THE CULTURE OF DIGITAL SCHOLARSHIP IN ACADEMIC LIBRARIES

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Introduction

The Culture of Digital Scholarship

What is the culture of digital scholarship, and what distinguishes it from scholarly culture in general? Where do academic libraries come into the equation, and what are the opportunities and challenges inherent to library staff interested in furthering the development of digital scholarship culture at their institutions?

Let's tackle these questions one by one, starting with some background in digital scholarship.

DIGITAL SCHOLARSHIP AND THE CULTURE OF DIGITAL SCHOLARSHIP

Digital scholarship (DS) a highly interdisciplinary term that encompasses any activity that makes extensive use of digital tools and methods for purposes of teaching or research. This focus on digital tools and methods is what distinguishes it from the more general world of scholarship, particularly in the last few years, as the work of digital scholarship has confronted new sets of questions, problems, and values that have yet to be adopted extensively by more traditional academic circles.

Digital scholarship is also strongly shaped by the sheer diversity of its outputs. As a field, it is composed of an unusually wide variety of works and practices, the specifics of which tend to reflect the values, priorities, opportunities,

and challenges of the surrounding intellectual and technical environment (to say nothing of the ambitions of its individual practitioners). Consequently, at some institutions, it is the topic of a growing conversation among a handful of supporters—perhaps in one department, perhaps across a few. At others it is a full-blown interdisciplinary movement, with robust centers and centralized services already in place to support its advancement and further diversification. Digital scholarship is, to a large extent, at the mercy of its local contexts and stakeholders—even more so than general academic scholarship, which is indeed saying something.

This assertion brings us back to the idea of a culture of digital scholarship, which extends our original definition by recognizing the tensions that exist between the overarching values of digital scholarship and its inevitable localisms. By adding the lens of culture to the mix, we essentially assert that one must consider digital scholarship alongside its everyday realities, from institutional policies and resources to funding conditions and community dynamics. As the theorist Raymond Williams once wrote, "Culture is ordinary: that is where we must start."[1] To embrace the ordinariness of digital scholarship is thus to flesh out its field of discussion, and in the process make attainable what otherwise could seem too perfect, too specialized to be of use to most of us.

A few quick clarifications are in order here.

First, this book's conscious emphasis on culture does not mean that we are here to reject the many excellent treatments of digital scholarship that cross geographies or that specifically target greater trends in the DS field. As mentioned earlier, there are several important questions and issues being productively discussed by experts at the broadest level of digital scholarship. The difference between our work and theirs is simply that they implicitly ask their audiences to do the labor of putting their conclusions through the filter of local DS culture, whereas we are here explicitly to model that practice on behalf of our readership. We'll discuss more about this in a moment.

Second, it's worth pointing out that a single institution may easily include more than one extant culture of digital scholarship, particularly at large universities where deep research silos may be firmly in place. Academic institutions are not monoliths, despite all the implications of their sometimes-Gothic exteriors. Still, there is something to be said for evaluating digital scholarship at the level of the institution, if only for the efficiency it affords stakeholders who seek to encourage a more robust, collaborative, interdisciplinary culture of digital scholarship "at home." Institutions are also a convenient scoping point for academic libraries, which are typically set up to benefit whole campuses, or at least entire research disciplines, and are accustomed to operating in collaboration with other institution-focused units, in addition to specific departments, centers, and so forth.

Which brings us, conveniently, back to libraries and the role they play in digital scholarship.

LIBRARIES AND THE CULTURE OF DIGITAL SCHOLARSHIP

Already we have strongly suggested that academic libraries are one of the stakeholders in the project of digital scholarship. The fundamental reason for this is obvious: all libraries, regardless of type, exist in part to encourage the intellectual growth of their communities. That being said, academic libraries have a special relationship to digital scholarship, which is propelled by three main factors.

