

A New Digital Library:

Imagining the Local Library as a Digital Social Space

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Local public libraries exist as an essential part of a community's social infrastructure. Libraries supply access to resources, space for leisure and social encounters, and opportunities for education. Libraries facilitate community wellbeing through a diverse environment, increased awareness of community activity, and provide opportunities for serendipitous discovery. However, these benefits are often unmatched by libraries' online counterparts, digital libraries. At present, digital libraries act as databases of media resources, functioning effectively as online warehouses. Faced with the fact that libraries are sought out as social spaces, as well as the reality that communities increasingly congregate online, the design of digital libraries should take into consideration the social component of information seeking. Focusing specifically on search, discussion, and annotation tools, this study investigates how the design of a digital library can afford the community benefits provided by a physical public library. The outcomes of this investigation suggest the effectiveness of motion as an indicator of presence, the opportunity for meaningful online experiences through purposeful limitation of technology, and increased engagement aided by user autonomy.

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1.0 INTRODUCTION

Libraries have a long and rich history, especially captivating to those who find interest in community, education, and social equality. Some of the earliest versions of libraries did not merely house manuscripts but acted as hubs of intellectual activity and conversation. Over the course of history societies have recognized the value of access to information and a common ground for people to gather. In the U.S., the push to democratize the conceptual and physical space of libraries has roots in Andrew Carnegie’s philanthropy. He called his finest public libraries, “palaces for the people” (Klinenberg, 2019). The term palace is powerful because it implies two things: the dignity of the tenant and the presence of an architect. Carnegie sought to provide the people with a space where they felt dignified and recognized the power that design has to achieve this goal.

The large windows and tall ceilings of Carnegie’s libraries create an inviting space to enter. People may go to public libraries to access information, but they receive the added benefit of a beautiful space and social opportunities. Today, the majority of people now have access to all of the information they need online. Access to information may have increased with the rise of digital libraries, but the beautiful spaces and social opportunities have been lost in translation. The undeniable shift towards the internet to fulfill both social and informational needs prompts the question: How can digital libraries become palaces for the people?

2.0 PROBLEM STATEMENT & JUSTIFICATION

Public libraries promote the social wellbeing of the communities they are in (Aabø, 2005). This support comes from offering citizens a diverse place to gather and access shared resources (Aabø, 2005, Audunson et al., 2019, Johnson, 2010, Kretzman & Rans, 2005). Studies show that frequent library users can be more likely to vote and engage in other civic duties, offering a tangible benefit to the community (Johnson & Griffis, 2009). People define and seek out public libraries as a social place (Fisher et al., 2007). The internet has completely changed the way that people search for community and information, both being available in an instant. However, digital libraries do not currently supply any of the community support of traditional libraries (Worrall, 2014).

Digital libraries are collections of published content for a user community (Worrall, 2014). While “library” can apply to many collections of online content, this investigation is particularly targeted at databases that exist as counterparts to physical libraries. For example, patrons of the New York Public Library would also access the New York Public Library database online. This specification is meant to tie the users’ online experience to a geographic boundary. Currently, most digital libraries consist of a search feature to find content and not much more. If it is known that library patrons seek out library spaces as social arenas, why is support for social engagement not built into digital library platforms? This missing piece posits a design investigation worth exploring.

There are some existing projects that incorporate community support into digital library platforms, but none fully embody digital library qualifications and features for community support. The online platform GoodReads allows members to chat, form groups, and annotate literary content but it does not supply the content itself. In this way, GoodReads is a successful example of how an online community can form around informational content supported through digital

Digital Library

A digital library is a collection of digital content. It is a digital home to functions and resources library users typically access in a physical library. Digital libraries usually consist of search functions and a digital collection of information.

features. However, GoodReads is not technically a digital library because its users do not have access to content. The New York Public Library (NYPL) has a digital collection of items in the library’s archive displayed in an interactive visualization. This visualization allows the user to group content in unexpected ways like by color. The allowance for serendipitous discovery and manipulation of the interface has potential for supporting a community through education and ownership but it does not currently have any supporting features to do so. No current manifestations of social digital libraries are tied to geographic location. This location boundary suggests a more hybridized approach to library design than purely digital or physical. The design of both a physical and digital library should not deny that the other exists. The translation of community benefits into a digital library aims to achieve a more seamless coexistence rather than the forced obsolescence of the physical library.

This investigation is not meant to imply the irrelevance of physical libraries, but to recognize the design potential in their digital counterparts. Books and physical libraries are not disappearing any time soon. However, this does not negate the fact that people are increasingly turning to the internet to find resources, information, and community. The internet has become a place where people gather, and designers have both the capability and responsibility to make this experience more meaningful. The future of social spaces involves the aggregation of digital and physical worlds through the seamless integration of technology through the internet of things. However, rather than investigate how this hybridization will occur in the library space, this exploration will focus solely on the translation of physical to digital. This narrow focus is meant to bridge the gap between practical and speculative design in this space. The outcomes of this study are ambitious and forward facing yet attainable and applicable in a pre-hybridized world.

Serendipitous Discovery

Serendipitous discovery is used to describe a way of discovering something new seemingly by chance or an enchanted chain of events.

There is design potential in borrowing and applying the methods that libraries implement to support communities in a digital environment. Diversity, the presence of a community, and open-ended browsing are three features of libraries that contribute to community wellbeing by leading to social inclusion, a sense of belonging, serendipitous discovery. In this investigation, I am pairing each community supporting feature with a web platform feature and using the design to translate the benefit in a way that takes full advantage of the affordances of the digital medium.

3.0 ASSUMPTIONS & LIMITATIONS

3.1 Assumptions

For the purpose of this investigation, I make several assumptions. One reason that many library patrons travel to a physical library location is to access free wifi. I assume that digital library users already have technology that allows them to access the internet, as well as internet connection. I also assume that digital library users are willing to participate in features that aid in community building within the platform. Even though some argue that physical library systems are disappearing, I assume that the search for both information and community will remain relevant in the future, especially in a digital context.

3.2 Limitations

While there is potential to apply the findings of this investigation to diverse types of media, this investigation only focuses on user interfaces as they currently exist, on computer and mobile device screens. This technology remains the most accessible to the general public, especially to low income and other vulnerable populations. Another limitation of this study is a lack of expertise in the field of library and information sciences. While the research done in this field is informative to the study, it is not comprehensive. Due to the time constraints of this investigation, designed and prototyped results are not functional, nor are the systems described as necessary on the back end for them to exist and operate. While this study acknowledges the opportunity for the combination of physical and digital spaces, it exists only to explore, in depth, the possibilities for digital platforms.

4.0 ANNOTATED BIBLIOGRAPHY

Library Benefits

- + Public libraries impact the community by facilitating the use of new information resources, supporting local identities and communities, and foster cultural enrichment and diversity (Aabø, 2005).
- + Public libraries support social wellbeing by providing a place for citizens to work together, a sense of shared resources, and the existence of a local community (Aabø, 2005).
- + From the viewpoint of a public library, a person is not a client nor a consumer, but a citizen (Aabø, 2005).
- + The variety of use and diversity of patrons are two common threads among the literature reviewed. Few other community arenas can be cited as including as many different patrons and services (Aabø & Audunson, 2012).
- + In terms of Oldenburg's third place framework, libraries have the ability to function as an extension of first place, a second place, and most often as a third place (Aabø & Audunson, 2012).
- + Libraries are sought out as places for chance encounters and serendipitous discoveries of community as well as other types of information (Aabø & Audunson, 2012).
- + Use of libraries as meeting places is higher among citizens with lower income as well as education. This suggests that the library as a meeting place plays a role in equalizing the opportunity to become an active citizen (Aabø, Audunson & Vårheim, 2010).
- + Libraries function as low intensity meeting spaces. A low intensity meeting space is valuable in that it exposes patrons to otherness,

- as opposed to high intensity meeting spaces in which patrons have shared values and interests (Aabø, Audunson & Vårheim, 2010).
- + Two main roles of public libraries are to provide a geographic community with social inclusion and equal access to information. (Audunson, et al., 2019)
 - + Based on interviews conducted with users of the Seattle Public Library, this study concluded that the library was seen as a primarily social environment and plays an important role as a meeting place (Fisher, et al., 2007).
 - + Library use can be tied to community involvement and there is a strong relationship between libraries and social capital (Johnson, 2010).
 - + Use of public libraries is a conscious and subconscious strategy by users to engage with fellow human beings. The social benefits gained at libraries often spill over into communities and increase quality of life for all members. An example of this is that frequent library users are more likely to vote and engage in other civic duties (Johnson & Griffis, 2009).
 - + Public libraries contribute to community development by providing a free place to gather, technological resources, and a sense of ownership among community members (Kretzman & Rans, 2005).
 - + Public library provisions to a community can be grouped into three main buckets: information, access to technology, and social space where all feel welcome (May & Black, 2010).
 - + While public libraries have broad commonalities—each library investigated in this study possessed unique qualities reflective of their particular community and the physical location of the library itself (May & Black, 2010).
 - + In this study, both libraries and bookstores were observed and compared. It was found that in libraries, more socialization occurs and it was far more likely for strangers to start talking over books and assist one another in using computers (McKechnie, et al, 2004).
 - + When libraries are designed with only the digital realm in mind, the design of the services discourages users from physically going to libraries (Weise, 2004).

Digital Spaces

- + Given the choice between physical spaces where similar tasks can be accomplished, the library today faces the challenge of differentiation from other “third places” (Pomerantz & Marchionini, 2007).
- + In agreement with other scholars, it is believed that digital libraries will not be capable of completely taking over the institution of physical libraries. However, the real future of libraries is a hybridized place where digital and actual environments compliment one another (Pomerantz & Marchionini, 2007).
- + Digital libraries can exist as social parallels to physical libraries (Pomerantz & Marchionini, 2007).
- + Libraries are embedded in two main branches: the local community and the digital world. This paper argues that it is vital to bridge the gap between geographically embedded institutions and digital communities for the sake of keeping local environments relevant to community members (Audunson, 2005).
- + There are repeated calls for digital libraries to be considered in a social context (Worrall, 2014).
- + In their current state, digital libraries do not have features to support the complex communities that use them, nor the collaboration that could occur (Worrall, 2014).
- + Serendipitous opportunities for collaboration should not be ignored in the translation of physical to digital (Worrall, 2014).

