from Egypt and the Caucasus provided by ca. 80 institutions and headed by the Deutsches Dokumentationszentrum für Kunstgeschichte–Bildarchiv Foto Marburg [63–65] and Europeana (more than 50 million images from ca. 4000 European institutions [66,67]). In the field of archaeology, the databases discussed here are the Arachne object database, a cooperation between the German Archaeological Institute (DAI) and the Archaeological Institute of the University of Cologne, giving access to ca. 2.4 million images as of November 2016 [68], and the independent Ubi Erat Lupa focusing on artifacts from the Roman Empire (65,000 images of ca. 31,000 objects from museums and private collections [69]). Particularly

relevant for the study of Late Antique material are Manar al-Athar (University of Oxford, ca. 78,000 images of sites across the Eastern Mediterranean, organized by countries [52]), and the photo archive of the American Center of Oriental Research (ACOR) in Amman, specializing in the cultural heritage of Jordan (ca. 30,000 digitized images [70,71]). Another valuable resource is the Archaeological Archives of the Department of Art and Archaeology at Princeton University, which give access to archival material, such as photos from the 1930s excavations of ancient Antioch [72].

Despite its significant role, Dumbarton Oaks is not discussed here because of the highly specialized nature of its online collections, which are available via separate online catalogues featuring varying functionalities and different degrees of digitization of the holdings [73]. Nevertheless, they are an important resource for the study of late antiquity and deserve a mention. Two other databases, the Digital Research Archive for Byzantium (DiFAB) based at the University of Vienna and the international BYZART Project also specialize in digitizing Byzantine artifacts, however, the available images are also part of Europeana, listed here [74,75].

3.2.2. General Observations

Compared with online museum collections, some databases are more transparent regarding their metadata practices. A good example is the BYZART project, using the European Data Model (EDM) and providing general instructions and controlled vocabulary lists based on the Getty Art and Architecture Thesaurus (AAT) on the project website, though the latter omit categories referring to cultures and periods and are instead limited to object types, materials and techniques [16,76,77]. However, the majority of the databases do not discuss their metadata practices with such a degree of transparency, while some omit disclosing them altogether.

Even though many of these databases list Late Antique objects, exploring these can be challenging. Compared to online museum collections, there seems to be a significant lack of standardization of filtering options and every repository offers a different number and type of available filters and subfilters that are structured and titled in a variety of ways (Table A2). This could be due to differences in focus, though whatever the reason, it makes these repositories difficult to compare. For example, Manaral-Athar aims to give access to a growing number of high-quality images and, compared to the other databases, it does not provide detailed object information or detailed object-related filtering options [52]. However, even databases of related institutions like the Digital Photo Library of the KHI and the Photographic Collection of the Bibliotheca Hertziana show significant differences. Although both institutes are based in Italy, belong to the Max Planck society and use the APS-MIDAS system, their public online collections are structured in different ways and are not interlinked [58,78]. Altogether, using the advanced filters on the discussed archaeological and art historical databases is less intuitive compared to the online museum collections. Furthermore, in contrast to the museum collections, the majority of the discussed databases offer neither a functioning customizable date range filter, nor predefined chronological periods (Table A5), which further complicates the search.

However, the existence of a customizable date filter or of non-customizable period filters is not a guarantee for facilitating one's query. A rather extreme example is the alphabetically organized 'Dating/Epoch' filter on the Arachne database. It offers 367 values alone for the letter 'S', eight of which refer directly to the Late Antique period ('spätantik' in German), while at least two more, 'spät-oder nachkonstantinisch' ('late or post-Constantinian') and 'spät-tetrarchisch' ('late tetrarchic'), listed on the same page could be considered just as relevant (Figure 3). Although some of these express a higher degree of chronological specificity, in many cases the differences lie only in the spelling; for example, there are three different spelling options for 'late antique' with a question mark. Adding the filters listed under the letter 'F' such as 'frühbyzantinisch' ('early Byzantine'), 'frühchristlich' ('early Christian'), 'frühjustinianisch' ('early Justinianic') complicates the search further. This type of fragmentation occurs for other periods as well. For example, there are more than seven

filters referring to the Roman period in general (Figure 4). Overall Arachne has 1554 non-numerical date filters (Table A2), which significantly complicates informational queries. However, the existence of a customizable date filter is also not always unproblematic. For example, a blank search on the Bildindex database in combination with the date filter in its full range provides 1,314,579 items, which accounts for approximately 70% of all listed items when using the blank search without the date filter.

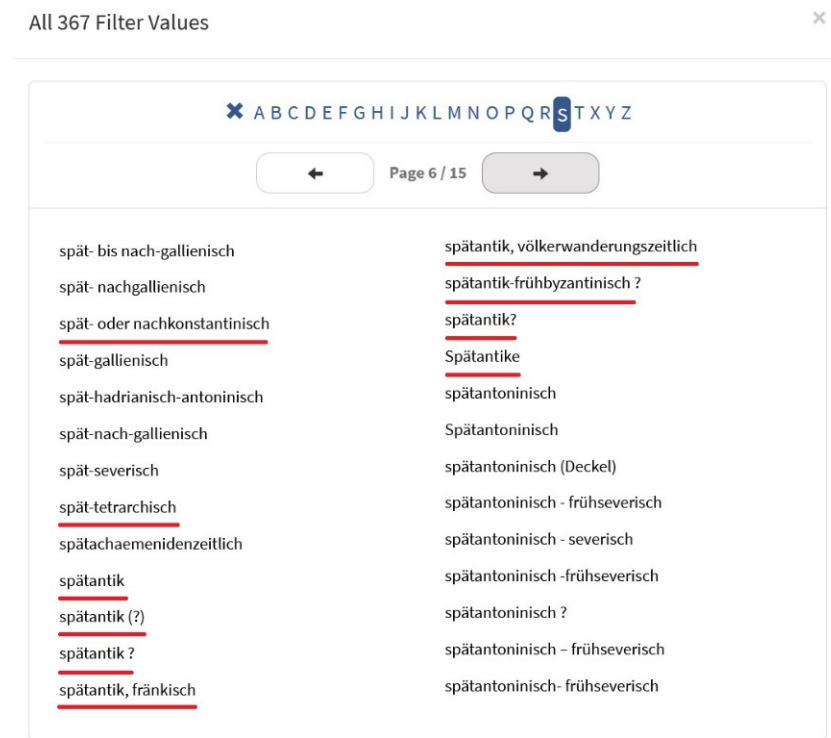


Figure 3. Available filters for 'Dating/Epoch', page 6 of the letter 'S' on Arachne (Screenshot, 27 November 2020). The relevant filters are underlined by the author.

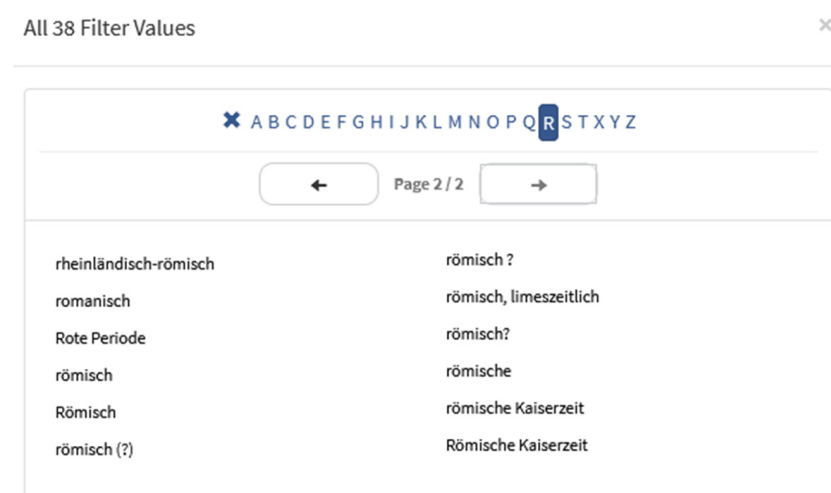


Figure 4. Available filters for 'Dating/Epoch', page 2 of the letter 'R' on Arachne (Screenshot, 10 February 2020).