1. *Digital scholarship is, by a definition, a subset of scholarship.* This is the least exciting of the three factors, but it also the hardest to argue with. All academic libraries pride themselves on supporting some combination of research, teaching, and learning—activities that are significantly impacted by the modern addition of digital tools, methods, and pedagogies. Libraries must constantly adapt to keep pace with new trends in academia, which makes us stakeholders in institutional digital scholarship culture, wittingly or not.
2. *Academic libraries are a consistent hub of digital scholarship.* Ask yourself: where does digital scholarship live at a college or university? The answers across institutions are remarkably inconsistent, in part because there are few predictable structures across institutions where digital scholarship seems to fit and thrive. Libraries and librarians, however, provide an exception to this inconsistency. Not only do they exist across different academic environments, but their contemporary work with collections, instruction, outreach, preservation, archives, and so on, effectively guarantees that any given academic library helps produce, house, and circulate some quantity of digital scholarship on behalf of users.
3. *Digital scholarship and academic libraries share overlapping values.* Several of our contributors will explore this point in depth—but suffice to say, there is a significant degree of overlap between the emerging topics of concern to the digital scholarship field and those of long-standing importance to segments of the academic library world. Access, for instance, is a driving force behind the actions of both communities—as are values of collaboration, interactivity, interdisciplinarity, sustainability, and more. Practically speaking, the result is that academic library staff have much to offer (and learn from) people interested in engaging further in digital scholarship. Libraries' expertise flows in the same direction as digital scholarship—which gives us the potential to be influencers in local digital scholarship culture, in addition to our role as stakeholders.

We may thus agree that academic libraries and proponents of digital scholarship have a kind of default connection, which varies in degree and shape

from instance to instance but exists nevertheless within the culture of digital scholarship. The tricky part comes when an academic library—or even an individual staff member—decides to develop this connection or otherwise further the DS culture of the surrounding environment.

It is here that we arrive at the purpose of this book, which is to reveal and unpack the opportunities, challenges, questions, and individual personalities that sit at the nexus of academic libraries and digital scholarship culture. To accomplish this task, however, we will not begin from a universal perspective, but instead from what will appear at first to be a highly local one: a single research university, the University of Washington, located in and around the city of Seattle.

THE UNIVERSITY OF WASHINGTON

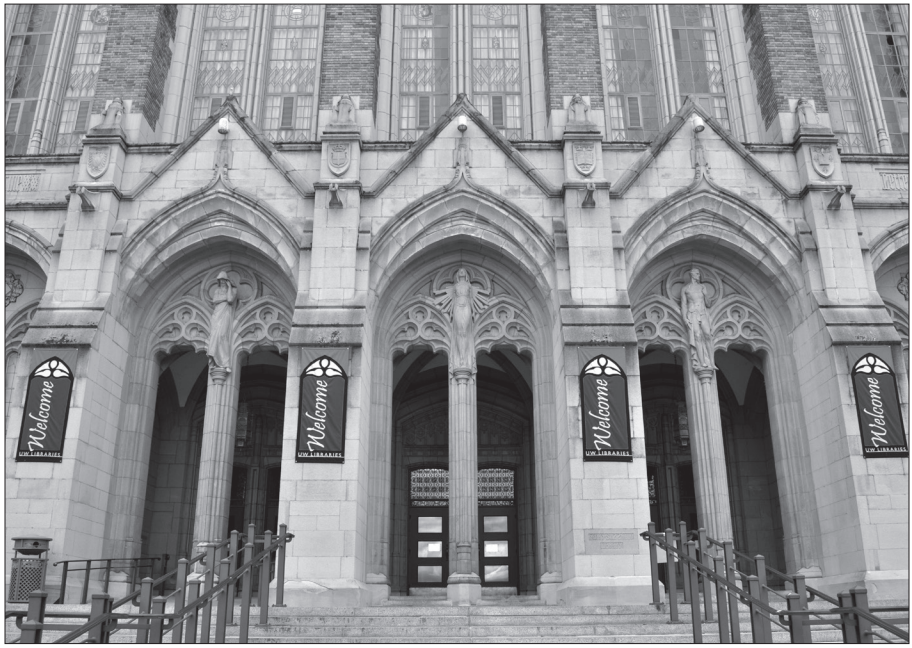
Founded in 1861, the University of Washington (UW) is one of the oldest and largest public universities on the Pacific coast of the United States. Originally based in what is now downtown Seattle, the University relocated in the late nineteenth century to its main campus home, on almost 650 acres of scenic bay-front property in northeast Seattle. In 1990, in response to regional

Courtesy of Joe Mabel.