Place and Space

- + In the third place framework, the first place is home, the second place is work or school, and a third place is a public or low threshold meeting space, where the main activity is talking, and that is neither of the first two places. Third places are regarded as necessary to community development (Oldenburg, 1991).
- + Social capital is a feature of any social organization consisting of trust, norms, and networks. Social capital is a result of people being socially active in a community organization. Face-to-face communication is seen as necessary to establishing social capital. Most importantly, social capital is rooted in trust (Putnam, 2000).

Table 4.1
References orga-
nized by topic.

Topic	Title	Citation
Library Benefits	The role and value of public libraries in the age of digital technologies	Aabø, 2005
	Use of library space and the library as place	Aabø & Audunson, 2012
	How do public libraries function as meeting places?	Aabø, Audunson & Vårheim, 2010
	Public libraries as an infrastructure for a sustainable public sphere	Audunson et al, 2019
	Seattle Public Library as place: Reconceptualizing space, community, and information at the central library.	Fisher, et al., 2007
	Do public libraries contribute to social capital? A preliminary investigation into the relationship	Johnson, 2010
	A place where everybody knows your name? Investigating the relationship between public libraries and social capital.	Johnson & Griffis, 2009
	The engaged library: Chicago stories of community building	Kretzman & Rans, 2005

	The Life of the Space: Evidence from Nova Scotia Public Libraries	May & Black, 2010
	Covered beverages now allowed: Public libraries and book superstores	McKechnie et al, 2004
Digital Communities	The public library as a meeting-place in a multicultural and digital context	Audunson, 2005
	The digital library as place	Pomerantz & Marchionini, 2007
	The Roles of Digital Libraries as Boundary Objects within and Across Social and Information Worlds	Worrall, 2014
Place & Community	The great good place: Cafés, coffee shops, bookstores, bars, hair salons and other hangouts at the heart of a community	Oldenburg, 1991
	Bowling alone: The collapse and revival of American community	Putnam, 2000

Community Wellbeing

Community wellbeing is dependent on a wide variety of factors being accessible to all members. Some of the factors cited as necessary are quality living conditions, health, a sustainable environment, smaller communities within, an education, elevated levels of participation, leisure and culture (Markovich, 2018).

5.0 CONCEPTUAL FRAMEWORK & RESEARCH QUESTIONS

5.1 Conceptual Framework

The framework designed for this study is a synthesis of Wenger’s Nine Community Orientations and Markovich’s Community Wellbeing Framework. Within the two frameworks, components of physical libraries are used as tangible examples to drive digital interpretations.

Nine Community Orientations. Wenger (2009) outlines nine orientations of online communities necessary to their success in his original framework in figure 5.1. Each orientation is a broader category of a need of a community group. The nine categories include: meetings, projects, access to expertise, context, cultivation, individual participation, content, and open-ended conversation. While there are nine total orientations, I incorporate four as several orientations fall outside the scope of this study. The features utilized in this study are expanded upon in table 5.1.

Community Wellbeing. Design professionals use Markovich’s (2018) Community Wellbeing Framework to evaluate the relationship between the physical environment and the health of the people within it. In this framework, practices that improve and strengthen communities are divided into five main domains: political, social, cultural, political, and environment. Specific elements that contribute to each domain as shown in figure 5.2 are further divided. The elements utilized in this study are shown in table 5.2 and supplemented with features of public libraries.

Synthesis. The chosen components of Community Orientations and Community Wellbeing frameworks can be attached and actualized through the services offered by public libraries. The translation of these physical benefits into a digital library platform ties together the two frameworks. The final synthesis is shown in Figure 5.3.

Figure 5.1 .1
Etienne Wenger's
nine community
orientations
(2009).

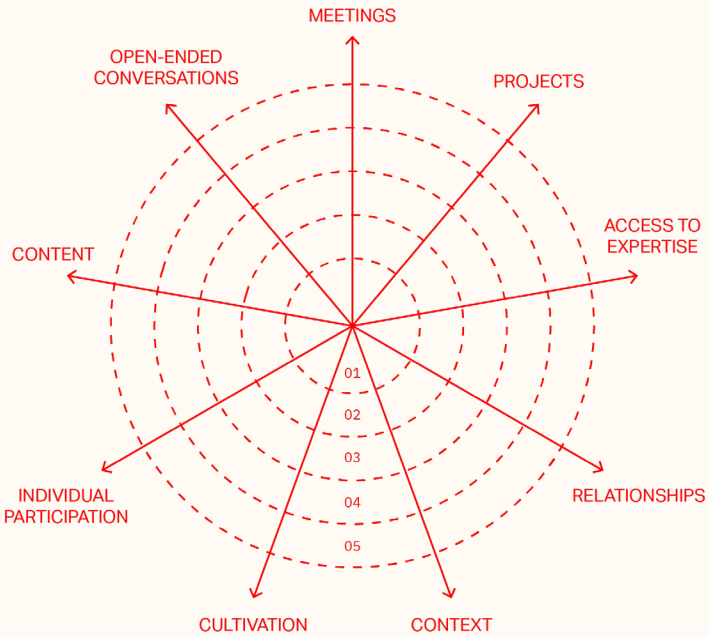


Table 5.1.1
Subcategories of
three community
orientations.

Community Orientations	Digital Feature	Definition
Open-Ended Conversations	Chat	Conversation as a way to learn together.
Content	Search Tag	Share, search, and access to materials and tools.

Figure 5.1.2
Markovich's
domains for
community well-
being (2018).



Table 5.1.2
Public library
indicators for
three domains
for community
wellbeing.

Domains	Indicators	Library Features
Social	Socialization	Public access to a diverse population
Cultural	Learning	Active presence of community

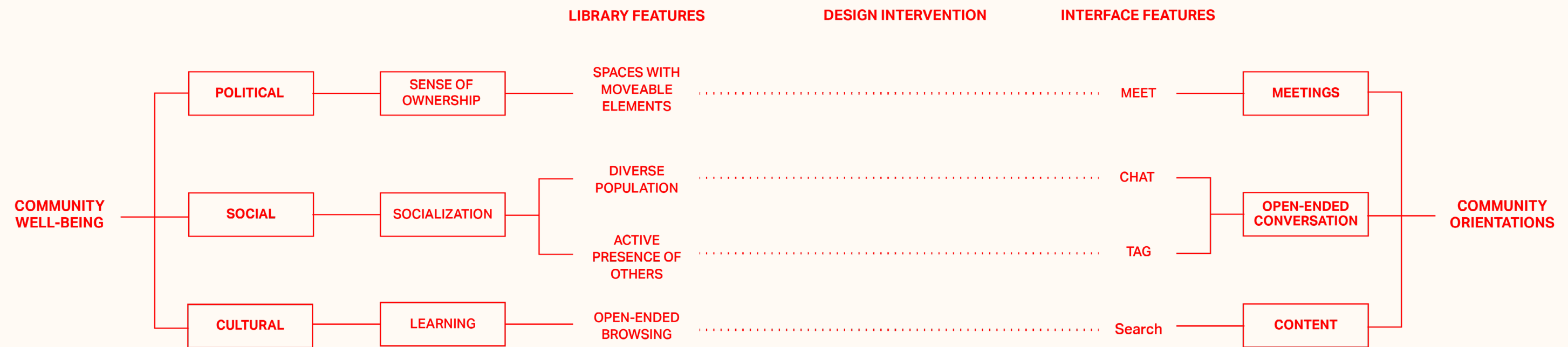


Figure 5.1.3
A conceptual
framework synthe-
sizing Wenger
and Markovich's
frameworks.

Table 5.1.3
The investiga-
tion framework
outlining the
scope of the
project.

Digital Interface Features	Socialization	Learning
Chat	SQ1: Public access to a diverse popu- lation	
Tag	SQ2: Active pres- ence of community	
Search		SQ3: Open-ended browsing

5.2 Research Questions

Table 5.1.3 a matrix combining the elements from the conceptual framework shown in Figure 5.1.3. The cells which contain descriptions are those relevant to the features of public libraries. These labeled cells represent the structure of the subquestions in this study as they are opportunities for digital translation.

Primary Research Question:

How can the design of a digital library, used by adults at home, afford the community benefits traditionally provided by physical libraries?

Subquestions:

- SQ1:** How can a digital conversation tool visualize diversity to provide social inclusion?
- SQ2:** How can a digital annotation system visualize content traffic to provide a sense of belonging?
- SQ3:** How can a digital search tool provide open-ended browsing for serendipitous discovery?
- SQ4:** How can the digital library platform synthesize search, discussion, and annotation tools facilitate community benefits?

5.3 Definition of Terms

Table 5.3.1
Definition of relevant terms.

Term	Definition
Digital Library	A digital library is a collection of digital content. It is a digital home to functions and resources library users typically access in a physical library. Digital libraries usually consist of search functions and a digital collection of information, literary and otherwise.
Online Community	An Online community consists of A. People who interact socially as they strive to satisfy their own needs or perform special roles such as leading or moderating B. A shared purpose—such as an interest, information exchange, or service that provides a reason for that community. C. policies—in the form of tacit assumptions, rituals, protocols, rules and laws that guide people’s interactions. D. computer systems—to support and mediate social interaction and facilitate a sense of togetherness. (Preece, 2012)
Social Capital	A term popularized by Robert Putnam’s Bowling Alone (2000), social capital refers to a resource embedded in a complex network of interaction, that increases social cohesion within a community.

Community Wellbeing	Community wellbeing is dependent on a wide variety of factors being accessible to all members. Some of the factors cited as necessary are quality living conditions, health, a sustainable environment, smaller communities within, an education, elevated levels of participation, leisure and culture (Markovich, 2018).
Diversity	Diversity refers to a wide variety in the four primary domains of diversity: race, age, income, and education.
Social Inclusion	Social inclusion is the process of improving opportunities for individuals to access and participate in society, especially those disadvantaged on the basis of their identity (World Bank, 2013).
Belonging	Belonging can be defined as feeling included in a group or set. A sense of belonging can also mean an affinity for a situation or place, or a feeling of fitting in.
Serendipitous Discovery	Serendipitous discovery is used to describe a way of discovering something new seemingly by chance or an enchanted chain of events.

6.0 METHODS

The methods utilized in this study were;

Interviews. I conducted key informant interviews with experts in the library field in order to gather firsthand information on library systems and services. I used a semi-structured interview style consisting of a set list of questions with room for conversation or new questions when they arose (Martin & Hanington, 2012, p. 102). While guided by the formal structure of a research interview, the interviews conducted for this investigation do not qualify as professional and exist only as a supportive resource to inform my writing and making.

Research through Design. Research through design is the use of making itself to inform a study. With the application of a conceptual framework, I produced design studies exploring interface design through the process of iterating (Martin & Hanington, 2012, p. 146).