Another limitation is that image and object databases often feature already relatively well-known material, which might be available on multiple repositories. For example, images of the floor mosaic of Megalopsychia (personification of Magnanimity) from the

Villa at Yakto in Antioch, excavated in the early 1930s can be found on the Princeton Archaeological Archives [72] and Arachne [79]. The entries are, however, not interlinked, although it deserves mentioning that Arachne is embedded in Linked Open Data infrastructures, as it is mapped to the ARIADNE Catalog Data Model [80]. The second known mosaic with this motif, again from Antioch, published in 2013 by Hatice Pamir [81] is not featured in any of the discussed databases. However, the degree of inclusion of recently excavated material on such databases requires further research.

3.2.3. Results Based on Keyword Searches

Regarding keyword searches, the inconsistencies observed in the online museum collections are repeated in the databases. When a filter for a predefined period such as ‘Late Antique’ is available, the number of results differs significantly compared to a simple keyword search, while multilingual databases (Bibliotheca Hertziana, KHI, Europeana) provide different outcomes based on language (Table 3). Some cases could be regarded as examples of inconsistent labelling. While it would not be surprising if the number of results for ‘early christian’ is lower than for ‘late antique’, the opposite outcome—564 results for ‘frühchristlich*’ but 502 for ‘spätantik*’ on Ubi Erat Lupa—would be an indication of such inconsistency.

Table 3. Searching for Late Antique material on art historical and archaeological databases (November 2020).

Site	Browse by Time Period ¹	Browse by Search Term ²	Number of Results	Total Number of Listed Items ³	Share
ACOR Photo Archive (images)	-	late antique	978	30,789	3.21%
		byzantine	3895		12.65%
		early christian	203		0.66%
Arachne (objects)	spätantik	-	1362	3,933,071	0.03%
	-	spätantik*	18,662		0.47%
	byzantinisch	-	280		0.01%
	-	byzantinisch*	7816		0.20%
	frühchristlich	-	270		0.01%
	-	frühchristlich*	1526		0.04%
Bibliotheca Hertziana ⁴ (images)	-	late antique	0	391,390	0.00%
		spätantik*	44		0.01%
		tardo antico	0		0.00%
		antique tardive	0		0.00%
		byzantine	2		0.00%
		byzantinisch*	688		0.18%
		bizantin*	53		0.01%
		early christian	4		0.00%
		frühchristlich*	175		0.04%
		paleocrisian*	8		0.00%
Bildindex (objects)	250–750 CE	-	6829	1,825,568	0.37%
	-	spätantik	218		0.01%
	-	byzantinisch	1738		0.10%
	250–750 CE	byzantinisch	165		0.01%
	-	frühchristlich	159		0.01%

Table 3. Cont.

Site	Browse by Time Period ¹	Browse by Search Term ²	Number of Results	Total Number of Listed Items ³	Share
Digital LIMC (objects)	-	late antique	8	unknown	unknown
		byzantine	1		
		early christian	3		
Europeana ⁵ (images)	-	late antique	1742	52,025,992	0.00%
	-	spätantik*	861		0.00%
	-	byzantine	88,151		0.17%
	-	byzantinisch*	80,299		0.15%
	Byzantine Art ⁶	-	75,895		0.15%
		early christian	1734		0.00%
		frühchristlich*	379		0.00%
KHI Photothek (objects) ⁷	-	spätantik	2	68,646	0.00%
		byzantinisch	101		0.15%
		frühchristlich	2		0.00%
Manar al-Athar (images)	-	late antique	44	77,955	0.06%
		byzantine	174		0.22%
		early christian	0		0.00%
Princeton Archaeological Archives (images)	-	late antique	0	10,366	0.00%
		byzantine	87		0.84%
		early christian	57		0.55%
Ubi Erat Lupa ⁸ (images)	spätantik	-	314	31,903	0.98%
	-	spätantik*	502		1.57%
	byzantinisch	-	-		-
	-	byzantinisch*	3		0.01%
	frühchristlich	-	526		1.65%
	-	frühchristlich*	564		1.77%
	250–750 CE	-	1401		4.39%
WI-ID (images)	3rd–8th century	-	1130	105,880	1.07%
	-	late antique	472		0.45%
	-	byzantine	413		0.39%
	3rd–8th century	byzantine	10		0.01%
	-	early christian	28		0.03%

¹ If filtering option available (cf. Table A5). ² Unless stated otherwise, the language used is either English or German, according to the site. The search terms used are 'late antique' ('spätantik' in German), 'byzantine' ('byzantinisch' in German) and 'early christian' ('frühchristlich' in German). When using the term 'byzantine' on sites that do not feature a time period filter, the results will inevitably include post-Late Antique material. ³ Information provided by site or via blank search. ⁴ Search in multiple languages possible. ⁵ As an international project, Europeana provides metadata in multiple languages but here only English and German are being tested. ⁶ On Europeana, 'Byzantine Art' is not a time period but a collection. ⁷ The KHI Photothek search is available in English and Italian as well but searching for these terms provides results only in German. ⁸ Results as of January 2021. * Database allows for searching using the asterisk (*) to include multiple grammatical forms, e.g., 'spätantike', 'spätantiken', etc. On Bildindex and KHI Photothek, searching with or without the asterisk does not alter the number of results. * The asterisk (*) is used to account for the different grammatical forms.

However, the number of results in Table 3 need to be regarded critically, since keyword searches can lead to the inclusion of objects belonging to different time periods. For instance, the Warburg Institute Iconographic Database (WI-ID) shows 472 images for the keyword 'late antique' but many of these include non-Late Antique works spanning from

the Hellenistic period to the 1940s. The reason for finding these objects via keywords lies in their occurrence elsewhere in the metadata. For example, a Hellenistic frieze is found among the eight ‘late antique’ objects on the LIMC database because the keyword is mentioned in the cited bibliography (Figure 5). Similarly, using the keywords ‘spätantike’ on the online Photographic Collection of the Bibliotheca Hertziana leads to the inclusion of works of late medieval sculpture in the results. A large part of these is found because many objects belong to the Skulpturensammlung und Museum für Byzantinische Kunst (Sculpture collection and Byzantine Art Museum) in Berlin, labelled on the database as the previously named ‘Museum für Spätantike und Byzantinische Kunst’ (Figure 6).

Digital LIMC

"late antique" Language ▾

Monument #44131


Data	Location
Persistent ID http://ark.dasch.swiss/ark:/72163/080e-76154a277c246-4	
Object ID: 44131 Type: frieze Origin: Greek Category: architectural relief Material: marble Discovery: Soloi Dating: -325 -- -300	
Bibliography Dikaio, P., Guide of the Cyprus Museum (1961) 132 pl. 33, 3; Vermeule, C., Greek and Roman Cyprus: Art from Classical through Late Antique Times (1976) 47 no. 3 fig. 3.	
Names Amazones	
Keywords Amazon, Phrygian cap, double-axe, bipennis, labrys, fight, battle, horse, rider, shield	
Museum Address Cyprus Museum Nicosia Inventory E 548 Photo rights © Cyprus Museum, Nicosia	

Figure 5. One of the search results on Digital LIMC using the term ‘late antique’ (Screenshot, 15 November 2020).


