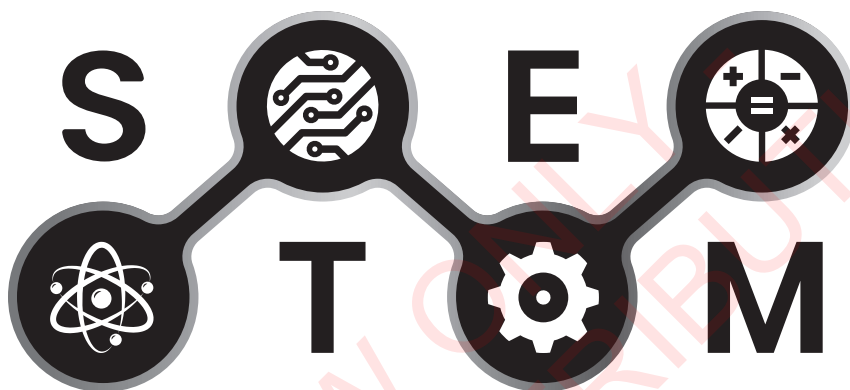


ESSENTIALS OF

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LIBRARIANSHIP

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**Alexander J. Carroll and Joshua Borycz**

*foreword by Carol Tenopir*

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Chicago | 2026

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# FOREWORD

The focus of academic libraries has expanded and changed dramatically in the past thirty to fifty years. From focusing internally on building collections and helping students and faculty who ask to use the tools that point to these collections, academic librarians of the twenty-first century look for opportunities to reach out beyond the library and its collections. Traditionally this was described as moving from “just in case” collections to “just in time” services or resource access. This distinction is still relevant, but modern librarianship goes even further.

The trend is more pronounced in the STEM fields than it is in the humanities and social sciences, meaning STEM librarians especially need to find ways to partner with the faculty and students at all stages of the research life cycle. The research life cycle, from the beginning stages of writing research proposals to the various stages of conducting the research to the final stages of writing papers and submitting research data to data repositories, is complex, with the need for various areas of expertise at each stage. Understanding the complexities of the research process and how and where a library team member’s expertise can best assist is an important role for proactive STEM librarians. *Essentials of STEM Librarianship* addresses this range of complexities and opportunities.

This is not to say that collections and library spaces are irrelevant. Instead, modern STEM librarians can become more of an essential participant in the research enterprise regardless of where relevant resources are kept and where the librarian is standing. Looking outward increases the relevancy and value of the library and library staff to all aspects of research. Some of the essential services covered in the middle chapters will sound very familiar to all librarians, such as searching for, finding, and citing research articles and teaching students to search effectively and understand how to identify high-quality research articles. Other skills and services in these chapters are newer—such as harnessing artificial intelligence and large language models or assisting with research data management. All are part of helping to advance the research enterprise of the institution by building long-lasting relationships with the STEM constituents.

Identifying services that meet current needs is not sufficient, however. It is also important to focus on the whys and hows of building ongoing liaison services between STEM librarians and STEM faculties that will address needs now and into the future as needs evolve or change. Liaison services must focus on meeting the multiple roles that faculty, postgrads, and graduate students play in today’s academic enterprise in a sustainable way. This means not only supporting the teaching mission through a variety of strategies but also advancing

all stages of modern research. A one-time fix is not sufficient—building long-term and sustainable relationships through robust liaison services is an ongoing challenge that this book addresses in detail in the final chapters.

At the same time as the need for proactive STEM librarians is growing in academia and other science organizations, the number of MSLIS students with STEM backgrounds remains low. Even without a STEM background, however, librarians can prepare to serve their communities with the thorough background information that this book provides. Understanding the research enterprise and how faculty, graduate students, postdocs, and undergraduates can be actively assisted by library personnel is essential for building the modern STEM library suite of services, even if the librarian has limited undergraduate or graduate experience in the sciences.

This book is a timely primer to help librarians, aspiring librarians, and administrators understand ways to fill the new and evolving roles of STEM librarians. This is true for readers whether or not they hold an undergraduate or a graduate STEM degree. Early chapters explain basic history, principles, and methods of how and why science happens and the roles and responsibilities of the wide range of constituents in today's modern science enterprise. How librarians can help each constituent at each phase will provide ideas and inspiration no matter the background each reader brings to the book. It is also an ideal textbook for MSLIS classes in STEM librarianship for a wide range of students.