University of Washington Quad

needs, the University added two more campuses: UW Bothell, to the north of Seattle, and UW Tacoma, to the south. Today, across its three campuses, UW (often locally pronounced "U-Dub") offers over 600 degree options across 300 programs and enrolls the equivalent of nearly 58,000 full-time students—a statistic independent of the nearly 55,000 non-degree students who take classes each year via the University's active professional and continuing education wing. However, even with these impressive teaching impacts, UW is still arguably best known as a public research university. Since 1972, for instance, it has continued to receive more federal funding for research than any other US public university and is one of the few institutions in the United States to receive research funding totaling over $1 billon.[2] That's a lot of dollars, and a lot of research—which helps explain the University's consistent investment in academic libraries, of which it has a whopping sixteen. These libraries—which are collectively known by the organizational name of "UW Libraries"—expend over $50 million annually, and employ nearly 450 librarians, professionals, support staff, and student workers (including virtually all of the contributors to this book).

Such numbers, combined with the well-known commercial success of the greater Seattle region (hello, Microsoft, Amazon, and Boeing), help make UW stand out as something of a powerhouse for teaching, research, and



Courtesy of Joe Mabel.

Exterior of Suzzallo Library

innovation—exactly the sort of place in which one might expect to find strong evidence of digital scholarship and its many academic variants. At the same time, numbers cannot always adequately tell the story of a university's digital scholarship culture—and such is the case with UW. Indeed, even as it houses dozens of the world's top programs in the sciences and social sciences, UW has only recently begun to invest explicitly in its digital scholarship profile, placing its progress arguably behind that of similar R1 universities. It does not, for example, have an interdisciplinary center dedicated exclusively to digital scholarship. And while it does have several librarians and library staff with job titles related to digital scholarship, many of these titles are relatively new, with responsibilities still subject to impending change and interpretation.

All this is to say that although UW is a massive, world-class institution with an abundant set of resources in place to support the cultivation of forward-thinking teaching and research, its specific culture with regard to digital scholarship is still in a state of growth—of rapid and well-established growth, but growth nonetheless. As such, for the ten UW-based contributors to this book, nine of whom hail from the UW Libraries, the opportunity to contribute to a more vibrant culture of digital scholarship is neither a distant memory nor a far-off dream. Instead, each of us comes to this topic with an immediate and unique set of goals and opinions regarding how to develop UW's understanding of digital scholarship, digital humanities, digital pedagogy, and more. We are thus in a position that many academic libraries will find relatable regardless of their size: we are the cheerleaders and counselors of a locally burgeoning academic movement in which we possess significant interest, impressive expertise, and uncertain long-term control. By encouraging a greater culture of digital scholarship at UW, we are paving the way for the UW Libraries' success as much as that of our community of active and would-be-active digital scholars. There is lots of excellent work behind us, but also serious work ahead, the details of which we are eager to share through the chapters in this book.

WHY AND HOW TO USE THIS BOOK

Although this book approaches digital scholarship from the foundation of a single academic institution, it is important to make clear that our aim is not to limit readers to a certain mindset or to tout the merits of UW's way of doing things above all others. Rather, our goal with this book is to do something we see as both unique and valuable: to expose the complexities of the culture of digital scholarship by bringing readers into a shared institutional workspace, and by encouraging them (and you) to move around in it in whatever way makes the most sense for their interests, needs, strengths, and concerns. Think of it as a professional "choose your own adventure," set at the University of Washington but designed to reflect the reader as much as its cast of contributing authors. As you'll find, it doesn't hurt that many of our authors

come from very different positions and units across the UW Libraries, not all of which agree about the best way to move the relationship between digital scholarship and library services forward at the University or in general.

To further encourage exploration, we have organized this book's chapters into three themed sections: Values, Practices, and Environments. The first section, Values, presents chapters by Robin Chin Roemer, Reed Garber-Pearson, and Maryam Fakouri, who are focused on investigating some of the theories and concepts that underlie the field of digital scholarship, and on how these ideas might ground or uproot a greater institutional culture of DS. Values are, without question, an essential part of how DS is able to create collaborations, reach new audiences, and to bring diverse impacts to research and teaching. And yet, as these chapters make clear, the values behind DS aren't just boxes to be checked and forgotten; rather, they can serve as blueprints for building a better, more stable academic future.