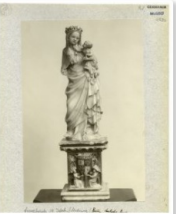
(BIBLIOTHECA HERTZIANA) Verwalter unbekannt · ΔbH005238  bbhertz: Δ bH005238	BERLIN Staatliche Museen zu Berlin - Preußischer Kulturbesitz, Museum für Spätantike und Byzantinische Kunst Statuette Skulptur · südwestdeutsch als Schule/Stil Datierung: 1301/1350
Intranet	„Madonna“ OBJ 08014717
RARO	
(BIBLIOTHECA HERTZIANA) Verwalter unbekannt · ΔbH005237  bbhertz: Δ bH005237	BERLIN Staatliche Museen zu Berlin - Preußischer Kulturbesitz, Museum für Spätantike und Byzantinische Kunst Statuette Skulptur · französisch als Schule/Stil Datierung: 1301/1400
	„Madonna“ OBJ 08014718

Figure 6. Search results on the Photographic Collection of the Bibliotheca Hertziana using the term ‘spätantike’ (Screenshot, 18 November 2020).

Furthermore, the number of results for Late Antique material seem very low in databases where they would be expected to be much higher, such as on the Archaeological Archives of Princeton University, Digital LIMC, the ACOR Photo Archive and especially Manar Al-Athar [52]. However, keyword searches for other periods can show surprisingly few results as well (Table A6). For example, all of the art historical databases, Bibliotheca Herztiana, Bildindex, KHI, WI-ID, provide between 27 and 5020 items when using ‘Renaissance’ as a simple keyword. Given their vast image collections of European art these numbers are particularly low.

Some further aspects not visible in the results in Table 3 deserve a brief mention. Searching informationally according to more specific criteria, for example, based on iconography and not on periodization, demonstrates further challenges. If someone is searching for Late Antique mosaics depicting representations of cities identified by an inscription, they might try using keywords such as ‘mosaic’, ‘city’ and ‘inscription’. Testing this on Manar Al-Athar results in finding seven images of the same (irrelevant) floor mosaic (Figure 7), while the same method results in over 10,000 images on the ACOR Photo Archive. However, when using keywords such as ‘Madaba Map’ or ‘Umm ar Rasas’ instead, both Manar Al-Athar and the ACOR Photo Archive provide a manageable number of relevant images. In this case, the enquirer needs to be aware that the floor mosaics of the churches of St. George in Madaba and St. Stephen in Umm ar-Rasas, both in modern day Jordan, feature the iconographic motifs of interest. Consequently, these databases can only be used efficiently when searching navigationally (see Section 2).

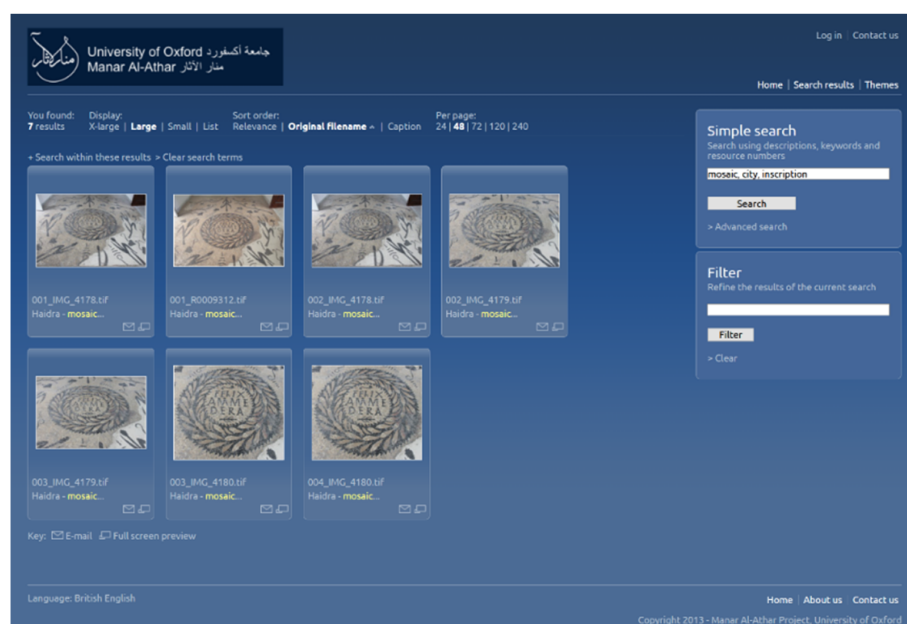


Figure 7. Results using the terms ‘mosaic’, ‘city’, ‘inscription’, via the simple search on *Manar Al-Athar* (Screenshot, 15 November 2020).

3.2.4. Results Based on Chronological Searches

Similarly to the online museum collections, only a very small fraction of the digitized material seems to fall in the Late Antique period. Based on keyword searches, Late Antique material often accounts for below one per cent of the total number of listed objects (Table 3). However, given the above-mentioned problems associated with simple keyword searches, as well as the similarly low shares for keywords like ‘Roman’ and ‘Renaissance’ (Table A6), these numbers cannot be regarded as reflecting the real situation. Nevertheless, meaningful comparisons can be made using the customizable date range filters on the three databases that offer it—Bildindex, Ubi Erat Lupa, and WI-ID. Since they all focus on Europe and the Mediterranean, the number of non-European artifacts found when using the date

filter without any keywords would be expected to be very low. Therefore, the date range 250–750 CE should cover predominantly Late Antique material, while the ranges 27 BCE–249 CE and 1400–1600 CE should reflect Roman Imperial and Renaissance material. On all three databases the share of potentially Late Antique material is significantly lower than for the two other periods (Table 4).

Table 4. Comparing the share of objects dated 250–750 CE with the share of objects from more popular time periods on databases with a custom date range filter (January 2021).

Site	Focus	Browse by Custom Date Range	Number of Results	Total Number of Listed Items	Share
Bildindex (objects)	Art History	250–750 CE	6931	1,833,228	0.38%
		1400–1600 CE	225,746		12.31%
Ubi Erat Lupa (images)	Archaeology	250–750 CE	1401	31,903	4.39%
		27 BCE–249 CE	10,073		31.57%
WI-ID (images)	Art History	3rd–8th century	1130	105,880	1.07%
		15th–16th century	48,984		46.26%

This is most pronounced with the art historical WI-ID. Filtering for the period from the 3rd to the 8th century provides 1130 results, which comprises ca. one per cent of the digitized images. In comparison, the share of results dated to the 15th and 16th centuries accounts for almost half of the digitized material. Even the largest database, Bildindex, with over 1.8 million items from ca. 80 institutions, offers less than 7000 objects dated between 250 and 750 CE. Given that the British Museum alone lists almost three times more objects when using the period filter ‘Late Antique’ (Table 1), these numbers seem particularly low. Consequently, the results in Table 4 are an indication of the overrepresentation of more popular time periods in art historical and archaeological databases, even if these might be half the length of the Late Antique period. In light of this, the low shares of Late Antique and Byzantine material found using simple keywords on databases without a custom date filter (Table 3) might still reflect the same phenomenon, even if the exact numbers remain questionable.

