

Metadata for Digital Collections

SECOND EDITION

A HOW-TO-DO-IT MANUAL®

Steven Jack Miller

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Preface

Good-quality metadata is critical for providing intellectual access to the ever-increasing number of digital collections being created by libraries, archives, historical societies, museums, galleries, and other cultural heritage organizations. Without good metadata, digital resources would be underutilized, if not useless, because potential users would be unable to search, browse, filter, gather, and evaluate them, nor would they likely even discover their existence in the first place. Information professionals charged with organizing these collections need guidance. This new edition of *Metadata for Digital Collections: A How-To-Do-It Manual* introduces readers to fundamental concepts and practices in a style accessible to beginners and library and information studies students as well as experienced practitioners with little formal metadata training. Unlike many other metadata texts, this book focuses on the hands-on practice of designing and creating metadata for digital collections, taking into account the widespread use of digital collection management systems such as CONTENTdm, but it also covers foundational metadata principles and standards that underlie good practice.

Since the first edition of this book was published in 2011, the world of cultural heritage metadata has gone through a number of changes. By far the most significant change has been the growth of the Linked Data movement. The topic of Linked Data has dominated metadata literature, conference presentations, and workshops since 2011. Yet the basics of how to create good quality, shareable, and interoperable metadata using standardized element sets, controlled vocabularies, and data formatting practices have not changed significantly during that time. In fact, the same fundamental metadata issues, problems, and solutions that arose in the 1990s and 2000s have recurred in metadata literature and practice during the 2010s and on into the 2020s, and will almost certainly continue well into the future.

Every chapter in the first edition of this book has been reworked in various ways, some major, others relatively minor, for this second edition.

Chapter 2 includes a new section on approaching metadata specifically as *data*, rather than simply as text, for machine-processing, and presents some basics on how computers process metadata as data. Teaching experience has revealed this is a gap in many people's understanding and application of metadata. This chapter also includes a new section listing metadata elements

commonly needed for digital collection resource description regardless of any specific standardized metadata scheme.

The introduction to Dublin Core, presented in chapter 2 of the first edition, has been moved into a new chapter 3, with expanded coverage of the full set of Dublin Core Metadata Terms. All but one of the subsequent chapters have therefore been renumbered. The detailed tables comparing elements from Dublin Core, MODS, and VRA in the chapters dealing with the details of resource description in the first edition have been eliminated, and a single high-level mapping table is included in an appendix.

To address Linked Data developments, this second edition includes new information about Linked Data in several chapters where it is relevant to the topics covered, including those on controlled vocabularies, MODS, and VRA. Most important, the second edition includes a fully revised and greatly expanded chapter 11 on Linked Data, including Linked Data models called *ontologies*, that will help readers understand the basic concepts and terminology of these areas. This will enable readers to better follow current discussions and developments as well as provide some groundwork for their own Linked Data work.

The chapter on metadata interoperability and quality (chapter 10 in this edition) now includes coverage of the widely adopted OpenRefine software for cleaning up and remediating metadata in large batches of records.

The first edition's chapter on designing and documenting a metadata scheme or application profile has been reworked with new, real-world examples of two Dublin Core and one MODS application profiles. Now chapter 12, it has been placed last because it functions as a kind of summation of all that came before it in the book, and because the chapter might be a source for a final class project for students.

Bibliographical references in every chapter, along with the full bibliography, have been updated to include important books, articles, and web resources introduced since the first edition, and several older, less-relevant references have been removed. This second edition also contains an extensive glossary of the most important metadata terms and concepts covered in the book, including many related to Linked Data and ontologies, as well as a separate acronym glossary.