The next section, Practices, presents chapters by Verletta Kern, Perry Yee and Elliott Stevens, and Elizabeth Bedford, who are interested in current actualizations of digital scholarship at the University of Washington and elsewhere. From the assessment of DS to its interaction with complexities of library stewardship, these chapters highlight the academic library's role in contributing to an institution's digital scholarship practices, and the challenges staff may face along the way.

Finally, the third section, Environments, presents chapters by Beth Lytle; Jennifer Muilenburg; John Vallier and Andrew Weaver; and Justin Wadland and Marissa Petrich, whose approach to digital scholarship is predominantly based on the perspective of a particular service, department, or campus. By highlighting the unique concerns of each environment *vis à vis* digital scholarship, this section makes an implicit case for the diversity of DS, and underscores DS's sometimes precarious potential to unite different groups in the interest of greater academic progress. Verletta Kern's conclusion further digests and meditates on the synthesis of these three themes and what they mean together for the culture of digital scholarship at the University of Washington, as well as for any academic library interested in catalyzing DS at home or in general.

And so, we embark on a bit of an experiment: a collection of chapters with a single starting place, but many possible endings. You will find it full of success and failure, ambition and frustration, but always invested in the culture of digital scholarship and in the different ways that academic libraries can contribute to its development and strive to affect change over time.

NOTES

1. Raymond Williams, *Resources of Hope: Culture, Democracy, Socialism* (London: Verso, 1989), 3.
2. Numbers are based on the University of Washington Office of Research's Annual Report for Financial Year 2018.

PART I

Values

ROBIN CHIN ROEMER

1

Public Scholarship

As implied by the title of this book's first section, digital scholarship is a term that implicates not only a set of practices but also a set of values—values that must be exposed and exercised in order for digital scholarship to grow and thrive. In this chapter, I plan to interrogate one of these values in particular: public scholarship, or what it means for a library to support its faculty and students in the cultivation of (more) public impacts and identities with regard to research and digital scholarship work.

BACKGROUND

As the head of Instructional Design and Outreach Services at the University of Washington Libraries, I find myself often thinking about the relationship between digital scholarship and the larger academic values of scalability, accessibility, and diversity. On a fundamental level, this is because my unit's purpose within the Libraries is to help improve the relevance, delivery, and effectiveness of information literacy instruction to students enrolled in online and professional programs, which often involves taking advantage of tools,

projects, services, and pedagogies that fall under the broad umbrella of digital scholarship. That said, my current work with instructional design is not the only reason that I became involved in the culture of digital scholarship. Rather, like many mid-career librarians, I am deeply influenced by my previous professional roles—in my case, serving as the librarian liaison to a School of Communication, and, before that, working as a graduate student in a digital humanities-focused research center.

Instructional design, communication studies, and the digital humanities all have strong overlapping interests with digital scholarship, not only because they all embrace technology, but because they each advocate in their own ways for a broader understanding of the audience of research. Is the purpose of conducting research simply to reach other researchers, or is it something greater and more inclusive? Each of these fields argues strongly for the latter viewpoint, and for an intentionality around the benchmarks of research that is not only well beyond the training of most faculty but also outside of their comfort zones.

But let us pause here a moment and return to this idea of public scholarship, and what that concept means in relation to the larger topic of research impact.

RESEARCH IMPACT AND PUBLIC SCHOLARSHIP

Just as digital scholarship is a field that has come to embrace a surprisingly wide range of digital tools and practices, research impact is an area whose default mode has grown to include, rather than exclude, the practices of scholars and behaviors of their outputs. This is because at its core, research impact is essentially driven by a set of questions: What does it mean for a scholar to produce "meaningful" research? What is the real or intended impact of a piece of research, and how can we tell if this impact has occurred? Last, but not least, can different types of impact be compared, or cultivated, or controlled—and if so, what responsibility do researchers have for managing the impacts of their work?

Defining, tracing, and understanding the impact of research is, as one might guess, a tricky business. No two specialties do this quite the same way, which makes having productive conversations about impact across departments, let alone disciplines, a little like discussing politics with extended family at Thanksgiving dinner. It's a mess. At the same time, the subject of research impact does have its own distinct and fascinating history, one which is heavily based on the twentieth century's record of scientific research and publication.