4. Discussion and Conclusions

Although many institutions make an ever-growing amount of material from potentially all time periods and geographic regions available online, there are still difficulties when it comes to finding and exploring relevant objects intuitively and efficiently. Focusing on the discoverability of Late Antique and Byzantine material, this article demonstrates several practical challenges, some of which are specific to less popular fields. The latter tend to be overlooked in the development of online image and object databases and terminological thesauri and in discussions of their usability (cf. Münster et al. [12] (p. 371, 380), Rannharter and Teetor [17] (p. 217)).

As this article demonstrates, compared to more popular periods Late Antique material often represents a fraction of digitized items. This is evident especially in professional art historical and archaeological databases (see Table 4). These show a clear preference towards some time periods (e.g., the Renaissance) over others, in this case Late Antiquity, which corresponds to the attitudes observed by specialists (cf. Nelson [13], Angelov [14], Cameron [15]). Despite the lower number of Late Antique and Byzantine items in such repositories, their different structures and the already observed lack of standardization of filtering options (cf. Münster et al. [12] (pp. 377–378))—especially, as observed here, in open access art historical and archaeological databases—as well as the significantly different outcomes based on search strategy alone, present major challenges. Although simple keyword searches are the preferred search method (cf. Münster et al. [12] (p. 375)), these are prone to a variety of problems. As tested here, different labels referring to objects

from the same period and culture can coexist within a single online repository, while multilingual repositories show significant inconsistencies based on language. In some repositories, insufficient metadata records make informational queries particularly difficult, as exemplified by an additional informational search on two of the discussed repositories.

It could be beneficial to consider the ongoing discussions among scholars in different fields regarding proper periodization or terminology (cf. Münster et al. [12] (p. 380), Rannharter and Teetor [17] (p. 217)). In addition, some scholars implement practical solutions to deal with problems of nomenclature by using “centuries, or more precise chronological spans” instead of “stylistic terminology” (Jurković [44] (p. 138)). However, in contrast to many museums, most of the discussed object and image databases do not offer customizable date filters. Thus, addressing the search practices and needs of students and scholars in less popular fields (cf. Münster et al. [12] (p. 371)), to improve the quantity and quality of the metadata and the addition of standardized filtering options, could significantly increase the usability of these repositories. Some proposed improvements are listed in Table 5.

Table 5. Proposed improvements.

No.	Proposed improvement
1	Addition of a customizable (numerical) date filter.
2	Optimization of existing metadata to account for different search strategies.
3	Translation of metadata entries on multilingual repositories.
4	Addition of sufficient metadata entries regarding materials, subject matter and further relevant details to improve informational searches.
5	Collaboration with scholars from different, especially less prominent, fields of art history and archaeology, to improve ontologies and metadata practices.
6	Inclusion of recently excavated and published material, perhaps by allowing scholars to make submissions to an online repository.
7	More transparency in respect of implemented metadata standards and ontologies.
8	Better collaboration between different repository providers to agree on major standardized search filters.

Propositions 1, 2, 3 and 7 are in respect of both online museum collections and professional databases; 4, 5, 6 and 8 are in respect of professional databases.

Although this article is a case study based on a minimal set of search terms in only one specialized area of research, it exemplifies some major practical issues that will likely be similarly experienced by students and scholars in other areas. An interdisciplinary approach or qualitative interviews with experts would be beneficial in order to properly examine the applied terminologies, search practices, tools and requirements of scholars in a wider range of areas.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: See Appendix A.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

The discussed online repositories are the following:

Online museum collections:

1. British Museum, London (BM), <https://www.britishmuseum.org/collection/search> (accessed on 10 February 2021);
2. Cleveland Museum of Art (CMA), <http://www.clevelandart.org/art/collection/search> (accessed on 10 February 2021);

3. Getty Museum, Los Angeles, <http://www.getty.edu/art/collection/> (accessed on 10 February 2021);
4. Harvard Art Museums, <https://www.harvardartmuseums.org/collections> (accessed on 10 February 2021);
5. Kunsthistorisches Museum, Vienna (KHM), <https://www.khm.at/objektdb/> (accessed on 10 February 2021);
6. Museum of Fine Arts, Boston (MfA), <https://collections.mfa.org/collections> (accessed on 10 February 2021);
7. Princeton University Art Museum, <https://artmuseum.princeton.edu/search/collections> (accessed on 10 February 2021);
8. Staatliche Museen zu Berlin (SBM), <http://www.smb-digital.de/eMuseumPlus> (accessed on 10 February 2021);
9. The Metropolitan Museum of Art, New York (MET), <https://www.metmuseum.org/art/collection> (accessed on 10 February 2021);
10. Victoria and Albert Museum, London (VAM), <http://collections.vam.ac.uk/> (accessed on 10 February 2021).

Image and object databases:

1. ACOR Photo Archive, <https://acor.digitalrelab.com> (accessed on 10 February 2021);
2. Arachne, <https://arachne.dainst.org/> (accessed on 10 February 2021);
3. Bibliotheca Hertziana, <http://foto.bibl.hertz.it/> (accessed on 10 February 2021);
4. Bildindex der Kunst & Architektur, <https://www.bildindex.de/> (accessed on 10 February 2021);
5. Digital LIMC, <https://weblimc.org/page/home> (accessed on 10 February 2021);
6. Europeana, <https://www.europeana.eu> (accessed on 10 February 2021);
7. KHI Photothek, <http://photothek.khi.fi.it/> (accessed on 10 February 2021);
8. Manar Al-Athar, <http://www.manar-al-athar.ox.ac.uk/> (accessed on 10 February 2021);
9. Princeton Archaeological Archives, <http://vrc.princeton.edu/archives/> (accessed on 10 February 2021);
10. Ubi Erat Lupa, <http://lupa.at> (accessed on 10 February 2021);
11. Warburg Institute Iconographic Database (WI-ID), https://iconographic.warburg.sas.ac.uk/vpc/VPC_search/main_page.php (accessed on 10 February 2021).

Appendix B

Some advanced search options or filters available on the discussed online museum collections are listed in Table A1. The numbers in the first column correspond to the list in Appendix A. All of the discussed museum collections are equipped with a main free text search field allowing for a simple keyword search. In some cases, suggestions are made as to how the field should be used. These are listed in the second column. The abbreviations in the square brackets describe the type of filter as follows: [cb] checkbox, [dd] drop down menu, [ft] free text, [rb] radio button. The dash (-) indicates the absence of a filter. For the sake of space, only some of the more common filters are documented in a separate column. In some cases, the categories ‘culture’, ‘period’ and ‘artist’ are combined within one filter. These are listed in the column ‘Culture/Period/Artist/Maker’ and, for the sake of clarity, the original filter titles are given.

In contrast to museum collections, the advanced search structure of object and image databases is more heterogeneous (Table A2). The filter options have been translated into English by the author where necessary. The abbreviations are the same as in Table A1. In some cases, when a long list of sub-filters is available, only the number of available sub-filters is given instead.

Table A1. Advanced Search Options/Filters available on online museum collections.