As with the first edition, rather than giving a cursory survey of a large number of diverse metadata schemes or element sets, this second edition of *Metadata for Digital Collections* also covers only three of the schemes most commonly used for general digital resource description, namely, Dublin Core, MODS, and VRA, in order to allow each of these schemes to be addressed in greater depth. Numerous practical examples illustrate and clarify common application issues and challenges. The book is filled with screen captures, diagrams, and tables. It provides detailed, practical guidance on applying each of the Dublin Core elements and qualifiers, and takes special care to clarify those most commonly misunderstood. It includes a step-by-step guide on how to design and document a metadata application profile for local institutional needs and for specific digital collection projects. This

edition also addresses topics such as controlled vocabularies, XML encoding, interoperability, OAI harvesting, and metadata quality control, and explains their relevance to current practitioners and students. Those who work through the entire book will be well equipped to engage in concrete metadata work and prepared to enter the professional marketplace; as well, they will be ready to learn additional metadata topics and schemes such as Encoded Archival Description (EAD) if they so desire.

This book is intended primarily, but not exclusively, for the following audiences:

- Practitioners and students who need a practical introduction to metadata for practical implementation and want a detailed guide to applying Dublin Core in practice
- Practitioners who work in small- to medium-sized libraries, museums, archives, and other institutions, rather than in the largest, most well-funded research and academic institutions
- Practitioners who are short on time, staff, budget, programming expertise, professional reading, or formal metadata education
- Users of out-of-the-box digital collection software packages such as CONTENTdm, LUNA, Greenstone, or Omeka
- Students and instructors in schools of library and information studies and continuing education courses and workshops who desire an introduction to foundational metadata principles and the world of practice experienced by the previous audiences

Organization and Scope

Metadata for Digital Collections is organized into twelve chapters that progressively build on one another in order to introduce fundamental concepts and practices. The book's design also facilitates practitioners who need on-the-run guidance to independently consult chapters.

Chapter 1 introduces basic metadata concepts, definitions, functions, and types. This chapter, and indeed the entire book, emphasizes the creation of metadata to perform important *functions* for users of digital collections, including searching, browsing, navigating, identifying, and interpreting digital texts, images, and other resources. Chapter 1 goes on to review the larger digital collection creation process, of which metadata is but one piece, followed by a brief overview of the process of designing a metadata scheme or application profile for local use.

The next group of chapters explores the most common kinds of information needed to describe and provide access to digital resources and gives practical guidance on understanding and applying the Dublin Core Metadata Element Set (DCMES). Chapters 2 through 5 accomplish this as they dig into the nitty-gritty challenges faced by metadata designers and creators by addressing such questions as these:

- What is a “digital object” or “resource,” and what aspects of it should a good metadata record describe and represent?
- How do I balance the meaning of local elements devised for a specific collection with the meaning of standardized elements, such as Dublin Core (DC), to which they are mapped?
- How do I deal with information about both the digitized and the original physical versions of a resource when each has its own creator, date, identifier, and other characteristics?
- What do each of the fifteen Dublin Core metadata elements mean, what qualifiers can be used with each, and how do I correctly apply them in practice?
- What is the meaning of, and difference between, the Dublin Core *Type* and *Format* elements and the *Relation* and *Source* elements?
- How should I devise titles for resources such as local photographs that have no preassigned titles?
- How do I analyze the subject content of a resource, including images, and represent it using metadata terms?

Chapter 2 introduces fundamental resource description concepts and issues encountered when creating metadata for digital collections, such as those addressed in the questions above, and focuses on metadata as *data* for machine-processing and how computers process that data. It concludes with a list of elements commonly needed for digital collection resource description regardless of which specific metadata element set or scheme is being used.

Chapter 3 introduces the Dublin Core Metadata Element Set (DCMES or DC), the most commonly used metadata scheme for digital collections, including Simple (unqualified) and Qualified Dublin Core, as well as the complete set of DC Metadata Terms beyond the original fifteen elements.

Metadata professionals face many practical challenges in the application of elements needed to address user needs and system functionality related to titles, identifiers, dates, languages, names, responsibility, and intellectual property. Chapter 4 delves into these issues in depth. After looking at general needs and practices, it details how to apply the relevant Dublin Core elements for each of these aspects. Chapter 5 continues this approach, focusing on more complex and challenging elements and practices, including resource types and formats, subject analysis and representation by means of subject terms and descriptions, and relationships among different resources. The chapter then details how to apply the relevant Dublin Core elements for each.