In the nineteenth century, an explosion in the volume of scientific research created a new and desperate need on the part of scholars, students,

and librarians for better ways to filter, organize, and prioritize scholarly information. Of particular importance was a way to cope with the sudden prominence of professional scientific periodicals, which rose in number from roughly 100 at the beginning of the century to an estimated 10,000 by its end.[1] Scientific journals and journal articles therefore became the focal point for early twentieth-century questions of scholarly communication, including "which print journals are the most essential to read, or subscribe to, or to keep on the shelf?" For decades, personal, anecdotal, and highly subjective answers abounded—much as they continue to do today. However, in the early twentieth century, a new type of answer to this question also began to appear, one based on the application of statistical methods to sets of written publications, especially journals and journal articles. The result was a new field of study: statistical bibliography, which later filtered and evolved into relatively catchier names, including *bibliometrics, scientometrics, librametrics,* and a bit later, *informetrics*. Of these, *bibliometrics* is the best known by far, and the one we'll use for the rest of this abbreviated history.

For those of us invested for whatever reasons in the topic of research impact, it is hard to overstate the influence of bibliometrics on how today's academic institutions view and evaluate "meaningful" research. Because of their overwhelming focus in practice on academic journals, the oldest and best-known bibliometrics are all inevitably based on the analysis of article citations—citations derived mostly, and for many years exclusively, from large sets of science-focused journals. Take, for example, the mega-metric of Journal Impact Factor. Journal Impact Factor (often just called Impact Factor, or J/IF) was invented around 1955 by Eugene Garfield, an entrepreneurial scholar with credentials in chemistry, library science, and (in later years) structural linguistics, who also founded the Institute for Scientific Information (ISI).[2] Its original purpose, according to Garfield, was to help select journals to be included in the first Science Citation Index—a revolutionary research discovery and retrieval tool published by ISI in 1963, which later became the basis for the internationally recognized Web of Science database. To determine which journals were influential enough to be included in the first Science Citation Index, Garfield suggested a metric that would start with the number of citations a journal received in a specific year for articles it published in the previous two years, and then divide that number by the total number of articles published by the journal during the same two previous years.[3] Thus, if a journal generated 1,000 citations in 1960 for articles published in 1958 and 1959, and published 100 total articles in 1958 and 1959, then it would have a 1960 Journal Impact Factor of 10 (n = 1,000/100). In 1976, following the success not only of the Science Citation Index but also its follow-up project, the Social Sciences Citation Index, ISI published the first edition of *Journal Citation Reports,* a stand-alone resource that ranked scientific journals according to their latest Journal Impact Factors. Today, *Journal Citation Reports* is the

preeminent tool for ranking and comparing academic journals in the sciences and social sciences, although it has since grown to include other bibliometric indicators, and now offers the option to filter its journals into approximately 235 disciplinary sub-categories.

Not shockingly, the new availability of these completely quantitative, seemingly objective means of comparing the influence of different journals was something of a revolution within the halls of mid-to-late twentieth century academia. Researchers, for their part, had at last an alternate means of understanding patterns in scholarly communication to simple word of mouth. Librarians, mindful of their users' needs, had a new set of tools for managing their collections and connecting scholars with relevant research. But it was academic institutions, ever hopeful of increasing the influence of their departments, that took the next significant step, which was to apply statistical methods like those behind Impact Factor to the records of individual faculty, either literally by using Impact Factor as a proxy for faculty publication quality, or by assessing faculty potential through an analysis of their article citation counts over time. The result was, for many research stakeholders, a frustrating oversimplification of what it meant for scholarship to be impactful. Scholars in fields that primarily produced monographs, policy documents, creative works, and other non-article outputs were left looking weak in relation to those in fields that thrived in a world of journal citations. Researchers with continuing ties to professional practice were frequently counseled to pivot their portfolios toward outputs with a higher likelihood of generating academic citations and accolades. To this day, many students and faculty, especially in the sciences, feel pressured to design their careers around citation-based notions of research impact, rejecting opportunities that better match their interests and those of their communities.