Site	Image Only ¹	On View	Object Title/Name	Object Type	Culture/Artist/Maker	Date/Period	Place of Origin	Material/Technique/Medium	Other Advanced Search Options/Filters
BM	[cb]	[cb]	[dd]	-	[dd] Cul- ture/Period/Dynasty	[dd] Production Date	[dd] Place	[dd] Material [dd] Technique	[dd] Person/Organisation [dd] Ethnic group [dd] Ware [dd] Escapement [dd] Denomination [dd] School/Style [dd] Subject
CMA	-	[cb]	[ft]	[dd]	[ft] Culture [ft] Artist	[ft] After Before	-	[ft] Medium	[dd] Location [dd] Collection [dd] Department [ft] Credit line [ft] Accession number [ft] Catalogue raisonné [ft] Provenance [ft] Citation [ft] Exhibition history [dd] Rights [cb] Highlights [cb] Open Access [cb] With videos [cb] In 3-D
Getty	[cb]	[cb]	[ft]	-	[ft] Maker/Artist [ft] Culture/Country	-	-	[ft] Medium/ Materials	[ft] Object Number [ft] Provenance Name [ft] Collecting Area [cb] Open Content Program
Harvard	-	[cb]	-	[dd]	[dd] Culture	[dd] Century [dd] Period	[dd] Place	[dd] Technique/Medium	[dd] Classification [dd] Gallery
KHM	[cb]	[cb]	[dd]	-	-	[dd] Period	-	-	[dd] Person

Table A1. Cont.

Site	Image Only ¹	On View	Object Title/Name	Object Type	Culture/Artist/Maker	Date/Period	Place of Origin	Material/Technique/Medium	Other Advanced Search Options/Filters
MfA ²	[cb]	[cb]	[ft]	-	[ft] Artist/Maker [ft] Culture	[ft] Date Range	-	[ft] Medium/ Technique	[ft] Accession Number [ft] Credit Line [ft] Provenance [ft] Description [dd] Collection(s) [dd] Classification(s) [dd] Location(s) [cb] Has Audio/Video [cb] Collection Objects Only [cb] Deaccessioned Objects Only
Princeton	[cb]	-	-	[dd]	[dd] Artist [dd] Culture	[dd] Date [dd] Period	-	-	-
SMB	-	-	[ft]	-	-	[ft] Date [ft] Year from ... to	-	[ft] Material	[ft] Full Text Search [ft] Collection [ft] Name/Person [ft] Object/Term [ft] Geographical Reference
MET	[cb]	[cb]	[ft]	[dd] ³	[ft] Artist/Culture	[dd] Date/Era	[dd] Geographic Location	-	[ft] All Fields [ft] Description [ft] Gallery [ft] Accession Number [dd] Department [cb] Highlights [cb] Open Access
VAM	[rb]	-	[ft]	-	[ft] Artist/Maker	[ft] Earliest year (YYYY) [ft] Latest year (YYYY)	[ft] Place of origin	[ft] Material/ techniques	[ft] Museum object number [ft] Current location [rb] All Records [rb] Best quality records including image and detailed description

¹ Show only entries with images. ² On the site of the Museum of Fine Arts, Boston one can search between objects and people. The table lists only the filters for objects. ³ The filter combines 'Object Type' and 'Material'.

Table A2. Advanced Search Options/Filters available on art historical and archaeological databases.

Site	Culture/Artist/Maker	Chronological Filters	Geographical Filters	Type/Material/ Technique/Medium	Other Advanced Search Options/Filters	Filter Use
ACOR Photo Archive	-	-	[dd] Place name [dd] Country [dd] Arabic place name	-	[dd] Theme [dd] Keywords [dd] Collection name	simultaneously
Arachne	-	[dd/index] Dating, Epoch (1554 options)	[dd/index] Place (5149 options) [dd/index] Location Type (20 options) [dd/index] City (5060 options) [dd/index] Subregion (190 options) [dd/index] Country (105 options) [dd/index] Region (153 options)	-	[dd] Category [dd] Contains Images (2 options) [dd/index] Literature (19,420 options)	simultaneously
Bibliotheca Hertziana	[ft] artist [obj] [dd] school/style (anonymous) [img] [dd] photographer/photo archive	[obj] [dd] date [img] [dd] acquisition date	[ft] City [obj] [dd] city	[obj] [dd] technique/material [img] [dd] color/technique	[dd] Object categories (7 further options): building/collection; title; classification; person/portrait; role; bibliography; inventory n.; [dd] Image categories (1 further option): file/photo/neg. n.; [tag cloud] Person, Portrait, Private Collection [tag cloud] Photo Archive, Photographer	filters can be used simultaneously, but the user can choose only one of the ‘Object categories’ [obj] and ‘Image categories’ [img] while the two ‘tag cloud’ options immediately redirect to an index
Bildindex der Kunst & Architektur	[obj] [ft + tag cloud] Arist	[obj] [ft] Date	[obj] [ft + tag cloud] Location	[obj] [ft + tag cloud] Technique [obj] [tag cloud] Type/ Genre	Image filters: [ft + tag cloud] Photographer [ft + tag cloud] Topic [ft + tag cloud] Technique [date] Date [ft + tag cloud] Image provider [ft + tag cloud] Collection	user has to choose between searching for images [img] or for objects [obj]; filters can be used simultaneously

Table A2. Cont.

Site	Culture/Artist/Maker	Chronological Filters	Geographical Filters	Type/Material/ Technique/Medium	Other Advanced Search Options/Filters	Filter Use
Digital LIMC	[ft] Artist	-	[ft] Place of discovery [ft] Museum name [ft] Museum city	[ft] Technique	[ft] ID [ft] Category [ft] Description [ft] Mythological figure [ft] Object [ft] Inventory Number [ft] LIMC article [ft] LIMC article number [ft] ThesCRA chapter name [ft] ThesCRA article name	one at a time
Europeana	-	-	[cb] Providing country (45 options) [cb] Institution (50 options)	[cb] Type of Media (5 options)	[rb] Collection (13 options) [cb] Can I use this? (3 options) [cb] Language (37 options) [cb] Aggregator (50 options) [cb] Color (50 options) [cb] Image orientation (2 options) [cb] Image size (2 options) [cb] File format (33 options) [cb] Item quality (1 option)	simultaneously
KHI Photothek	[ft] Artist/Manufacturer [ft] Photographer	-	[ft] Location [ft] Location represented	[ft] Object type [ft] Material/Technique	[ft] Title [ft] Full Index [ft] Document number [ft] Subject [ft] Person depicted [ft] Copyright holder [ft] Negative Number [ft] Acquisition type [ft] Owner Scan	user has to choose between searching for images [img] or for objects [obj]; filters can be used one at a time

Table A2. Cont.

Site	Culture/Artist/Maker	Chronological Filters	Geographical Filters	Type/Material/ Technique/Medium	Other Advanced Search Options/Filters	Filter Use
Manar Al-Athar	[ft] Credit	[dd] By date	[cb] Country (18 options)	[rb] Resources of all types	[rb] Photo [rb] Collections [ft] Title [ft] Caption [ft] Resource ID(s) [ft] Original filename [ft] Keywords [ft] Extracted text	simultaneously
Princeton Ar- chaeological Archives	-	-	-	[dd] Search by Type	[ft] Search for Keywords [ft] Narrow by Specific Fields (89 options in combination with Boolean operators) [ft] Search by a range of ID#s [dd] Search by Collection [ft] Search by Tags [dd] Featured/Non-Featured	simultaneously
Ubi Erat Lupa	-	[dd] Date (Phase) [ft] Date from (year) to (year)	[dd] Place of discovery [dd] Ancient place of discovery, Province [dd] Current location	[ft] Inscription text, Type	[ft] Title, Object, Iconography [ft] Number [ft] Museum, Inventory number [ft] Image rights [ft] Literature [ft] Full text search (except place of discovery, current location, museum, ancient place of discovery)	simultaneously
WI-ID	[dd] Artist	[dd] Limit by [century] (earliest)–(latest) [dd] Auction date	[dd] Location	-	[ft] Search by subject keyword(s) [dd] Manuscript number [dd] Author/book [dd] Special collection + [ft] Number	simultaneously

Table A3. Availability of a date filter on online museum collections (February 2021).