Controlled vocabularies are critical to facilitating resource discovery for users. Chapter 6 provides an overview of different types of vocabularies, such as lists, taxonomies, thesauri, and subject heading schemes. It then examines some of the most commonly used established vocabularies and discusses the process of creating an institution’s own local vocabularies.

The chapter includes a section on the publication of most of the common established vocabularies as Linked Data.

Chapter 7 provides a simple introduction to the basics of XML, focusing on those aspects needed to “read” and understand an XML-based metadata record. It includes examples of Dublin Core and MODS XML records, and concludes with a guide to the anatomy of an XML metadata record.

MODS, the Metadata Object Description Schema, is the subject of chapter 8, which gives an overview of the MODS elements, subelements, and attributes; examples of MODS records; and issues in mapping from Dublin Core to MODS. It includes the use of URLs in MODS for terms expressed as Linked Data. The chapter emphasizes the value of learning something about MODS even if it is not used in practice. Studying MODS provides, for example, an opportunity to compare Dublin Core with a more complex, XML-based general resource description scheme, among other values.

Chapter 9 surveys the Visual Resources Association Core Categories (VRA Core) for works of art, architecture, and visual culture, and reviews both the relatively DC-like VRA 3.0 and the relatively MODS-like VRA 4.0, accompanied by record examples of each. VRA is covered in much less detail than DC or MODS, and it is included primarily for purposes of further comparison and contrast with those two schemes.

In the current and future metadata environments, practitioners must consider the usability of their local metadata outside of its original context. Chapter 10 investigates a set of interrelated topics concerned with metadata interoperability, including the viability of metadata for future system migration; sharing metadata within an institution or with a consortium or a third-party aggregator; metadata harvesting, especially the use of the OAI harvesting protocol; metadata processing; crosswalks and mapping among different element sets; as well as metadata quality indicators, assessment methods, and remediation or cleanup methods and tools. The chapter concludes with five concrete practices that implementers can follow to improve their metadata quality and interoperability from the start.

Chapter 11 serves as a beginner’s-level introduction to metadata as Linked Data for the Semantic Web. This includes the foundational Resource Description Framework (RDF) data model, the components of RDF “triple statements,” the use of URIs as globally unique identifiers for entities in the world, the distinction between entities and “literals,” and examples of machine-readable syntaxes for RDF data. The chapter offers examples of linked data in action on the web and for digital collections. It explores the components of Linked Data schemes or models, typically called *ontologies*, that are composed of *classes* and *properties* and other specifications. The chapter goes on to introduce the ontologies for DC, MODS, BIBFRAME, SKOS, and Schema.org. It concludes with a discussion about Linked Data in practice. Even for those not currently working with metadata as Linked Data, some basic familiarity with these topics is valuable for current awareness, potential future practice, and when interviewing for positions in the field.

Frequently, metadata project managers must not only create metadata, but also design and document their own local metadata schemes or application profiles. Chapter 12 details a step-by-step process for assessing the context, content, and users of a digital collection or set of collections; developing a set of functional requirements; selecting or creating a set of metadata elements and determining the element and database field specifications to meet those functional requirements; and presents examples of and best practices for documenting a scheme. The chapter looks at two basic models of metadata design: (a) selecting and adapting an established scheme such as Dublin Core or MODS to serve multiple collections within an institution or consortium, and (b) creating collection-specific elements and mapping them to an established scheme such as Dublin Core (the typical CONTENTdm method).

Not all of the information in every chapter will be relevant to all practitioners. For example, the chapters on MODS and VRA may not be of interest to practitioners using only Dublin Core. But, as mentioned previously, a study of a hierarchically nested XML-based scheme such as MODS has great value for better understanding simpler, flatter schemes such as DC: for developing a better sense of the strengths and limitations of DC, for better understanding hands-on issues of mapping from one scheme to another, and for gaining insight into the types of metadata schemes that could possibly supersede DC for digital collections in the future. Learning some basics about topics such as XML, interoperability, harvesting, aggregating, and Linked Data will help broaden and deepen metadata practitioners' knowledge of their field of practice and might also suggest unforeseen practical applications.