Prototyping. I used high and low fidelity design prototypes in order to create visual artifacts to test concepts and receive feedback. The purpose of prototyping was to translate ideas into a physical form to allow for better feedback and critique (Martin & Hanington, 2012, p. 138).

Persona and Scenarios. Personas and scenarios are meant to build empathy for end users of a design and ground abstract solutions in tangible details. I used personas and scenarios to better understand the user group and contextual situations in which interaction with digital libraries might occur (Martin & Hanington, 2012, p. 132, 152).

Precedent Analysis. In order to establish an understanding of the design space and note important features, I conducted an analysis of existing precedents relevant to this study.

7.0 RESULTS

7.1 Precedents

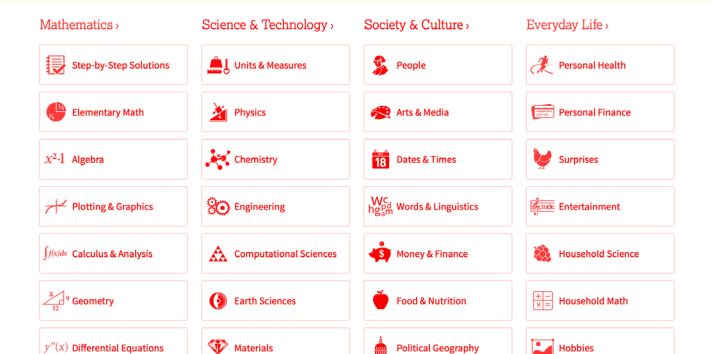


Figure 7.1.1 Search results and categories available in the search engine.

WolframAlpha. WolframAlpha is a search engine powered by machine learning with the goal of generating more direct answers to searches. Rather than sifting through all internet content to find keywords or sponsored links, WolframAlpha uses computations, algorithms, and built in data to find precise information offered within the platform. Machine learning reflects the role of librarian as an expert, guide, and resource in a physical library setting. The access to verified information mirrors the free access to published works that libraries offer. The option to randomize a search is reminiscent of the ability to physically browse library content without initial prompt or goal.

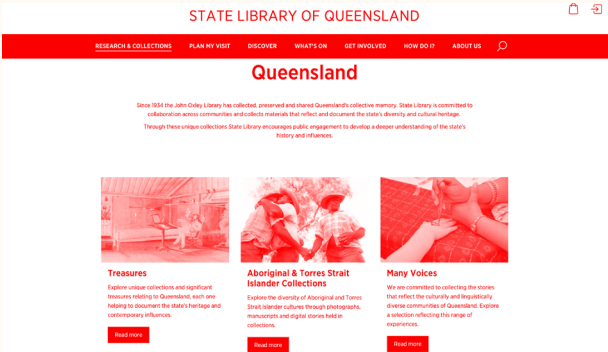


Figure 7.1.2
The State Library of Queensland resources for archive exploration.

State Library of Queensland. The State Library of Queensland is noted as an institution for its extensive programming as a public library. The role of the institution is not only to provide free access to information to Queenslanders but also archive cultural heritage documents. Specifically, the navigation of the website search tool serves as an alternative to a randomized search but remains less directed than a search and response format like a Google search. The search tool offers suggestions of themes, topics, and then specific collections in the database that might be of interest.



Figure 7.1.3
A view of the NYPL Digital Archive showing content as thumbnails with one image highlighted.

NYPL Digital Collection. In 2016 the New York Public Library Labs made over 187k items in the digital archive available for download. This database exists as an experiment for public access and open source information. The archive interface provides the prompt to “explore” and offers filters of collection, genre, century, and color. The digital collection can be viewed in its entirety on a single page, communicating its immense size, a similar effect as the ability to physically see rows and rows of shelves of books in a library. The interface does not offer a search bar, only allows the enlargement of individual documents upon hover. The nature of this interface encourages viewers to engage with content in a nonlinear fashion, prompting the discovery of unlikely patterns and connections.



Figure 7.1.4
The homepage of Dr. Robyn Cook's personal website.

Dr. Robyn Cook. Dr. Cook, a professor of Communication design at Falmouth university in the United Kingdom, has a personal website powered by the hosting platform: Cargo Collective. Cargo Collective allows for greater creative control and access to website code than other platforms marketed as easy-to-use. One of the features available through the platform is the movement of content on a page by the viewer as illustrated by Dr. Cook's personal website. The content boxes have no indication that they are mobile. However, the primary text on the website is intentionally covered by these content boxes, leaving the viewer to draw the inference that these boxes must move in order for content to be accessible.

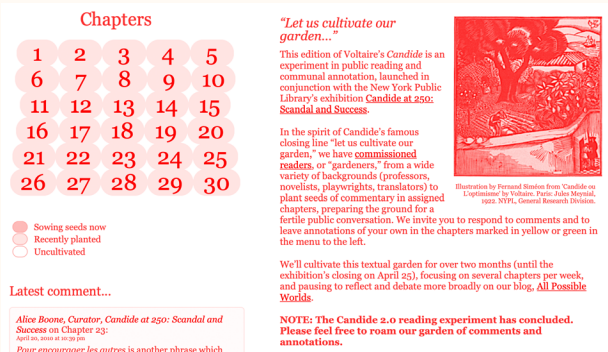


Figure 7.1.5
A view of Candido 2.0 showing the chapters and instructions.

Candido 2.0. Candido 2.0 is a project from the New York Public Library Labs exploring the ways that an online community can collaboratively comment around a single text, the text being Voltaire's Candide. As stated in the project description it is an experiment on, “public reading and communal annotation.” Candido 2.0 is unique in the way that it combines free library content with the affordance of viewer commentary.

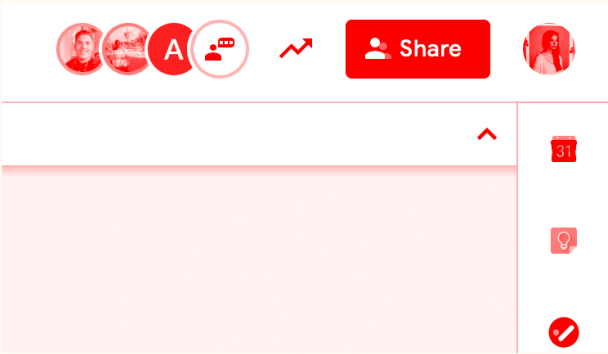


Figure 7.1.6
The feature in Google Drive showing other users in the document displayed as profile photos in side of circles.

Google Drive. Google Drive is one of the most used file management systems online. Aside from the prevalence of Google and accessibility the free platform provides, the service is a rare example of a collaborative workplace. Unlike social media, the primary goal of Google Drive is not to interact with others, but it is highly valuable to the platform to be able to share and work on shared documents. The feature of most interest to this study is the live visualization of others presence in the same document, along with the chat and commenting features.

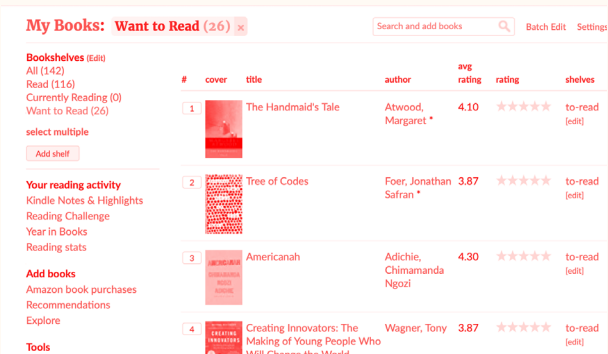


Figure 7.1.7
A view of GoodReads showing a list of books the user has saved.

GoodReads. GoodReads is an online social platform built around the review and suggestion of books. Readable content is not offered on the website, so it is not considered a digital library and more accurately defined as a social media. The platform allows users to save books into lists, suggest books to friends, and post reviews of books. Observing a community formed around book content is informative for this study because it may suggest the types of features most utilized or desired.

Diversity

Diversity refers to a wide variety in the four primary domains of diversity: race, age, income, and education.

7.2 Studies

7.2.1 How can a digital conversation tool visualize diversity to provide social inclusion?

Question

The first digital feature I decided to explore in the context of a social digital library is the conversation tool. For the purpose of this study I am defining diversity as variety in the dimensions of diversity: race, age, income, and education. This exploration is situated within one of Wenger’s community orientations, open-ended conversation, as well as one of Markovich’s domains for community wellbeing, socialization. Wenger’s framework suggests that for an online community to exist, there must be an opportunity for open-ended conversation. Conversation online has the advantage of being asynchronous and anonymous. These inherent affordances should be carefully considered. Markovich’s community wellbeing domains propose that one of the markers of a successful community is socialization. While there are many ways that socialization can occur, this study focuses on the community members’ access to diverse spaces. The combination of Wenger and Markovich’s frameworks prompt the question of how a digital conversation tool might visualize diversity. Further, how this tool might increase social inclusion and the health of the community. Physical public libraries already achieve both open-ended conversation and diversity in several ways which offers a starting point to this study. Aabø (2005) argues that the public library encourages diversity and the awareness of diversity by allowing the public a space to gather together. Examining the ways that physical libraries facilitate both diversity and conservation is important to ground this study in the translation of physical methods to digital features. The qualities of physical conversation and diversity that I aim to incorporate in this study are the collaborative nature, publicity, and the idea that numbers are not attached to individuals but to the collective.

Process

Open-ended conversation and visualizing diversity were each explored separately before their results were combined. These studies were predicated on the belief that diversity would be best represented in an abstract way and that conversations on a digital library platform should happen on some type of public discussion platform. Motion was introduced to the study as a means for representing the activity level and a sense of time as well as diversity. Figures 7.2.4–6 are explorations in abstract representation.