Although it would be convenient to blame this turn of events on the existence of bibliometrics, or at least on the popularity of Impact Factor, the reality is, of course, more complicated. "Impact factor is a mixed blessing," Garfield himself was known to say in the decades following his metric's success. "Like nuclear energy . . . I expected it to be used constructively while recognizing that in the wrong hands it might be abused."[4] The question of what it means to use research impact metrics constructively is still a matter of debate institutionally as well as across the disciplines. That said, many major professional organizations have issued explicit statements over the last ten years cautioning institutions and researchers against the use of bibliometric indicators as the primary means of evaluating research; among them the American Society for Cell Biology, IEEE, and the American Mathematical Society.[5] One factor in this pushback is certainly the "abuses" alluded to by Garfield—which tend to occur most egregiously in situations where quantitative indicators of impact are encouraged without mitigating evidence of research or impact quality. However, the other major factor—arguably the more influential of

the two, given the timing—is the advent of the internet and subsequent social networking platforms, which have expanded and energized conversations about impact in ways that were unthinkable even at the beginning of the twenty-first century. As society's daily practices of information-seeking and sharing have changed to include digital platforms, peer networks, and nontraditional voices, so too have we seen the infusion of openness, access, interdisciplinarity, individuality, and informality into our mental models of research and impact. It is no accident that the same innovations that gave birth to the field of digital scholarship were also instrumental in reinventing the topic of research impact, giving scholars permission to propose new answers—or re-propose those that had previously been dismissed—to the original question of what makes research meaningful.

One special beneficiary of what I will call this "digital era" of research impact is the concept of public scholarship, which is also sometimes called publicly engaged scholarship, community-engaged scholarship, or community-based scholarship. Its definition, like its name, varies noticeably across the academy—but it is commonly understood to suggest a type of scholarship that has both a serious and intentional connection to public groups, public practice, public outcomes, or all three of these combined. For example, an often-cited 2008 report by the Imagining America consortium of arts and humanities-focused colleges and universities describes public scholarship as follows: "Publicly engaged academic work is scholarly or creative activity integral to a faculty member's academic area. It encompasses different forms of making knowledge 'about, for, and with' diverse publics and communities. Through a coherent, purposeful sequence of activities, it contributes to the public good and yields artifacts of public and intellectual value."[6]

One important feature of this definition, which is expanded upon in the full report, is the idea that public scholarship cannot to be assigned by default to a specific field or department. "Not all scholarship is public scholarship, and not all creative work in the arts is public art or public design," the report explains.[7] And although it's fair to say that the arts, humanities, and social sciences do tend to get the lion's share of attention when it comes to the locus of public scholarship projects, there are enough examples of public scholars in the sciences, particularly the health sciences, to make the term genuinely interdisciplinary in scope.[8]

So why is public scholarship so intertwined with the digital era of research impact—and why is it a core value of the field of digital scholarship? Looking at our working definition, there is nothing especially new or tech-savvy about the idea of public scholarship—and yet instinct tells us that something about its recent manifestation qualifies it as a growing movement.

The first answer, as you are probably already thinking, is that we are living in a critical moment in which both information and technology are viewed by most people as having vast public dimensions, and in some cases, public

responsibilities. In the library world, where terms like "open access" and "net neutrality" are both familiar and common, we know this argument well, and have embraced it as our own via our professional organizations, marketing campaigns, and institutional mission statements. At the University of Washington Libraries, for instance, we strive to "advance intellectual discovery and enrich the quality of life by connecting people with knowledge."[9] Thirty years ago, that might have meant helping face-to-face patrons learn to use an OPAC terminal to more quickly locate journal issues in the stacks. Today, however, the bar for "connecting people with knowledge" is considerably higher, and patrons understandably seek information—including research—that conforms to their expectations for instant, cheap, ubiquitous access. For librarians at public institutions and visitor-friendly private entities, these expectations have real repercussions for our purchases and policies, as we strive to make research not only available but convenient for members of our communities, including the nonaffiliated, nonexpert public.