One aspect of this second edition's organization deserves special note. When creating a digital collection, the first step is to design a metadata scheme or application profile. Yet this edition of *Metadata for Digital Collections* covers this topic in its final chapter rather than in the second chapter. Experience has shown that in order to design a well-developed and effective metadata scheme, the designer needs a solid foundational knowledge of resource description and controlled vocabularies, the meaning and application of the standard scheme (e.g., Dublin Core, MODS, or VRA) selected as the basis for the local scheme, and some familiarity with interoperability, harvesting, and mapping for metadata shareability and long-term usability.

A major challenge in writing a book on metadata principles and practice is the deep interrelatedness of most of the topics covered in the different chapters. A book must necessarily cover these in some kind of progressive order, but the majority of topics interrelate with one another such that they give a complete picture of metadata basics only when taken together. For example, chapter 10 on metadata interoperability covers metadata principles and practices deeply related to the content of chapters 2, 4, and 5.

When reading and consulting this book, readers are cautioned to *not* take the Dublin Core or MODS examples as paradigms for a single “correct” way to create metadata. Non-MARC metadata is very different from library cataloging, in which there often *is* a single correct way of entering RDA-based cataloging data into specific MARC fields or post-MARC elements. All of the concrete metadata record examples in this book assume the use of some kind of local or consortial application profile with its own specifications for the application of Dublin Core or MODS, often including its own local element names—specifications that are *not* universally applicable. These examples are purely illustrative, not normative.

Metadata for Digital Collections provides a practice-oriented approach to learning about and applying metadata based on the author’s many years of professional library work and of teaching both students and working professionals. Readers will come away with a solid working knowledge of metadata for digital resources that they can put to use in their jobs or take with them into today’s professional marketplace.

FOR REVIEW ONLY

Introduction to Metadata for Digital Collections

1

Metadata is a broad generic term that encompasses a wide variety of specific types of information that is either created or captured about information resources. Various kinds of metadata are used today in a wide variety of contexts, including government, research, education, health care, law, business, and e-commerce. This book focuses on one particular type of metadata, usually called *descriptive metadata*, and on its application in one particular type of context, namely online collections of digital objects, such as digital images, texts, sound files, and video files, within cultural heritage institutions such as libraries, archives, historical societies, museums, and galleries.

IN THIS CHAPTER

- ✓ 1.1. What Is Metadata?
- ✓ 1.2. What Is a Digital Collection?
- ✓ 1.3. What Does Metadata Do?
- ✓ 1.4. Types of Metadata
- ✓ 1.5. Metadata Standards
- ✓ 1.6. Creating a Digital Collection
- ✓ 1.7. Metadata for Digital Collections
- ✓ 1.8. Summary
References

1.1. What Is Metadata?

Metadata is a term used to refer to a particular kind of data or information. It is data or information that is *about* other data or information resources, such as a book, an audio file, a scientific data set, or a digital image. The term *metadata*, like the term *data*, is technically plural, but it is most frequently used as if it were a singular term. Metadata is data or information that enables people to perform certain functions in relation to the information resources that the metadata is about. Metadata is information that is distinct from the resource which it is about, even when the metadata is embedded within a digital resource. The term *metadata* itself is a combination of the Greek prefix *meta* and the Latin word *data*.

- **Meta:** after, higher, relating to or based on, an abstraction level higher than the current, that which is about something else.
- **Data:** bits of information processable by computers, and by extension any information-bearing entity including books and films.
- **Metadata:** data about data, or information about information resources.

Many knowledgeable writers have composed concise definitions of the general concept of metadata. Here are some examples.