As the authors explain, the reader does not need to read every chapter sequentially and may want to pick and choose depending on their prior experience or background. Here is a primer that will inspire and assist at different levels, from offering insights into the research laboratory work environment and research life cycle to providing guidance and imaginative ways that librarians can assist all STEM participants at every stage of research and education.

The authors are well qualified to help readers fill the need for modern STEM librarians who contribute to this academic science enterprise. Alex Carroll brings to this work over a decade of STEM librarianship expertise, along with experience in library and information science publishing as longtime editor of *JMLA*. Josh Borycz, for his part, earned a PhD in computational chemistry before deciding his heart lay with the information side of research. He subsequently returned to school to earn his master's degree in library and information sciences at the University of Tennessee. I had the pleasure of working with Josh on the National Science Foundation–sponsored DataONE research data project team, a project that brought together nearly 100 researchers, librarians, and data managers to work on challenging research data management issues. From their backgrounds, education, and work as STEM librarians at Vanderbilt, both authors understand the culture and practices of modern sciences and engineering in the academic realm—an understanding that permeates this book in many ways and for many different audiences.

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If you are an administrator who wants to make the library the most relevant source of assistance for the academic STEM community, or an aspiring librarian with a goal of working with STEM constituents in the best ways possible, or a working librarian who hopes to transform an inward-focused library model to an outward-focused modern model and build a robust liaison service, or an instructor for a class in STEM librarianship for a library and information science program, *Essentials of STEM Librarianship* is relevant to all of you. It is a book that you will likely return to as new services or new opportunities arise in building your STEM library future.

**CAROL TENOPIR**

Chancellor's Professor Emerita  
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School of Information Sciences

# INTRODUCTION

STEM librarianship has changed dramatically since the public debut of the World Wide Web in 1991. These changes are reflected in STEM librarian position descriptions as well as in the collections held by STEM libraries.<sup>1,2</sup> Three decades ago, science and engineering librarians could expect to spend their time selecting indexes, journals, and books that their institutions would own in perpetuity. Identifying as subject bibliographers, science librarians would hand select specific books and manage individual serial subscriptions, developing just-in-case collections that were assessed by quantity rather than use.<sup>3</sup> When viewed thirty years later, the priorities of these positions appear remarkably inward; the science bibliographer of thirty years ago purchased items stored within the library, and their public services responsibilities revolved around helping library visitors navigate labyrinthian stacks to find those purchased items.

By contrast, the modern STEM liaison librarian's position has an emphasis on the external. Libraries spend much of their collections budgets licensing online resources that exist outside the physical library entirely and may be paid for on a just-in-time basis to meet users' needs as they occur. These online resources are often bundled together and licensed in multiyear agreements, resulting in collections that provide users with more convenient access to more resources than ever before while also reducing the number of collections decisions for a STEM librarian to make. This shift from internal to external collections has raised two new questions for STEM librarians to consider: How can librarians reach and engage with community members if they no longer need to visit the library? And if STEM community members no longer need to use library spaces, do they still even need librarians?

These questions have reverberated throughout the profession for decades. Discussions among science librarians at conferences and on mailing lists reflect overriding concerns about demonstrating relevance and value in the face of these questions. How can I connect my expertise to my campus's research enterprise? How can I contribute to the teaching mission at my institution? What skills will I need to thrive in these roles? Over time these questions have distilled down into a single, urgent question: What is the purpose of a STEM librarian at the quarter mark of the twenty-first century?

This book is our attempt to answer that question, which we explore over the course of three sections. Part I, which includes chapters 1–5, provides context about the structure and design of science and engineering programs within institutions of higher learning in the United States. Part II, which includes chapters 6–9, discusses the fundamental skills and tools of the trade for STEM

liaison librarians. Part III, which includes chapters 10–13, explores strategies for designing successful service models and sustainable staffing models for liaison librarian programs.

As with reading a scientific article (which we discuss in chapter 7), this book need not be read in sequential order. Although the book's chapters build off one another, we encourage readers to jump to the sections that discuss their needs. An experienced librarian or information professional considering a transition into STEM librarianship may benefit most from part I, which explains how STEM's epistemology, publishing models, and staffing differ from those of other academic disciplines. An early career librarian with a science background, on the other hand, may benefit the most from part II's emphasis on practical skills and tools that will provide value to their community members. Meanwhile library managers and leaders may benefit most from part III, which provides concrete suggestions on how to redesign and redeploy liaison librarians into service models that will align with institutional priorities.