This first answer to the "why now?" question of public scholarship is certainly important—but taken by itself, I would say it slightly misses the point when it comes to the reason public scholarship matters to digital scholarship and to the latest developments in research impact. The real deal—the juicy stuff—comes when we reflect what it means if today's researchers are no longer exclusively confined to producing outputs that one must go to or through, a library to access. Indeed, as Imagining America's definition points out, public scholarship can denote *any* scholarly or creative activity, so long as it is both integral to its academic area and purposeful in its connection to diverse publics. Such a statement is, I think, a direct reflection of the variety of outputs and options that characterizes research—and research impact—in the digital information age. Faculty and students are now able, if not encouraged, to share insights and information not only by publishing in subscription journals but by adding preprint manuscripts to online academic networks, creating project websites, writing for scholarly blogs, sharing recordings on YouTube, posting to Twitter, uploading data to repositories, sitting down for interviews with online publications—basically extending their scholarly footprints in ways that not only make digital discovery of their work more likely, but also public digital discovery. What's more, self-identified digital scholars are better situated to take advantage of this landscape, as their voluntary engagement with digital tools and methods suggests a higher probability of producing "artifacts of public and intellectual value," that is, research outputs that will translate well to at least one publicly accessible online space, and hopefully more than one.

Thanks to these opportunities, and the benefits they imply, it is a much smaller leap for modern-day researchers to imagine the public as an audience for their research, and thus to see their research as potentially part of the project of public scholarship. What differentiates those who do from those

who don't is sometimes as basic as the presence of a catalyst—an encouraging policy, a positive role model, an appropriately themed research venue, or simply access to information about the tools, technologies, and methods of planning one's scholarship with community in mind. As academic librarians, we have the power to create some of these catalysts, particularly when it comes to teaching faculty and students about the diverse impacts of digital public scholarship, and how such impacts can be identified, traced, and communicated to stakeholders for maximum understanding.

CASE IN POINT: TWO APPROACHES TO METRICS-BASED IMPACT

To illustrate better what I mean by the diverse impacts of public scholarship in the digital age, I will briefly walk through an example that I have used occasionally to educate faculty and students about the significance of different outputs from a single research project. I'm fond of this example for many reasons, but primarily because (1) it traces the work of a prominent UW researcher, (2) it focuses on research that doesn't appear at first glance to be unconventional for its field, and (3) it closely mirrors my own real-life approach when consulting with researchers about their impact. For librarians looking to create a similar test case for audiences at their own institutions, I recommend searching a database like Scopus or Web of Science for research affiliated with your university or a specific sub-department, and then selecting an article from the results that has a relatively high citation count. This is the exact sequence of actions I performed in 2017 when preparing an example for a talk about impact for the UW Biomedical Research Integrity Program. The result that caught my eye was a 2009 article titled "Effect of Early versus Deferred Antiretroviral Therapy for HIV on Survival"—a scholarly output on a topic with clear potential for public health and public good.[10] Its primary author, Mari Kitahata, is listed as affiliated with UW's Harborview Medical Center—but I was unfamiliar with her record of research and scholarship.

When tracing the impact of an unfamiliar piece of scholarship, it is usually wise to begin with a traditional metrics approach—which is to say, a quick check for citation-based evidence of impact via amenable online indexes like Web of Science, Scopus, and Google Scholar. Thanks to my initial method of discovery, I had already surfaced a record for Kitahata's article in Scopus, which indicated that the work had been cited 747 times, placing it in the ninety-ninth percentile (i.e., compared to Medicine articles of the same age and document type within the Scopus database).[11] By contrast, when I searched for the same article in Web of Science, the article was listed as having 640 citations—still an impressive number, but noticeably lower than Scopus's due to key differences in indexing between the two sources. Bearing this reason in

mind, it was not surprising to find that Google Scholar gave an even higher citation count for the article than Scopus: 1,202 citations according to my search at the time, or nearly double what was listed in Web of Science.

Although numbers do not themselves tell the full story of an article's impact, knowing that such high citation counts existed for Kitahata's article was a promising start for its impact profile. Were this article part of an actual researcher consultation, I would have counseled Kitahata to further parse and analyze her citations, using the indexes in question to learn more about the authors who have built on top of her work, including their disciplines, fields, and specific interest in her original research. For most faculty, this blend of qualitative and quantitative information would be more than enough to satisfy their academic curiosity—certainly a more satisfying stopping place than simply regurgitating a journal's Impact Factor on a grant proposal or tenure file.[12] However, let us pretend that having completed this first approach for collecting evidence of impact, we were motivated to try another: in this instance, a check for less traditional "altmetric" impacts of Kitahata's research.