Figures 7.2.1–3 are all attempts at exploring different conversation structures. Figure 7.2.1 shows each comment in a discussion board as possessing its own form, potentially fueled by user data. The user’s photographs are attached to their comments but their names are not. This study contains remnants of the way that a physical conversation might occur. Comments stick to one another and fit together and are controlled by both time and topic. While the form of this conversation proved to be interesting, the visualization of diversity was lacking. In this circumstance, a user would be able to see each person commenting and decide for themselves if the conversation was diverse. This is almost an exact translation of what occurs in a physical library space but it felt wrong on a digital platform. One of the benefits of a digital depiction of diversity was that there could be an agreed upon definition of diversity determined by the computer, rather than by each user. Further iterations attempt to incorporate this idea. Figure 7.2.2 is a 3D rendered cube with the book title “To Kill a Mockingbird” on one side and a description of the book on the other. If this cube represented a discussion board, then a user could “go inside” with other users, providing a more spatial, communal sense to the

discussion. This leaves room for spatial visualizations of diversity to take place. While the dimensional nature of this study worked well to convey a sense of space that a user is in, it proved to be too contained. Conversation itself is an expansive thing to grasp and is rarely limited to a single topic, or book. To have a conversation take place inside of a cube is counterintuitive to the nature of the thing. Figure 7.2.3 also employs a spatial representation of discussion. Each rectangle, or card, could represent a comment. Over time, the most recent comment would always be shown on top, and older comments would be stacked below, all accessible to drag out and read. Colors could be overlaid on this structure to communicate trends in commenting like a timeline. Whether or not the form in this investigation is developed further, it references a pattern that has emerged in several studies of conversational structure. In design iterations that most successfully depict conversation, there is a prominent level of visual importance placed on time and presence. These two elements are principles that are carried forward in this investigation.

Figure 7.2.4 depicts a motion gradient. The colors shown could represent the number of people in each discussion while the movement could imply the activity level of the discussion. Experimentally, this iteration communicates activity and presence of others in the space. The use of motion to convey activity is something that is incorporated into further studies. However, it is difficult to calculate how this visualization could be representative of data. This begs the question: how important is it to accurately depict the data behind the concept of diversity? Could withholding data using an ambiguous visualization equally affect a user's experience?

Figure 7.2.5 represents the community as a moving entity. The motion indicates the activity level of either a conversation or the library community as a whole. The color could represent either a "high" or "low" level of diversity. A strength of this iteration is that it incorporates both dimensionality and motion. However,

its visual complexity proves difficult to map a conversation onto. Figure 7.2.6 is a rippling spatial visualization that invites the user to think of the platform as an active space rather than an interface. While this visualization would not be able to represent data from the system in a direct way, the rippling grid could represent the way that user's comments and contributions to the platform are connected and affect one another.

Figures 7.2.7–10 are wireframe variations of data visualizations representing the diversity levels present in discussion boards for different books. One of the challenges in visualizing diversity is that diversity itself is not made up of a set of static variables. The variables are often debated and each of factor and dimension presents its own weight to be considered in context. I created a visualization whose main purpose is not to convey data, but a peripheral awareness, akin to the one achieved in a physical library setting. The goal of all of this study is to get a sense of others different from oneself present in space, rather than communicate any specific information. The inaccuracy of the visualization can be leveraged to create a more understandable experience. Inaccuracy could also be called limitation. With this intention, the visualization uses a points system to convey diversity levels as either "high" or "low." Each dimension of diversity is assigned a point value of 1–10 based on the user demographic compared to the larger community of Raleigh demographic to indicate whether there is a comparatively higher or lower variance of people contributing to the discussion. This could be taken one step further by removing the number values completely and using only the descriptors of high, medium, and low. Both wireframes incorporate this same method of measuring diversity.

In the first visualization, each book has a discussion space. Each space is represented by a circle. The color of the circle is representative of income inclusivity, and the size of the circle is representative of racial inclusivity. When a user hovers the cursor over a circle, the number values asso-

ciated with the level of diversity present in the conversation appear next to the cursor, while the conversation is shown on the right portion of the screen. When the user hovers over a comment, similar comments and responses are highlighted. Each comment is linked to a bank of the contributor's other comments on the platform, but no other personal information or indicators. The second visualization plots the same data on a grid in order to add two more dimensions, education and age. The discussion appears in a similar fashion when the book is selected, but the comments have varying opacities to indicate the time they were posted, with most recent comments appearing the most opaque.

Observations

This study produced a body of iterations that address the question of conversation and diversity, while also informing further studies. As each study progresses, principles are drawn out based on strategies that prove effective. While many of the iterations in this investigation lack contextualization, each study will increase in concreteness and continuously build on one another rather than exist independently.

Moving forward, it is evident that the use of motion can more experientially communicate the concepts of activity and diversity. The effectiveness of motion is rooted in its connection to the physical library experience. The rippling shapes are reminiscent of people moving in a space and conversation volumes fluctuating. Incorporating motion into further studies will aid with the ease of perception as the complexity of each study increases. The use of motion also allows for the incorporation of time as a variable. The perception of time also forms a connection to the tangible library experience. The use of real-time features allows an awareness of sharing a digital space. Further studies also consider a digital library system that only caters a curated collection of books. While digital libraries offer the ability to house an unlimited number of titles, the limitation could result in a more effec-

tive and intentional discussion tool. In order to protect user privacy, diversity visualizations could use a point system rather than the demographic data of each person. There is an opportunity for less precise information visualizations to display conversations in more meaningful ways.

Figure 7.2.1
An exploration into discussion structure which prompted the question of whether or not users should be represented in a concrete way, and whether or not form could be determined by traits.

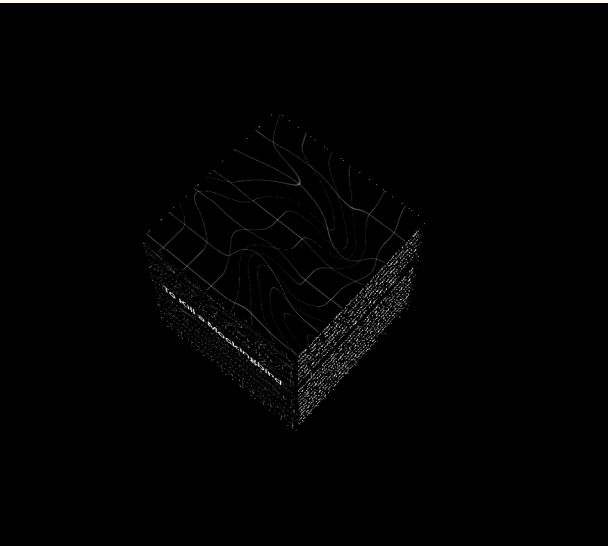
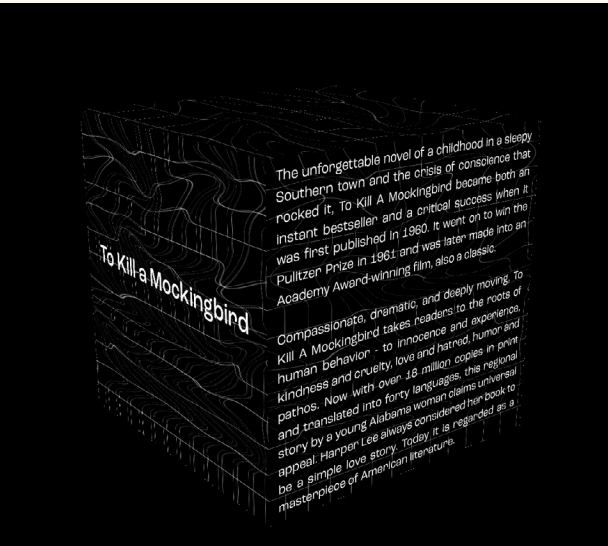
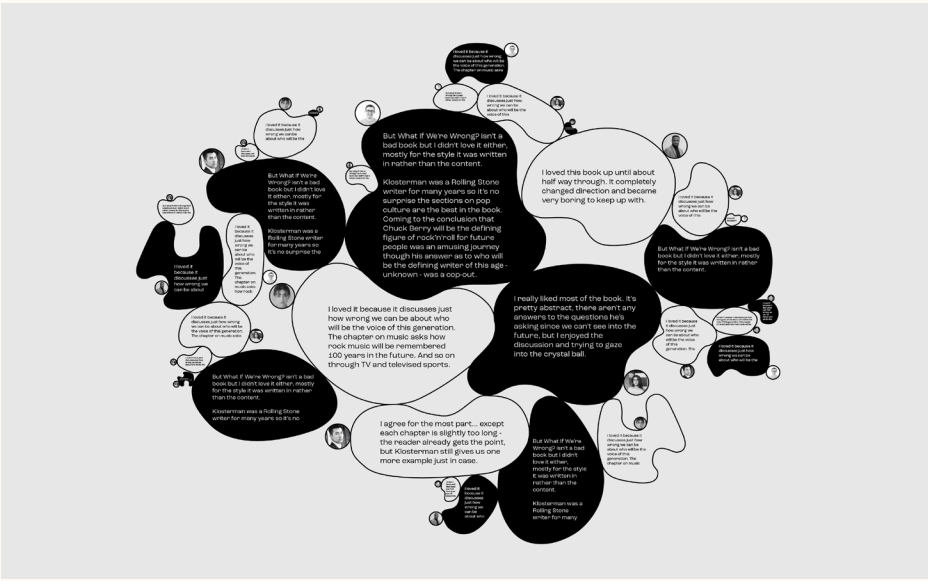
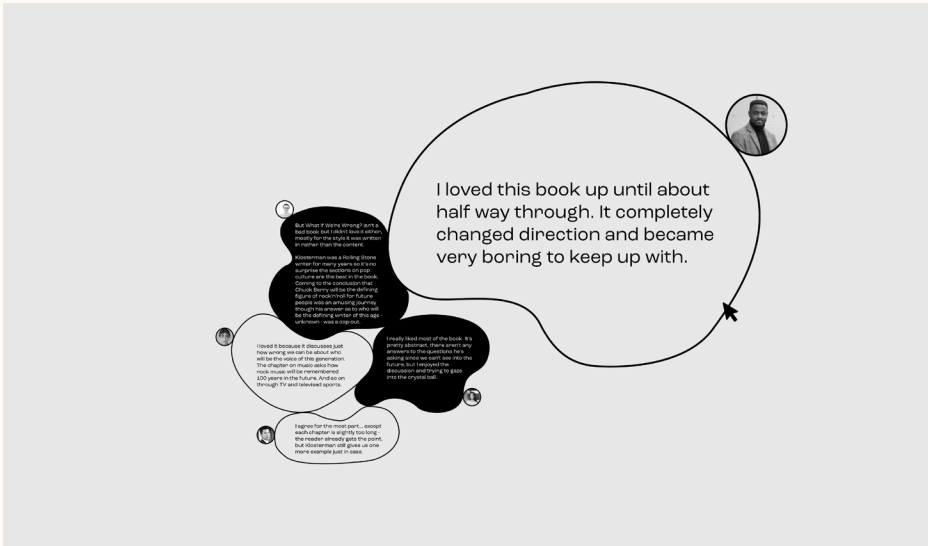


Figure 7.2.2
A visualization of what a discussion could look and feel like if it were an object.