A central premise connects these sections and serves as the heartbeat of this book: *We believe in the role of the liaison librarian.* We think liaison librarians provide unique value to academic libraries by forging meaningful relationships between a library and its community members. These relationships, in turn, enable an academic library to become strategically integrated into an institution's educational programs and research enterprise, enhancing student learning and researcher productivity. To accomplish these goals, the work and identity of STEM liaison librarians must fully reflect the changes we have seen over the past few decades, moving away from a curatorial model that emphasized building collections and toward an engagement model predicated on building relationships. We hope this book helps spark this transformation.

## **How This Book Is Organized**

We have organized *Essentials of STEM Librarianship* into three parts. In the following sections, we provide a brief description of each chapter of the book. This book uses a modified version of the Vancouver citation style commonly used in the life sciences. This style employs a citation-sequence system wherein end-of-chapter references are numbered by the order in which they are first cited rather than arranged alphabetically by author last name.

### **Part I: STEM and the American Higher Education Environment**

Chapter 1, “The State of STEM Education and Academic Libraries,” describes recent trends in higher education enrollment, highlighting the growing importance of STEM degree programs at the undergraduate and graduate levels. We

then consider whether academic libraries are prepared to support colleges and universities that are increasingly STEM focused.

Chapter 2, “What Makes Science Different? Epistemologies and Methodologies,” explores the growth of science as an epistemology and a methodology, outlining some of the major figures who contributed to our previous and current understandings of the scientific method.

Chapter 3, “How Does Science Happen? Research in Practice,” describes how STEM research works in practice, detailing the major funding mechanisms and publication processes that bookend the research enterprise within the American system of higher education.

Chapter 4, “STEM Personas: Researchers, Educators, and Students,” outlines the people who populate the research enterprise and teaching mission of colleges and universities, opening with a detailed description of the research group as a collective unit of interest.

Chapter 5, “STEM Personas: Leaders and Administrators,” profiles the administrators who lead STEM departments within colleges and universities, describing their roles and responsibilities for shepherding the collective efforts of the researchers, educators, and students within their units.

## **Part II: Skills and Knowledge for STEM Librarians**

Chapter 6, “Finding Information and Citing Sources,” describes the information-seeking behaviors of STEM students and researchers, highlighting some of the noteworthy discovery tools available for finding technical information in these fields. We also describe step-by-step strategies for how to teach STEM students structured searching techniques within an information literacy classroom setting. The chapter closes with a discussion of citing information, including suggestions for how librarians should approach teaching novice researchers about scholarly attribution.

Chapter 7, “Reading Literature and Sharing Results,” outlines how STEM research is communicated within primary literature, sharing strategies for reading and writing journal articles efficiently and effectively.

Chapter 8, “Managing Data and Evaluating Research,” describes the challenges and tribulations of managing research data within STEM fields, while also exploring how STEM research is evaluated using research impact metrics.

Chapter 9, “Generative Artificial Intelligence,” outlines the growing field of artificial intelligence (AI) and considers possible implications for the practices of STEM librarians.

### Part III: Designing Successful Liaison Librarian Programs

Chapter 10, “Supporting the Teaching Mission,” provides detailed ideas for engaging with instructors and for developing effective lesson plans to fully integrate into the teaching mission of the university.

Chapter 11, “Advancing the Research Enterprise,” explores the liaison’s potential impact on the research enterprise, outlining effective methods for accelerating research productivity.

Chapter 12, “Building Relationships within STEM Communities,” suggests that relationship management is a key step toward advancing an institution’s teaching and research. We will suggest that rather than being a by-product of supporting teaching and research, relationships with campus stakeholders precede, inform, and enrich a liaison’s professional practice.

Chapter 13, “Designing Sustainable Liaison Librarian Programs: The Team-Based Model,” outlines how transitioning away from the isolating single subject liaison model toward an inclusive team-based liaison model can amplify inroads into the teaching mission and research enterprise, while also meeting the needs of the librarians asked to do this vital work.

#### Notes

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