Metadata is structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use, or manage an information resource. Metadata is often called data about data or information about information (NISO 2004).

Metadata, literally “data about data”—specifically, descriptive metadata—is structured data about anything that can be named, such as web pages, books, journal articles, images, songs, products, processes, people (and their activities), research data, concepts, and services. Now a mainstream concept, metadata first trended in 1995, closely following World Wide Web in 1994 (DCMI 2020).

Metadata is pervasive in information systems, and comes in many forms. The core features of most software packages we use every day are metadata-driven. People listen to music through Spotify; post photos on Instagram; locate video on YouTube; manage finances through Quicken; connect with others via email, text, and social media; and store lengthy contact lists on their mobile devices. All of this content comes with metadata—information about the item’s creation, name, topic, features, and the like. Metadata is key to the functionality of the systems holding the content, enabling users to find items of interest, record essential information about them, and share that information with others (Riley 2017: 2).

Perhaps a more useful, “big picture” way of thinking about metadata is as the sum total of what one can say at a given moment about any information object at any level of aggregation (Gilliland 2016).

D. Grant Campbell explains that

Metadata is difficult to define as an activity for two primary reasons. First, unlike library cataloging, metadata development involves a large number of varied stakeholders. . . . Second, metadata evolved from several different communities, each with its own disciplinary background and objectives (2005: 59).

According to Campbell, these include but are not limited to libraries, database design, records management, and computer science and programming.

A good way to help clarify the meaning of metadata, for those who are completely new to the concept, is to look at some concrete examples. All of us have encountered metadata in one form or another many times in our lives, although until roughly the last decade or so most of us would not

have called it by that name. In its broadest sense, metadata can include the information on the title page and other preliminary pages of a book, giving information *about* the book, such as title, author, publisher, date, and so forth. Product information printed on a packaged grocery item that lists its contents can be considered metadata: it is data or information *about* the food contained in the package.

To take another example, Microsoft Word automatically generates some metadata about a document at the time of creation, often including its author and sometimes its title, which can be further edited. Table 1.1 gives an example of some of the kinds of metadata that may be included in a Word document. *Author*, *Title*, *Subject*, and *Keywords* are metadata elements, fields, or properties, and the information in the boxes is the content or value of each element. In this example, the data or information object is the Word document. The information shown in table 1.1 is data *about* that document, namely, *metadata*.

TABLE 1.1
Metadata in a Microsoft Word Document

Document Properties	
Author:	Steven J. Miller
Title:	The One-To-One Principle
Subject:	Metadata
Keywords:	metadata, Dublin Core, one-to-one principle

The textual information that appears in various music applications consists of nothing but pure metadata: data *about* each song or piece of music, as illustrated in table 1.2. This information is separate from the music itself, but it enables a user to find songs using several different properties, such as name, album, and composer, to identify information about each song to navigate through the user's collection of digital music, and to pull together sets of songs by the same performer, in the same genre, published in the same year, and so on. These are all classic functions of metadata. The key thing about metadata is *what it is intended to do*. People create metadata to help themselves, their family, friends, customers, or users to find, identify, sort, gather, and navigate collections of music, texts, images, and other resources, among various other functions.

Digital cameras, to use another example, automatically generate various pieces of technical information *about* digital images they've created. These pieces of information may include file name, date created, resolution, file size, make and model of the camera, and exposure time. This kind of information is commonly called *technical metadata*. In the example in table 1.3, the information resource is the digital photograph, and the information in the table is data *about* that photograph, called *metadata*.