Site	Custom Date Range	Epoch/Period
British Museum, London	yes	yes
Cleveland Museum of Art	yes	no
Getty Museum, Los Angeles	no	no
Harvard Art Museums	no	yes
Kunsthistorisches Museum, Vienna	yes	yes
Museum of Fine Arts, Boston	yes	no
Princeton University Art Museum	yes	yes
Staatliche Museen zu Berlin	yes	no
The Metropolitan Museum of Art, New York	no	yes
Victoria and Albert Museum, London	yes	no

Table A4. Searching for Roman and Renaissance material on online museum collections using simple keywords (February 2021).

Site	Browse by Time Period ¹	Browse by Search Term ²	Number of Results	Total Number of Listed Items ³	Share
British Museum, London	-	Roman	317,456	4,500,000	7.05%
	Roman	-	248,533		5.52%
	-	Renaissance	5682		0.13%
Cleveland Museum of Art	-	Roman	1258	63,754	1.97%
	-	Renaissance	472		0.74%
Getty Museum, Los Angeles	-	Roman	13,064	157,493	8.29%
	-	Renaissance	1263		0.80%
Harvard Art Museums, Cambridge, MA	-	Roman	10,262	235,878	4.35%
	Roman periods ²	-	8042		3.41%
	-	Renaissance	50		0.02%
Kunsthistorisches Museum, Vienna (KHM) ³	-	Roman	1937	23,963	8.08%
	-	römisch*	791	23,963	3.30%
	-	Renaissance	117	23,963	0.49%
Museum of Fine Arts, Boston	-	Roman	9955	439,557	2.26%
	-	Renaissance	489		0.11%
Princeton University Art Museum	-	Roman	2319	55,692	4.16%
	Roman Imperial	-	244		0.44%
	-	Renaissance	76		0.14%
Staatliche Museen zu Berlin (SMB)	-	Roman	699	261,679	0.27%
	-	römisch*	22,020		8.41%
	-	Renaissance	657		0.25%
The Metropolitan Museum of Art, New York (MET)	-	Roman	31,426	406,000	7.74%
	-	Renaissance	4241		1.04%
Victoria and Albert Museum, London	-	Roman	9603	1,230,805	0.78%
	-	Renaissance	19,839		1.61%

¹ Period filter, if available (cf. Table A3). 'Renaissance' is not listed as a period. ² Combined results of the filters: 'Roman period' + 'Roman Imperial period, Early' + 'Roman Imperial period, Late' + 'Roman Imperial period, Late, to Early Byzantine' + 'Roman Imperial period, Middle' + 'Roman Republican period' + 'Roman Republican period, Late, to Early Imperial' + 'Roman Imperial period'. ³ A multitude of relevant period filters exist but these can only be selected one at a time. * The asterisk (**) is used to account for the different grammatical forms.

Table A5. Availability of a date filter on art historical and archaeological databases (November 2020).

Site	Focus	Custom Date Range	Epoch/Period
ACOR Photo Archive	Cultural Heritage, Jordan	no	no
Arachne	Archaeology	no	yes
Bibliotheca Hertziana	Art History, Italy	no ¹	no
Bildindex	Art History, predominantly Europe	yes	no
Digital LIMC	Art History, iconography, classical mythology	no	no
Europeana	Cultural Heritage	no	no
KHI Photothek	Art History, Italy	no	no
Manar Al-Athar	Archaeology / Art History, Eastern Mediterranean	no ²	no
Princeton Archaeological Archives	Archaeology	no ²	no
Ubi Erat Lupa	Archaeology, Roman Empire	yes	yes
WI-ID	Art History, iconography	yes	no

¹ A date filter exists but the available options are highly fragmented and neither a customizable range, nor a specific epoch can be selected.

² Functionality exists as an option but does not work in practice.

Table A6. Searching for Roman und Renaissance material on art historical and archaeological databases using simple keywords (February 2021).

Site	Browse by Time Period ¹	Browse by Search Term	Number of Results	Total Number of Listed Items	Share
ACOR Photo Archive (images)		Roman Renaissance	4831 20	31,830	15.18% 0.06%
Arachne (objects)	Römisch Renaissance	Roman römisch* Renaissance	18,644 129,430 595 1 4	4,520,856	0.41% 2.86% 0.01% 0.00% 0.00%
Bibliotheca Hertziana (images)		Roman römisch* Renaissance	692 18,428 310	395,099	0.18% 4.66% 0.08%
Bildindex (objects)		Roman römisch Renaissance	10,462 118,630 547	1,833,998	0.57% 6.47% 0.03%
Digital LIMC (objects)		Roman Renaissance	11 3	unknown	unknown
Europeana (images)		Roman Römisch* Renaissance	140,807 53,306 13,872	52,046,985	0.27% 0.10% 0.03%
KHI Photothek (objects)		Roman römisch* Renaissance	545 659 27	28,851	1.89% 2.28% 0.09%
Manar al-Athar (images)		Roman Renaissance	1284 58	87,528	1.47% 0.07%
Princeton Archaeological Archives (images)		Roman Renaissance	425 4	10,366	4.10% 0.04%
Ubi Erat Lupa ² (images)		Roman römisch* Renaissance	1533 0 0	31,906	4.80% 0.00% 0.00%
WI-ID (images)		Roman Renaissance	11,501 5020	105,880	10.86% 4.74%

¹ Period filter, if available (cf. Table A5). ² A multitude of relevant period filters exist but these can only be selected one at a time. * The asterisk (*) is used to account for the different grammatical forms.