<https://college.design.ncsu.edu/thenfinally/herndon/cube.mp4>

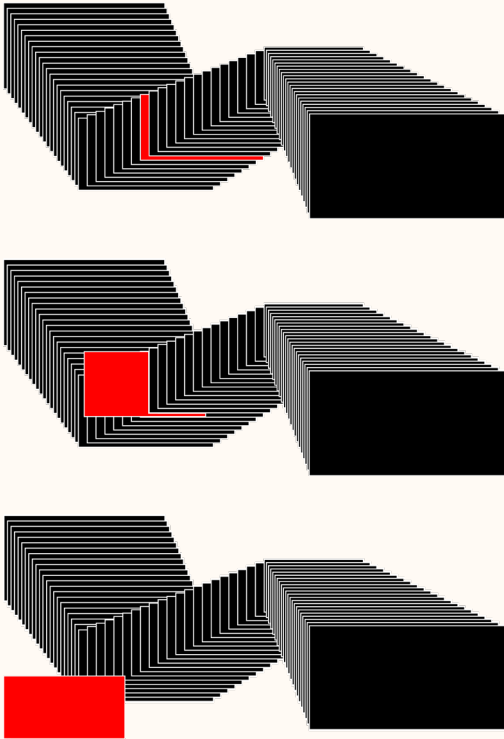


Figure 7.2.3
A visualization of what a discussion could look and feel like if comments and reviews were stacked on top of one another.

<https://college.design.ncsu.edu/thenfinally/herndon/card.gif>

Figure 7.2.4
Variations of motion gradients. The colors could represent the amount of people in a given discussion while the movement implies the activity level of the discussion.

<https://college.design.ncsu.edu/thenfinally/herndon/gradient.mp4>

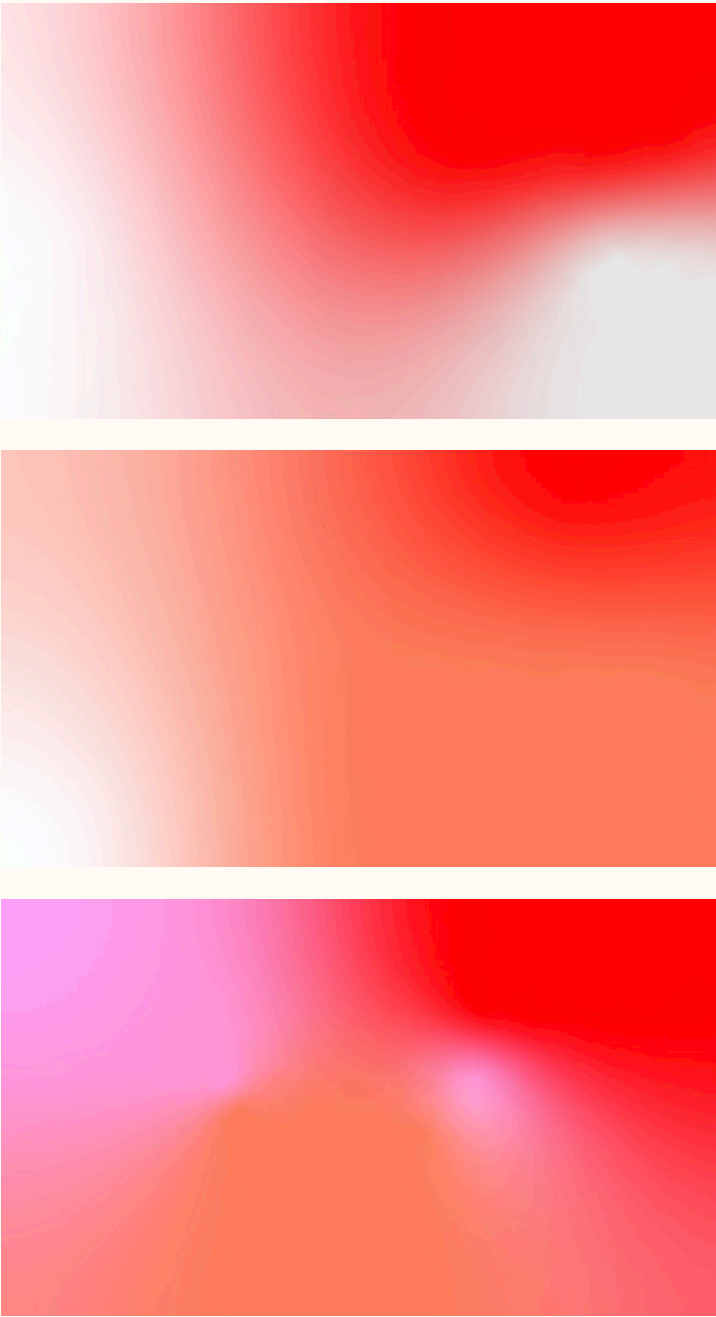


Figure 7.2.5
A visualization representing the community as a moving entity.

<https://college.design.ncsu.edu/thenfinally/herndon/blob.gif>

Figure 7.2.6
A rippling spatial visualization could invite a user to think of the platform as an active space rather than an interface.

<https://college.design.ncsu.edu/thenfinally/herndon/grid.mp4>

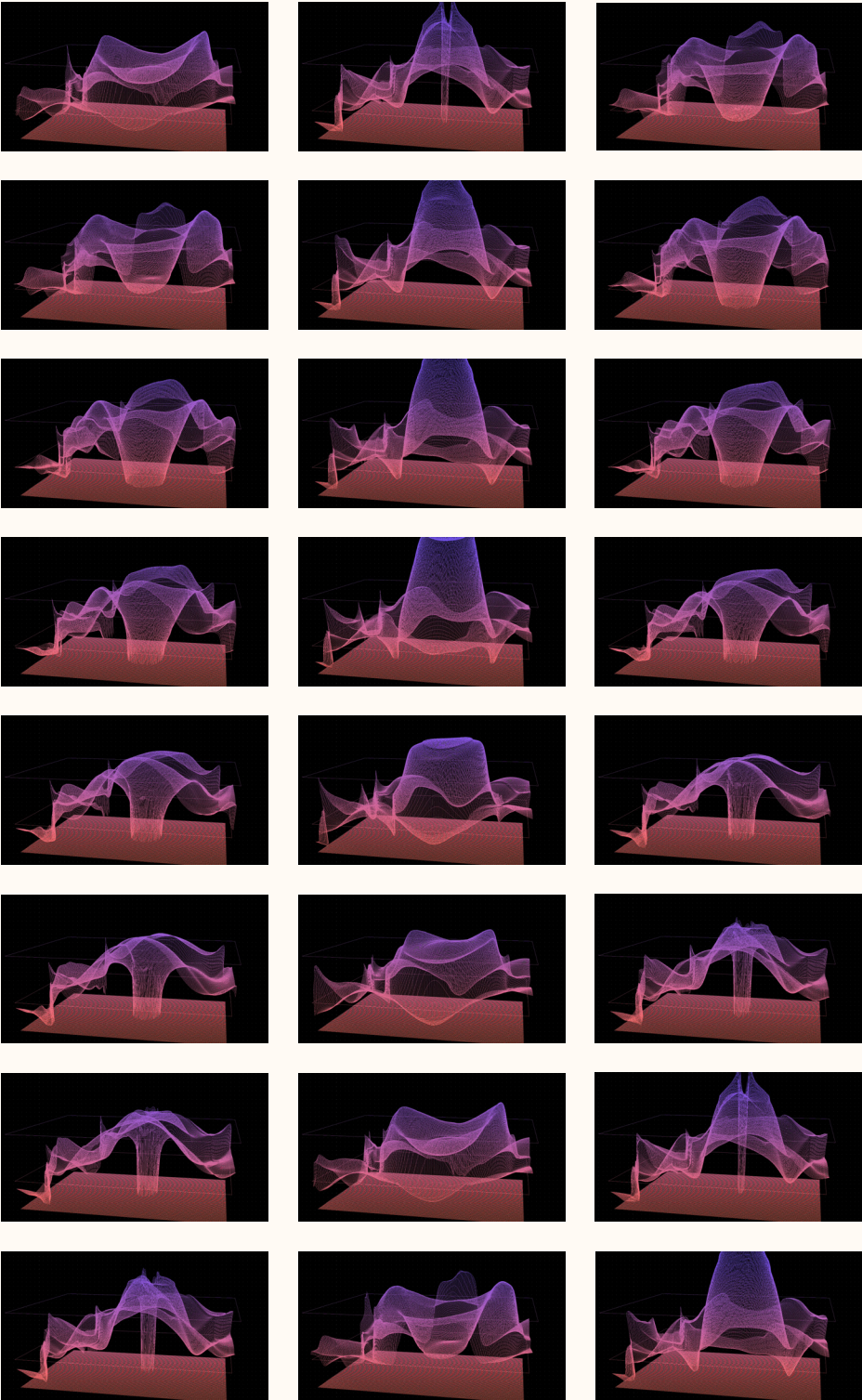


Figure 7.2.7
A wireframe showing a visualization depicting diversity levels of race and income for the conversation to the right.

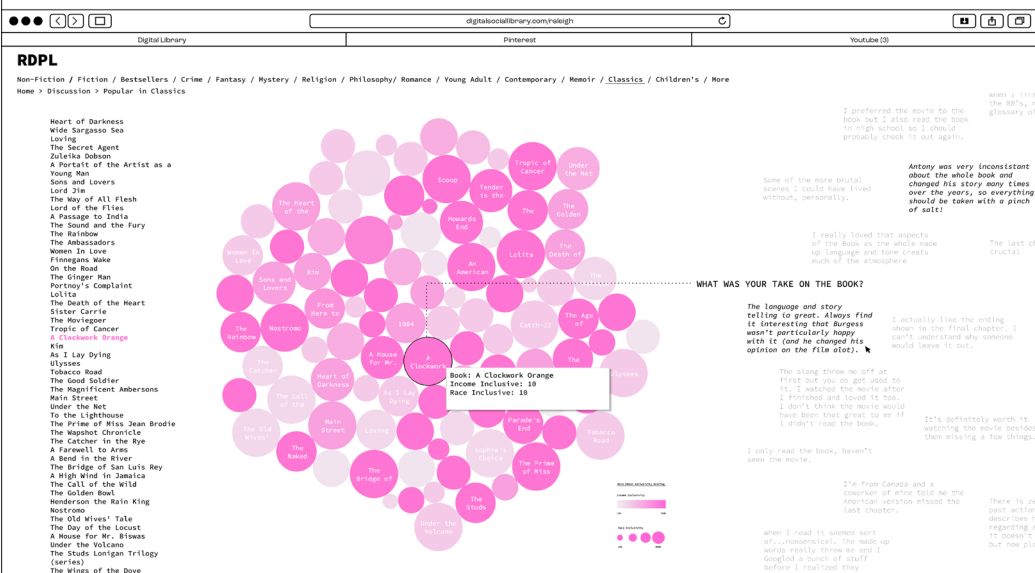


Figure 7.2.8
A detailed view of the visualization in the previous wireframe depicting the metrics.