The information in a library catalog is a well-known kind of metadata, that is, data or information *about* a book, video, map, or the like that stands

CHAPTER 1

TABLE 1.2

Metadata for an Album of Songs in a Music Application

Name	Album	Composer	Artist	Genre	Year	Track	Time
Changing Opinion	Songs from Liquid Days	Glass, Philip, 1937-	Michael Riesman & Philip Glass Ensemble	Classical	1986	1 of 6	9:56
Lightening	Songs from Liquid Days	Glass, Philip, 1937-	Janice Pendarvis, Michael Riesman, & Philip Glass Ensemble	Classical	1986	2 of 6	6:42
Freezing	Songs from Liquid Days	Glass, Philip, 1937-	Kronos Quartet	Classical	1986	3 of 6	3:16
Liquid Days (Part I)	Songs from Liquid Days	Glass, Philip, 1937-	Michael Riesman, Philip Glass Ensemble & The Roches	Classical	1986	4 of 6	4:46
Open the Kingdom (Liquid Days, Part II)	Songs from Liquid Days	Glass, Philip, 1937-	Douglas Perry, Michael Riesman, & Philip Glass Ensemble	Classical	1986	5 of 6	6:59
Forgetting	Songs from Liquid Days	Glass, Philip, 1937-	Kronos Quartet, Linda Ronstadt, Michael Riesman, Philip Glass Ensemble, & The Roches	Classical	1986	6 of 6	8:10

TABLE 1.3

Technical Metadata about a Digital Photograph

Properties - Metadata	
Filename	IMG_8-31-2010.jpg
Image Format	image/jpeg
Date Created	8/31/2010 3:25 PM
Date Modified	9/02/2010 10:11 AM
Color Mode	RGB
Resolution	1900.00
File Size	6.2 MB
Width	4416
Height	1969

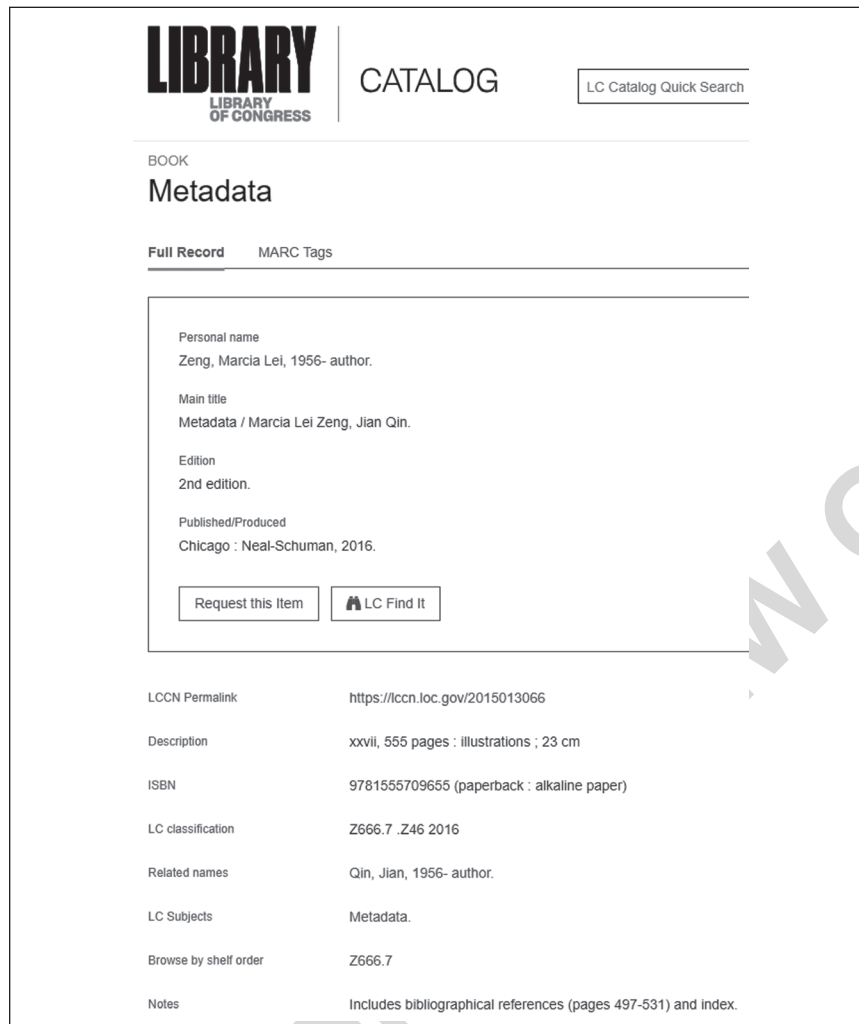
as a concise, humanly constructed surrogate for the actual information resource. It allows users to find, identify, select, and obtain these resources without having to examine every physical item residing in a library or every digital resource licensed by a library. Figure 1.1 shows part of an online library catalog record display for a book. In this context, the data or information object is the book, and the *metadata* is the data in the catalog record *about* the book. The metadata elements include *Personal name*, *Main title*, *Edition*, *Description*, and *LC Subjects*.