Altmetrics is a term that was coined in 2013 by Jason Priem, who was then a doctoral student in North Carolina but has since become an entrepreneur and vocal advocate of digital public scholarship. Initially a simple portmanteau for "alternative metrics," altmetrics has come to refer to a wide range of digital indicators, all related to scholarly work, but uniquely "derived from activity and engagement among diverse stakeholders and scholarly outputs in the research ecosystem, including the public sphere."[13] In the twenty-first century, virtually every piece of scholarship leaves some sort of a digital trace, whether or not this is the researcher's intention. As a field, altmetrics embraces this shift in scholarly communication and looks to shed light on how different communities of users come across, filter, and use digitally discoverable research to meet their needs, regardless of whether those needs feed back into academic discourse.

To test the likelihood of major altmetric impacts of Kitahata's research, I began by performing a series of experimental Google searches on her name, affiliations, and keywords from her article. These online searches quickly uncovered an impressive number of popular news stories related to the 2009 study, several of which dated back to late October 2008, a full six months before the official article first appeared on the *New England Journal of Medicine* website.[14] As it turns out, Kitahata presented data from her team's study at a major international medical conference in Washington, DC around that time—a presentation which she followed up with a press conference, at which she answered questions for a group of reporters about the study's implications for HIV patients and medical specialists.[15] The date of this press conference corresponded exactly to the earliest of my online news stories, making clear that Kitahata's efforts to share her pre-published research were successful not only by basic scholarly standards, but from the standpoint of public

scholarship as well. Indeed, by the time *NEJM* released the full study online in April 2009, stories about Kitahata's research had already appeared in multiple major news venues, including the *New York Times* and *Time.com*. It is worth noting that the 2008 circulation of the *New York Times* alone was approximately 928,000, making the print *and* online publication of these non-scholarly articles arguably the most significant outputs of Kitahata's research from a pure numbers perspective, and an important indicator of her study's probable public impact.[16]

Following this tentative exploration of the broader outputs of Kitahata's 2009 research, I performed some formal searches on the altmetrics generated specifically by the publication of the *NEJM* article. In the altmetrics world, nearly any online community space has the potential to collect data about users' engagement with a digitized research output, from institutional repositories to Twitter and Facebook. That said, there are only a few major tools available for aggregating these metrics into convenient categories of engagement, which gives librarians interested in altmetrics a fairly stable place to start a consultation if asked. Of these tools, the two most popular are the Altmetric Bookmarklet, a free browser plug-in available from Altmetric, and PlumX Metrics, an Elsevier-owned product that is employed most frequently inside of Scopus. Together, these tools gather, organize, and vaguely attempt to interpret third-party digital usage and engagement metrics from select scholarly blogs, social media, video sites, repositories, popular media, online reference managers, Wikipedia, and more. However, in the same way that it's important to search multiple indexes when gathering citation counts for a given scholarly article, it's essential to check multiple tools and sources when tracing the altmetrics of a given scholarly output.

For instance, when I compared the Altmetric bookmarklet data about Kitahata's article to data gleaned from its PlumX profile in Scopus, I found numerous discrepancies, such as the number of times the article had been saved by Mendeley users (thirty-five "readers" according to Altmetric; six according to PlumX). To resolve this, I went directly to the Mendeley online network, which led to me to discover that, due to variations in how the article's citation had been entered by different Mendeley users, the actual metric should have been closer to 121 readers, dwarfing the estimates of both Altmetric and PlumX. As this anecdote illustrates, the current value of altmetric aggregators is not so much the specific numbers they show as the breadcrumbs that open up further qualitative and quantitative investigation across larger online spaces. Not only did these tools inspire the idea of searching community-driven reference managers like Mendeley, they pointed me toward mentions of the article in nineteen international health policy documents, nine clinical database citations, and the Wikipedia page for the "Management of HIV/AIDS." Each of these source types points toward a different key audience for Kitahata's findings and underscores the value of making one's research

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