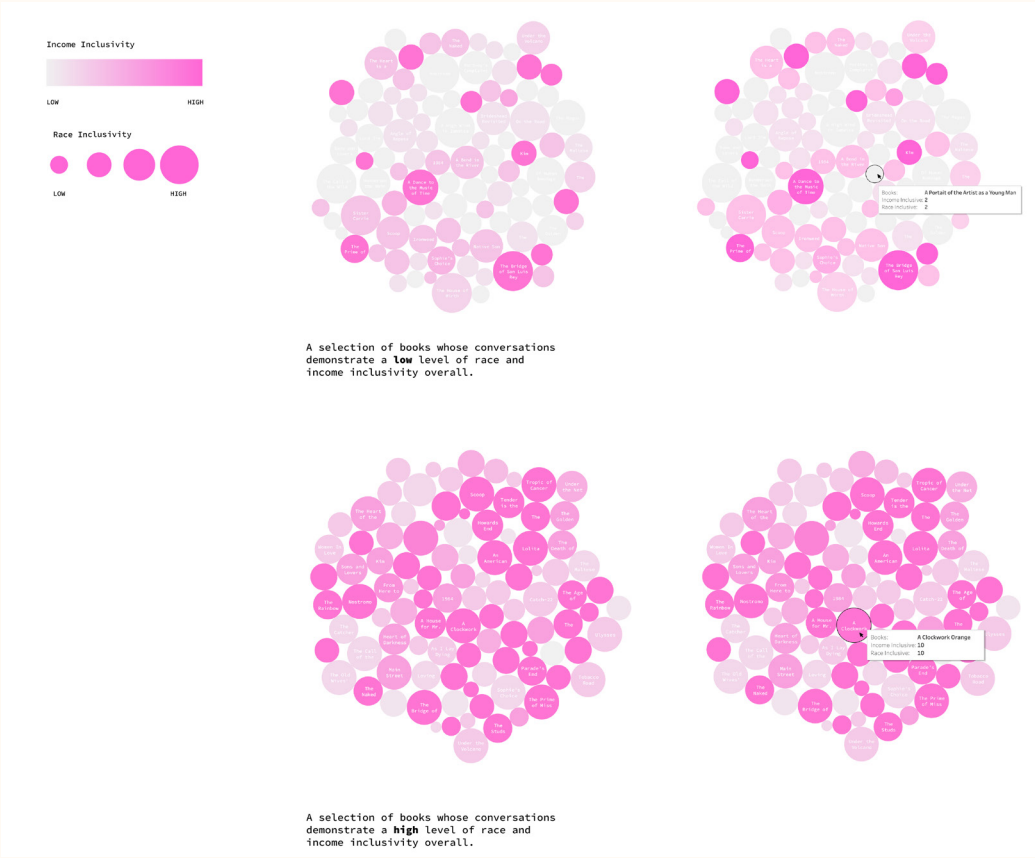


Figure 7.2.9
A wireframe showing a visualization depicting diversity levels of race, income, age, and education for conversations using the screen as a scatter-plot.

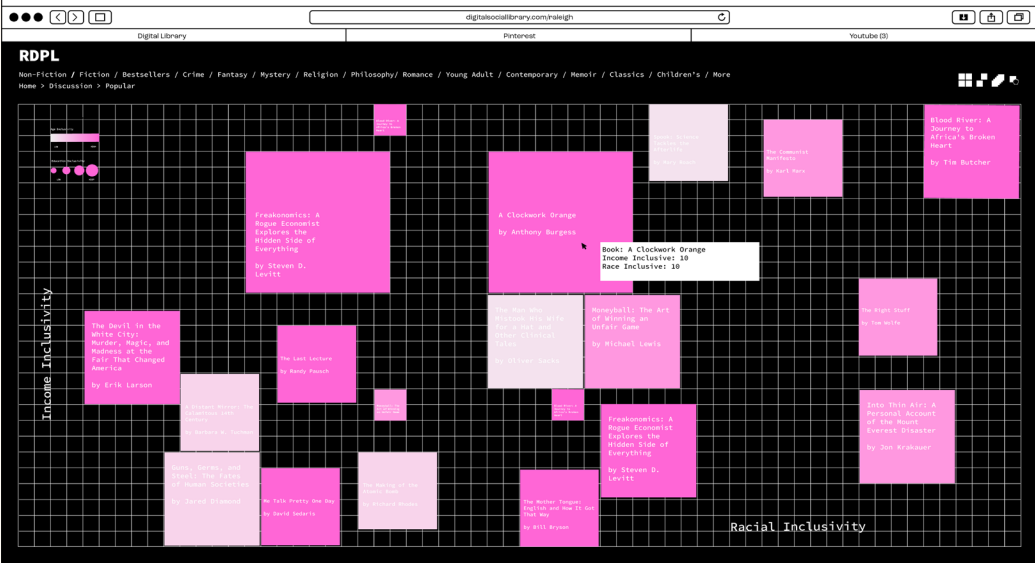
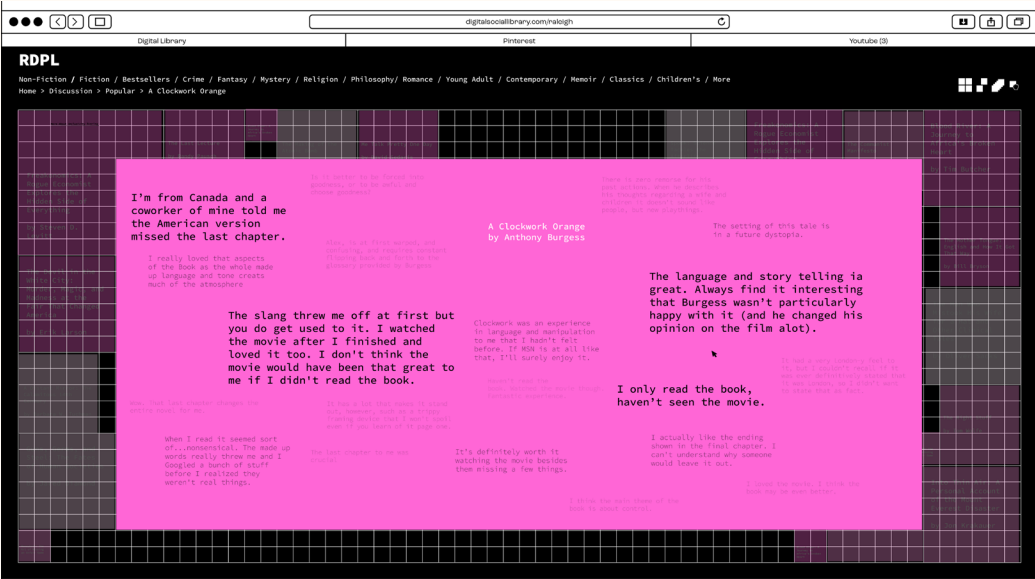


Figure 7.2.10
A wireframe depicting the view once a user has selected a conversation to explore.



7.2.2 How can a digital annotation system visualize content traffic to provide a sense of belonging?

Belonging

Belonging can be defined as feeling included in a group or set. A sense of belonging can also mean an affinity for a situation or place, or a feeling of fitting in.

Question

The second study is predicated on an interest in translating the experience of finding notes in the margins of a library book. The exploration centers around the idea that notes in the margins of a library book denote two things: that the book itself is a shared resource, something that connects a community together; and that notes serve as a visual indication that the content has been accessed and used. This study examines how a digital annotation feature might afford the same sense of belonging that a note in the margin of a physical library book does.

Process

This study examining how an annotation system can visualize content traffic to provide a sense of belonging, was conducted in two phases. The first investigates potential ways that traffic, defined in this study as the number of people reading and annotating a book, can be visualized to the user in the most apparent way. Figures 7.2.12–14 show the results of this phase of the study. The second phase explores ways that in-text-annotation could occur digitally, shown in figures 7.2.16–21. The synthesis of these explorations was then evaluated by how effectively they were able to facilitate belonging.

One of the conclusions drawn from study one was that motion, over any other design principle, best depicted the activity level. Incorporating motion into the representation of content traffic involved determining how both speed and intensity would reflect the level of annotation and how they would affect the users’ perception of the community. When the user views books that are available for annotation they are shown, in both iterations, the books in a tiled fashion where

some are larger and some are smaller. The larger books in this layout are newer to the collection and the smaller books are closer to being removed from the annotation options. Users are then able to hover over each book to view how active the annotations have been over the past few days. The first iteration, figure 7.2.12, shows a warping pattern playing over the cover of the book breaking apart or meshing together. The pattern moves more slowly for one book, indicating that it had not been as active. The second iteration shows the actual cover of the book warping when it is hovered over. This iteration appears more promising because the rippling pattern makes annotation activity more obvious.

The first decision I had to make when designing an annotation system was where the annotation would occur, inside or outside of the text. In a physical library it can be serendipitous to find marginalia in a book. Typically, a user would not read a book within a digital library; it would instead be downloaded. However, if the books offered for in-text annotation are limited, akin to a special feature, it would be more reasonable to have these copies of the book hosted online within the digital library. The first iteration of in-text annotation, figures 7.2.19–21, use a common symbolic language and key to annotate a text. Each symbol is assigned with a different mood or commentary that is commonly used to annotate text. The purpose of using a shared language is twofold: it includes the user with “in-group” code so that they feel like they belong, in understanding the language; and it allows the user to quickly read the group sentiment when all the annotation symbols are viewed at once. For example, it would be very easy to see if the general population were confused during a certain paragraph if the page was populated with question marks. However, using the language of symbols

is limiting and potentially prescriptive to marginalia, even with numerous options. The second iteration of the annotation system allows users to input any kind of comment they wish, including text, drawings, and symbols. In this iteration the entire screen acts like the large margins of a page. Users can toggle between viewing all annotations or simply highlighting the line they are interested in, cutting down on the visual clutter while reading. Although this iteration mimics the physical version of a book, the digital affordances allow a user to sort various annotations and view them in diverse ways.