Finally, in an example very similar to that of a library catalog record, figure 1.2 shows a digital image of women suffragists picketing in front of the White House in 1917, and table 1.4 gives the metadata *about* that image from one of the Library of Congress's American Memory collections.

As diverse as these examples are, they have several things in common. First, they all consist of a set of **properties** (elements or fields) and a set of **values** for each property. In most of the examples, the properties are displayed to the left of each value. The properties have been invented or selected by human beings because they have been judged to be useful for people to perform some kind of function in relation to the resource. Functions might include finding resources in a database or catalog based on the value of a single property, such as *Title* or *Date*, or gathering together many resources that share the same value for a given property, such as all books by the same author, all songs by the same performer or composer, all images about the same subject or depicting the same location or time period, or all items in the same file format. Metadata allows people to perform various other kinds of functions as well, including managing, structuring, preserving, authenticating, and exchanging those resources. The collection of properties (elements or fields) used in any particular context are often called a *metadata scheme* or *element set*.

FIGURE 1.1

Library Catalog Record: Metadata about a Book



LIBRARY
LIBRARY OF CONGRESS

CATALOG

LC Catalog Quick Search

BOOK

Metadata

Full Record MARC Tags

Personal name
Zeng, Marcia Lei, 1956- author.

Main title
Metadata / Marcia Lei Zeng, Jian Qin.

Edition
2nd edition.

Published/Produced
Chicago : Neal-Schuman, 2016.

Request this Item LC Find It

LCCN Permalink <https://lccn.loc.gov/2015013066>

Description xxvii, 555 pages : illustrations ; 23 cm

ISBN 9781555709655 (paperback : alkaline paper)

LC classification Z666.7 .Z46 2016

Related names Qin, Jian, 1956- author.

LC Subjects Metadata.

Browse by shelf order Z666.7

Notes Includes bibliographical references (pages 497-531) and index.

FIGURE 1.2

Digital Image in an Online Digital Collection

**TABLE 1.4**

Metadata about the Digital Image

Title
The first picket line - College day in the picket line

Summary
Women suffragists picketing in front of the White house.

Created / Published
1917 Feb.

Subject Headings

- White House (Washington, D.C.)-1910-1920
- Demonstrations- Washington (D.C.)-1910-1920
- Suffragists-1910-1920
- Women's suffrage- Washington (D.C.)-1910-1920

Format Headings
Photographic prints-1910-1920.

Notes
Forms part of: National Woman's Party records, Manuscript Division.

Medium
1 photographic print.

Call Number/Physical Location
Item in MSS Coll [Manuscript RR]

Repository
Library of Congress Washington, D.C. 20540 USA

Digital Id
cph 3a32338 //hdl.loc.gov/loc.pnp/cph.3a32338

Library of Congress Control Number
97500299

Reproduction Number
LC-USZ62-31799 (b&w film copy neg.)

Rights Advisory
No known restrictions on publication.

Language
English

Online Format
image

Description
1 photographic print. | Women suffragists picketing in front of the White house.

LCCN Permalink
<https://lccn.loc.gov/97500299>

Additional Metadata Formats
MARCXML Record, MODS Record, Dublin Core Record

Source: Library of Congress, Prints and Photographs Division, Library of Congress Online Catalog, <https://www.loc.gov/item/97500299/>.

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