References

- Simon, H.; Hohmann, G.; Verstegen, U. Prometheus—Das verteilte digitale Bildarchiv für Forschung & Lehre. Synergetische Nutzung heterogener Datenbasen in den Geisteswissenschaften. *Inf. Wiss. Prax.* **2002**, *6*, 355–360. [CrossRef]
- Simon, H. “prometheus” und Justitia—Bildarchive der Kunst- und Kulturwissenschaften im Spannungsfeld des medialen Umbruchs hin zu einer digitalen Informationsgesellschaft. In *Forschung und Lehre im Informationszeitalter—Zwischen Zugangsfreiheit und Privatisierungsanreiz*; Pfeifer, K.-N., Gersmann, G., Eds.; De Gruyter: Berlin, Germany, 2007; Volume 4, pp. 65–86.
- Förtsch, R.; Keuler, M. Cologne Digital Archaeology Laboratory—Arbeitsstelle Für Digitale Archäologie. *Köln. Bonn. Archaeol.* **2011**, *1*, 174–176.
- Scheding, P.; Krempel, R.; Remmy, M. “Vom Computer Reden Ist Nicht Schwer...”. Projekte Und Perspektiven Der Arbeitsstelle Für Digitale Archäologie. *Köln. Bonn. Archaeol.* **2013**, *3*, 265–270.
- Scriba, G.; Stockinger, U. Timeo Interretem et Dona Ferentem. On ARACHNE and the Potential and Limits of Publishing Archaeological Catalogues Online. In *Proceedings of the Entre ciência e cultura: Da interdisciplinaridade à transversalidade da arqueologia. Actas das VIII Jornadas de Jovens em Investigação Arqueológica*; Pinto Coelho, I., Bento Torres, J., Serrão Gil, L., Ramos, T., Eds.; CHAM: Lissabon, Portugal, 2016; pp. 497–502.
- Dobreva, M.; O'Dwyer, A.; Konstantelos, L. User needs in digitization. In *Evaluating and measuring the value, use and impact of digital collections*; Hughes, L.M., Ed.; Facet Publishing: London, UK, 2012; pp. 73–102. ISBN 978-1-85604-720-3.
- Ross, C.; Terras, M. Scholarly Information-Seeking Behaviour in the British Museum Online Collection. In *Museums and the Web 2011: Proceedings*; Trant, J., Bearman, D., Eds.; Archives & Museum Informatics: Toronto, ON, Canada, 2011.
- Ross, C.; Terras, M.; Motyckova, V. Measuring impact and use: Scholarly information-seeking behaviour. In *Evaluating and Measuring the Value, Use and Impact of Digital Collections*; Hughes, L.M., Ed.; Facet Publishing: London, UK, 2012; pp. 85–102. ISBN 978-1-85604-720-3.
- Villaespesa, E. Who Are the Users of The Met's Online Collection? *Metrop. Mus. Art* **2017**. Available online: <https://www.metmuseum.org/blogs/collection-insights/2017/online-collection-user-research> (accessed on 11 November 2020).
- Pandey, S.; Kumar, S. A Study of Information Seeking Behavior of Users in Rajasthani Art and Culture. *Libr. Waves—Biannu. Peer Rev. J.* **2019**, *5*, 8–19.
- Beaudoin, J.E.; Brady, J.E. Finding Visual Information: A Study of Image Resources Used by Archaeologists, Architects, Art Historians, and Artists. *Art Doc. J. Art Libr. Soc. N. Am.* **2011**, *30*, 24–36. [CrossRef]
- Münster, S.; Kamposiori, C.; Friedrichs, K.; Kröber, C. Image Libraries and Their Scholarly Use in the Field of Art and Architectural History. *Int. J. Digit. Libr.* **2018**, *19*, 367–383. [CrossRef]
- Nelson, R.S. The Map of Art History. *Art Bull.* **1997**, *79*, 28–40. [CrossRef]
- Angelov, D. Byzantinism: The Imaginary and Real Heritage of Byzantium in Southeastern Europe. In *New approaches to Balkan studies*; Keridis, D., Elias-Bursac, E., Yatromanolakis, N., Eds.; Brassey's: Dulles, VA, USA, 2003; ISBN 978-1-57488-724-2.
- Cameron, A. The Absence of Byzantium. *Nea Estia* **2008**, *1807*, 4–59.
- Marsili, G.; Orlandi, L.M. Digital Humanities and Cultural Heritage Preservation: The Case of the BYZART (Byzantine Art and Archaeology on Europeana) Project. *Stud. Digit. Herit.* **2019**, *3*, 144–155. [CrossRef]
- Rannharter, N.; Teetor, S. Challenges of Building and Maintaining an Image Database: A Use Case Based on the Digital Research Archive for Byzantium (BIFAB). *Mitteilungen Ver. Österr. Bibl. Bibl.* **2017**, *70*, 208–224. [CrossRef]
- Knaus, G. *Leitfaden für digitales Sammlungsmanagement an Kunstmuseen*; Bracht, C., Ed.; Deutsches Dokumentationszentrum für Kunstgeschichte—Bildarchiv Foto Marburg; Museum für Kunst und Kulturgeschichte, Philipps-Universität Marburg: Marburg, Germany, 2019. [CrossRef]
- CIDOC CRM. Available online: <http://www.cidoc-crm.org/> (accessed on 5 January 2021).
- Categories for the Description of Works of Art (CDWA) (Getty Research Institute)—16. Subject Matter. Available online: https://www.getty.edu/research/publications/electronic_publications/cdwa/18subject.html (accessed on 17 November 2020).
- The Getty Research Institute. Getty Vocabularies. Available online: <https://www.getty.edu/research/tools/vocabularies/index.html> (accessed on 6 December 2020).
- Metadata and Vocabularies for Archaeological Datasets—ARIADNEplus Training Hub. Available online: <https://training.ariadne-infrastructure.eu/metadata-and-vocabularies-for-archaeological-datasets/> (accessed on 9 February 2021).
- Sbarbati, S. About the Project. Available online: <https://www.parthenos-project.eu/about-the-project-2> (accessed on 9 February 2021).
- Lewis, M.J. Islam by Any Other Name: On the Met's Reopening of the Galleries for the Art of the Arab Lands, Turkey, Iran, Central Asia, and Later South Asia. *New Criterion* **2011**, *30*, 1–6.
- Shalem, A. What Do We Mean When We Say 'Islamic Art'? A Plea for a Critical Rewriting of the History of the Arts of Islam. *J. Art Hist.* **2012**, *6*, 1–18.
- Shaw, W.M.K. *What Is “Islamic” Art?: Between Religion and Perception*; Cambridge University Press: Cambridge, UK, 2019; ISBN 978-1-108-47465-8.
- Freire, N.; Robson, G.; Howard, J.B.; Manguinhas, H.; Isaac, A. Cultural Heritage Metadata Aggregation Using Web Technologies: IIF, Sitemaps and Schema.Org. *Int. J. Digit. Libr.* **2020**, *21*, 19–30. [CrossRef]
- Fafalios, P.; Holzmänn, H.; Kasturia, V.; Nejdil, W. Building and Querying Semantic Layers for Web Archives (Extended Version). *Int. J. Digit. Libr.* **2020**, *21*, 149–167. [CrossRef]