Both the iterations on visualizing content traffic as well as the annotation system have a focus on the user being in-the-know and aware of what the community is doing and saying. The awareness of community traffic and commentary are how a user can feel included into a group. Allowing users to annotate the same few copies of a book creates a sense that the book, although digital, is something shared. This also collects all the annotations to create a diverse voice of the people, something each user will know that they have contributed to.

Observations

Overall, I drew several conclusions about how an annotation system could operate in order to best promote a sense of belonging. The annotation feature of each local digital library would only offer a select amount of books at a time available for annotations. Only 5–20 books at a time would be available and only several “copies” could be checked out at a time. The purpose of a rotating selection of books for annotation is the feeling of being in-the-know. Users would feel that they know what books are popular with others in their community and be able to see their notes in the margins. Although there could realistically be an unlimited amount of copies distributed digitally, the purpose of mimicking the limitations of physical book copies is to enhance the feeling of something shared. This also permits each digital book copy to have a unique set of annotations,

or all of the annotations to be compiled into a master copy. Once a book’s annotation time is up, the book would be archived so the notes and annotations are preserved. Anytime that book is checked out, a user would have the option to select the annotated copy. Another potential benefit of limiting the amount of time a book is open for annotation is the inclusion the user receives from knowing they contributed to something that was relatively exclusive. Each of my following iterations operates under the notion that this is how the system would function.

Figure 7.2.11
The Digital Public Library homepage.



Figure 7.2.12
A visualization of the activity level of annotations on two books using moving color.

<https://college.design.ncsu.edu/thenfinally/herndon/blob2.mp4>

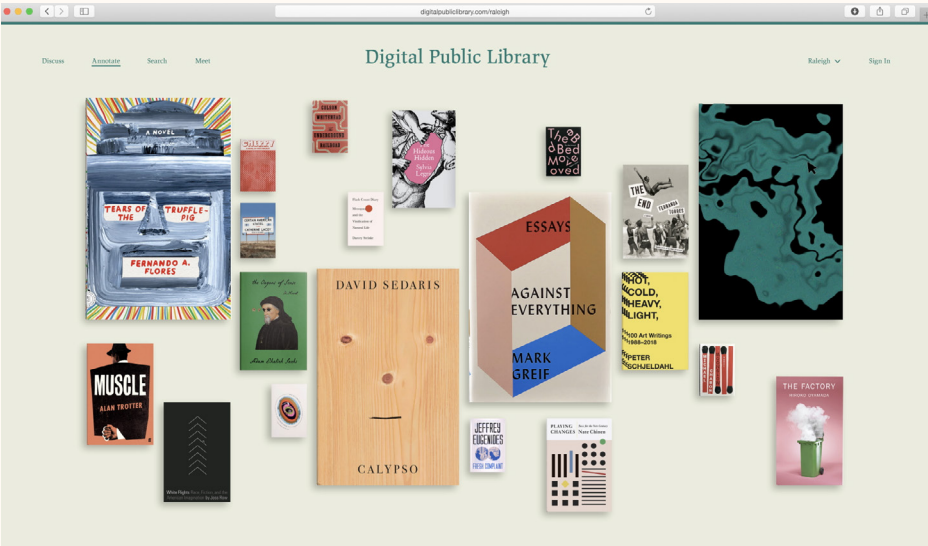


Figure 7.2.13
A visualization of the activity level of annotations using a warped pattern movement.

<https://college.design.ncsu.edu/thenfinally/herndon/wiggle1.mp4>

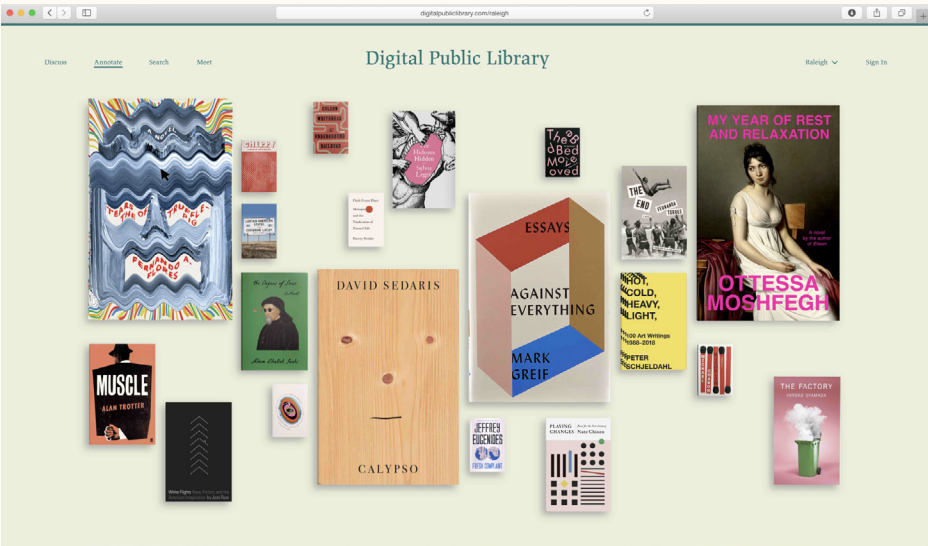


Figure 7.2.14
The warped pattern movement shown on all books offered for annotation.

<https://college.design.ncsu.edu/thenfinally/herndon/wiggle2.mp4>

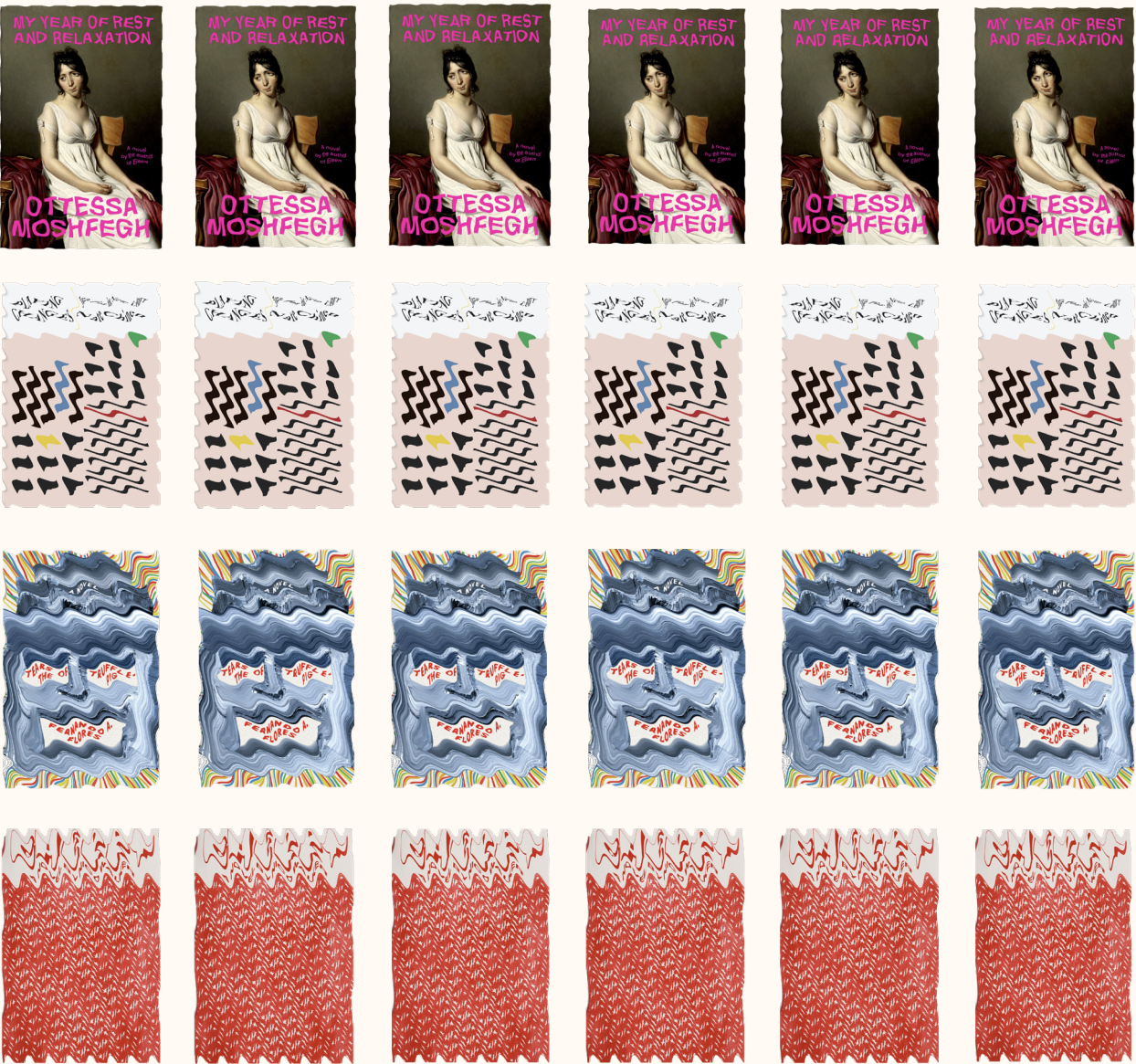
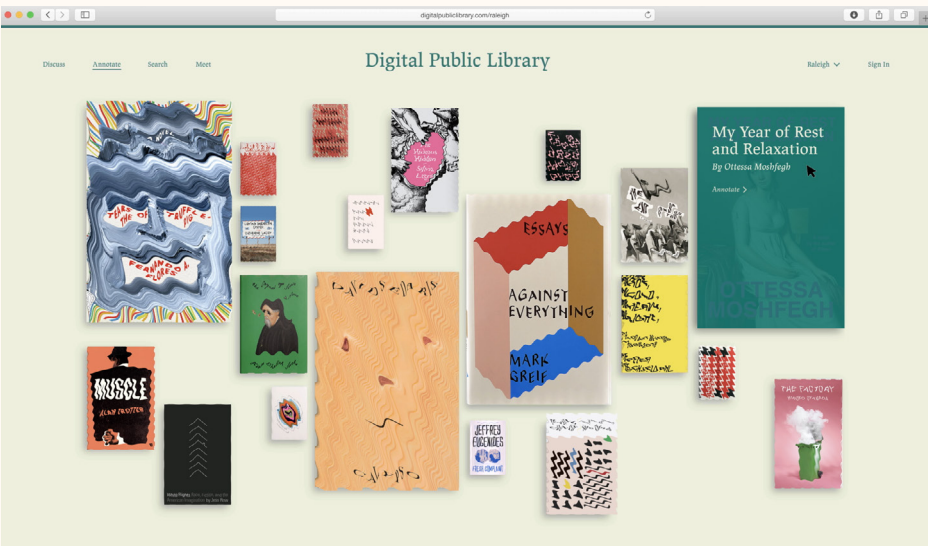


Figure 7.2.15
The variance in the warping pattern indicates a higher or lower activity level.