29. Commare, L. Social Tagging als Methode zur Optimierung Kunsthistorischer Bilddatenbanken—Eine empirische Analyse des Artigo-Projekts. *Kunstgesch. Open Peer Rev. J.* **2011**. Available online: <https://www.kunstgeschichte-ejournal.net/160/> (accessed on 30 October 2021).
30. Earle, E.F. *Crowdsourcing Metadata for Library and Museum Collections Using A Taxonomy of Flickr User Behavior*; Cornell University: Ithaca, NY, USA.
31. Payant, A.; Skeen, B.; Arnljots, A.-M.; Williams, R. Beyond Crowdsourcing: Working with Donors, Student Fieldworkers, and Community Scholars to Improve Cultural Heritage Collection Metadata. *J. Digit. Media Manag.* **2020**, *8*, 242–253.
32. Salmi, H.; Laine, K.; Röpötti, T.; Kallioniemi, N.; Karvo, E. Crowdsourcing Metadata for Audiovisual Cultural Heritage: Finnish Full-Length Films, 1946–1985. In *Proceedings of the CEUR-WS Digital Humanities in the Nordic Countries Conference (DHN 2020)*, Riga, Latvia, 21–23 October 2020; pp. 325–332.
33. Avgousti, A.; Papaioannou, G.; Gouveia, F.R. Content Dissemination from Small-Scale Museum and Archival Collections: Community Reusable Semantic Metadata Content Models for Digital Humanities. *Code4Lib J.* **2019**, *43*. Available online: <https://journal.code4lib.org/articles/14054> (accessed on 30 October 2021).
34. Riley, J. *Understanding Metadata: What Is Metadata, and What Is It For?: A Primer* | NISO Website; National Information Standards Organization (NISO): Baltimore, MD, USA, 2017; ISBN 978-1-937522-72-8.
35. Berners-Lee, T. Linked Data—Design Issues. Available online: <https://www.w3.org/DesignIssues/LinkedData.html> (accessed on 6 January 2021).
36. Linked Open Data. Available online: <https://pro.europeana.eu/page/linked-open-data> (accessed on 10 February 2021).
37. Haslhofer, B.; Isaac, A. Data.Europeana.Eu—The Europeana Linked Open Data Pilot. 6 October 2011, pp. 94–104. Available online: https://www.researchgate.net/publication/268428958_The_Europeana_Linked_Open_Data_Pilot (accessed on 4 September 2021).
38. Community—IIIF | International Image Interoperability Framework. Available online: <https://iiif.io/community/> (accessed on 10 February 2021).
39. Broder, A. A Taxonomy of Web Search. *ACM SIGIR Forum* **2002**, *36*, 3–10. [CrossRef]
40. The Prometheus Image Archive: High-Quality Images from the Fields of Arts, Culture and History. Available online: <https://www.prometheus-bildarchiv.de/> (accessed on 13 November 2020).
41. Artstor. Available online: <https://www.artstor.org/> (accessed on 5 December 2020).
42. Agapitos, P. Late Antique or Early Byzantine? The Shifting Beginnings of Byzantine Literature. *Rendiconti Cl. Lett. E Sci. Morali E Stor.* **2012**, *146*, 3–38. [CrossRef]
43. Cameron, A. Late Antiquity and Byzantium: An Identity Problem. *Byzantine Mod. Greek Stud.* **2016**, *40*, 27–37. [CrossRef]
44. Jurković, M. Quo Vadis Late Antiquity? Quo Vadis Middle Ages? *Hortus Artium Mediev.* **2019**, *25*, 137–139. [CrossRef]
45. Byzantine (Culture and Style). Available online: <http://vocab.getty.edu/page/aat/300020669> (accessed on 25 August 2021).
46. Clarke, M. Early Christian. In *The Concise Oxford Dictionary of Art Terms*; Oxford University Press: Oxford, UK, 2010; ISBN 978-0-19-956992-2.
47. Early Christian. Available online: <http://vocab.getty.edu/page/aat/300020665> (accessed on 25 August 2021).
48. Late Antique. Available online: <http://vocab.getty.edu/page/aat/300020666> (accessed on 24 August 2021).
49. Kaldellis, A. Late Antiquity Dissolves. Available online: <https://marginalia.lareviewofbooks.org/late-antiquity-dissolves-by-anthony-kaldellis/> (accessed on 29 December 2020).
50. Roman (Ancient Italian Culture or Period). Available online: <http://vocab.getty.edu/page/aat/300020533> (accessed on 25 August 2021).
51. Renaissance. Available online: <http://vocab.getty.edu/page/aat/300021140> (accessed on 25 August 2021).
52. Manar Al-Athar الرئيسية الصفحة. Available online: <http://www.manar-al-athar.ox.ac.uk/> (accessed on 1 November 2020).
53. Ikonen Museum: Sammlung. Available online: <https://ikonen-museum.com/ikonen-museum/sammlung> (accessed on 30 November 2020).
54. Museo dell’alto Medioevo “Alessandra Vaccaro”. Available online: <http://museociviltà.beniculturali.it/museo-vaccaro/> (accessed on 9 February 2021).
55. Museo Nazionale Del Bargello. Available online: <https://www.bargellomusei.beniculturali.it/musei/1/bargello/> (accessed on 9 February 2021).
56. Barsanti, C. The Fate of the Antioch Mosaic Pavements: Some Reflections. *Uludag Univ. J. Mosaic Res.* **2012**, *5*, 25–42.
57. Fountain Mosaic: Eroses Riding Dolphins and Fishing, Late 3rd Century A.D. Available online: <https://artmuseum.princeton.edu/collections/objects/21662> (accessed on 11 November 2020).
58. Digital Photo Library—Kunsthistorisches Institut in Florenz. Available online: <http://photothek.khi.fi.it/> (accessed on 1 November 2020).
59. Photographic Collection. Available online: <https://www.biblherzt.it/en/photographic-collection> (accessed on 12 November 2020).
60. The Photographic Collection. Available online: <https://warburg.sas.ac.uk/library-collections/photographic-collection> (accessed on 12 November 2020).
61. The Warburg Institute Iconographic Database. Available online: https://iconographic.warburg.sas.ac.uk/vpc/VPC_search/main_page.php (accessed on 2 November 2020).

62. Digital LIMC. Available online: <https://www.weblimc.org/> (accessed on 14 November 2020).
63. Bildindex der Kunst und Architektur. Available online: <https://www.uni-marburg.de/de/fotomarburg/researchieren/bildindex> (accessed on 12 November 2020).
64. Über Uns—Bildindex Der Kunst & Architektur. Available online: <https://www.bildindex.de/cms/homepage/ueber-uns/> (accessed on 12 November 2020).
65. Das Projekt—Bildindex Der Kunst & Architektur. Available online: <https://www.bildindex.de/cms/homepage/ueber-uns/das-projekt/> (accessed on 28 August 2021).
66. Europeana. Available online: <https://www.europeana.eu/en> (accessed on 2 November 2020).
67. Europeana Pro—Our Mission. Available online: <https://pro.europeana.eu/about-us/mission> (accessed on 12 November 2020).
68. About IDAI.Objects Arachne. Available online: <https://arachne.dainst.org/info/about> (accessed on 12 November 2020).
69. Ubi Erat Lupa—Bildindexbank Zu Antiken Steindenkmälern. Available online: <http://lupa.at> (accessed on 1 November 2020).
70. ACOR Photo Archive. Available online: <https://photoarchive.acorjordan.org/> (accessed on 1 November 2020).
71. Summary—ACOR Photo Archive. Available online: <https://photoarchive.acorjordan.org/about-our-collections/> (accessed on 12 November 2020).
72. Archaeological Archives. Available online: <http://vrc.princeton.edu/archives/> (accessed on 12 November 2020).
73. Dumbarton Oaks Online Collections. Available online: <https://www.doaks.org/resources/online-collections> (accessed on 22 November 2020).
74. The Digital Research Archive for Byzantium (DiFaB). Available online: <https://difab.univie.ac.at/en/difab/> (accessed on 26 August 2021).
75. BYZART—Byzantine Art Thematic Collection. Available online: <https://byzart.eu/> (accessed on 26 August 2021).
76. Metadata Modelling—BYZART. Available online: <https://byzart.eu/helpdesk/helpdesk-metadata-modelling> (accessed on 26 August 2021).
77. Vocabulary—BYZART. Available online: <https://byzart.eu/vocabulary> (accessed on 26 August 2021).
78. FOTOTHEK | FOTOTECA | PHOTO COLLECTION | PHOTOTHÈQUE: OPAC—Version 2.4.0 2007–2020 (Bibliotheca Hertziana, Max-Planck-Institut Für Kunstgeschichte, Rom)—Startseite. Available online: <http://foto.biblherz.it/exist/foto/search.html> (accessed on 12 November 2020).
79. Jagdmosaik, S. Megalopsychia-Mosaik. Available online: <https://arachne.dainst.org/entity/1376477> (accessed on 21 November 2020).
80. ARIADNE: The Way Forward to Digital Archaeology in Europe. Available online: <https://arachne.dainst.org/project/ariadne> (accessed on 10 February 2021).
81. Pamir, H. Antakya Kent İçi Kurtarma Kazıları. In *Uluslararası Çağlar Boyunca Hatay ve Çevresi Arkeolojisi Sempozyumu Bildirileri, 21–24 Mayıs 2013 Antakya/The Proceedings of the International Symposium on the Archeology of Hatay and Its Vicinity through the Ages, 21–24 May 2013 Antakya*; Özfirat, A., Uygun, Ç., Eds.; Mustafa Kemal Üniversitesi Yayınları: Antakya, Turkey, 2014; pp. 101–114. ISBN 978-975-7989-50-9.