Figure 7.2.16
Annotation
instructions
using a symbolic
language.

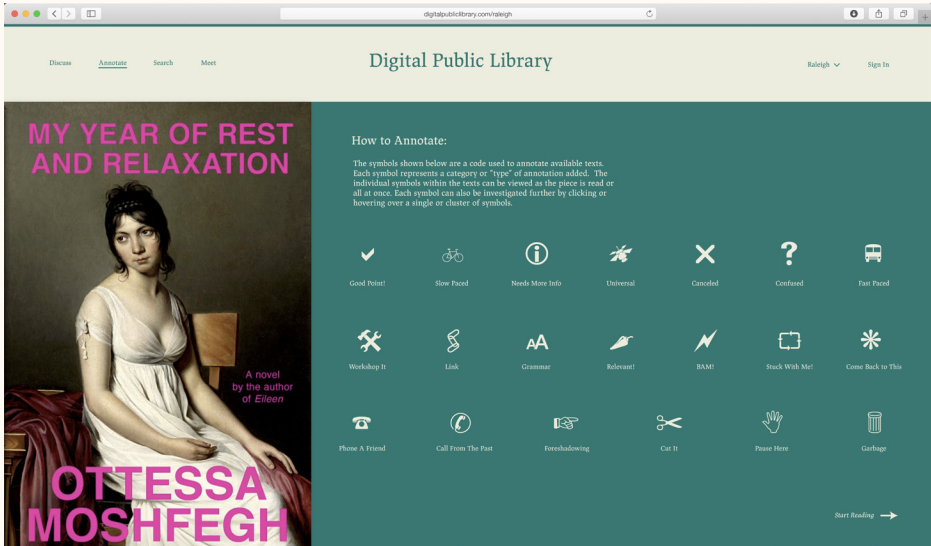


Figure 7.2.17
A view of anno-
tations where a
user hovers over
a line to see each
comment.

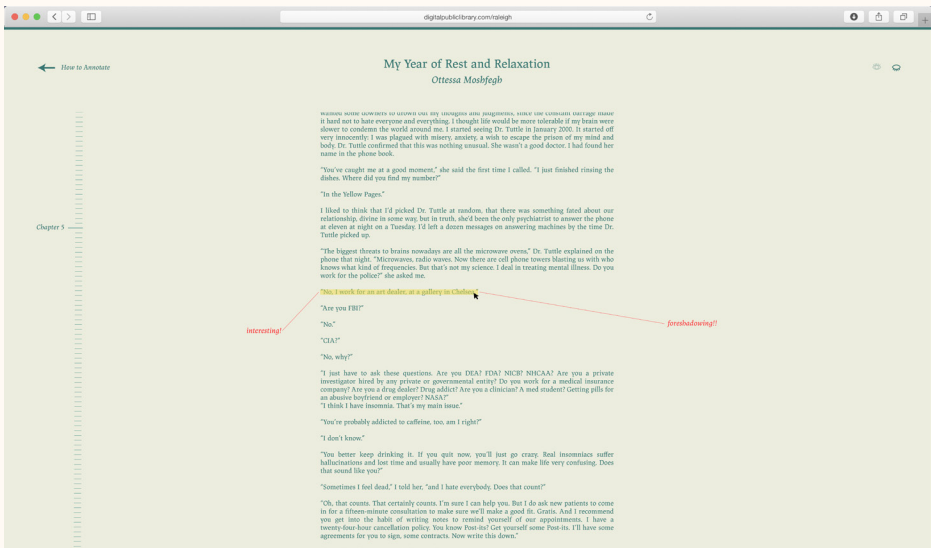


Figure 7.2.18
A view of anno-
tations where a
user can view all
comments at the
same time.

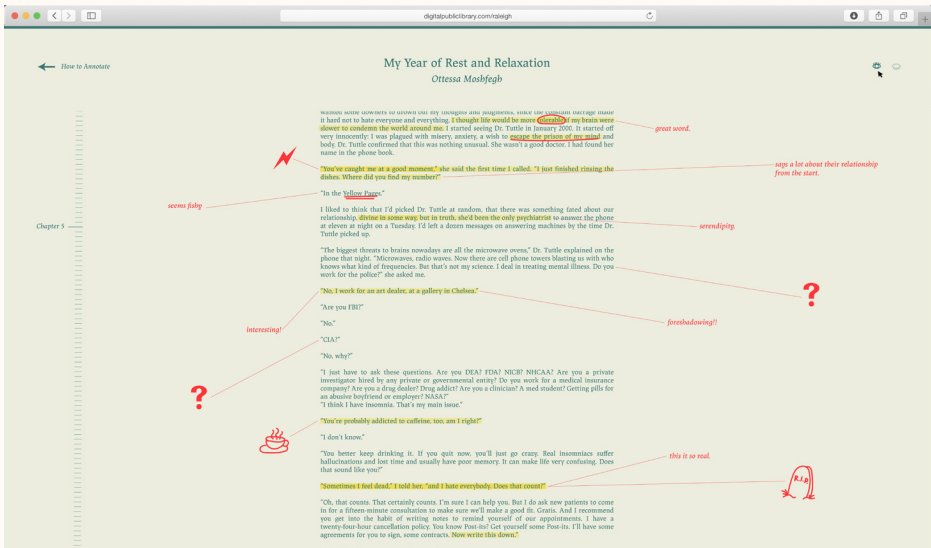


Figure 7.2.19
The user is able to
limit the amount of
annotations.

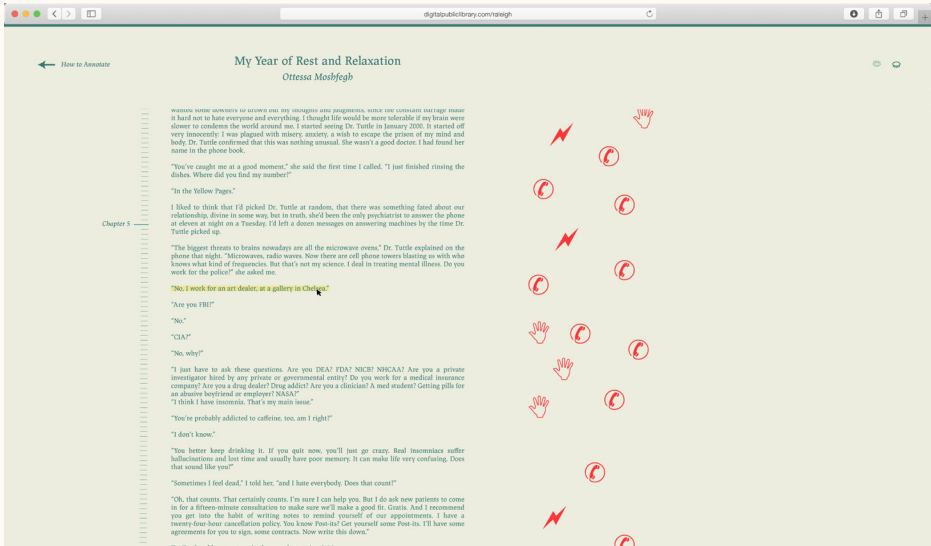


Figure 7.2.20
When selecting a
symbol the user
is able to view the
full comment.

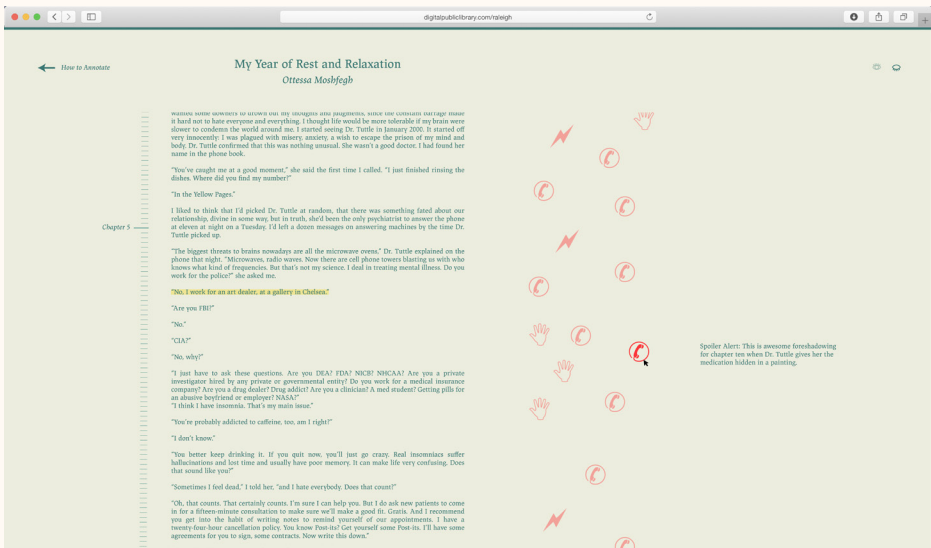


Figure 7.2.21
The user is also
able to view all
annotations at the
same time.



7.2.3 How can a digital search tool provide open-ended browsing for serendipitous discovery?

Question

The purpose of a library search engine is to aid users in finding books. On a traditional digital library platform, users type in the title they are searching for, and a list of results is provided. In a traditional public library setting, patrons either ask a librarian for assistance or wander through the shelves on their search, with ample moments of opportunity along the way to discover something they had not intended. This study investigates how the serendipity experienced in a physical library can be translated into a digital space and how this feature could provide community benefits to users.

Data Visualization Librarians at the NCSU Hunt Library, Walt Gurley, and Scott Bailey, provided an interview to supplement this investigation. Both librarians were surprised that serendipity was associated with physical libraries. They commented that from their perspective as librarians, they were aware of so much careful planning and organization of libraries, that it felt like a very structured and straightforward place. In contrast, to them, the idea of an online search engine lent itself much more to serendipity due to hyperlinking and the infinite number of routes to click through. However, they both agreed on the current shortcomings of digital library searches and the lack of awareness of other users in the space. Gurley and Bailey noted that the affordances of an online platform inherently allowed for a high level of serendipity, while many of the moments of discovery that occur in physical libraries have not been translated into this space. The results of this study suggest the possibility of a search feature that allows users to experience serendipity, search for, and discover books, in addition to maintaining an awareness of one another.

Process

This study involved a greater degree of preparation than the previous two. The design of the search feature required deeper consideration of how the system might operate, because the feature should permeate the entire platform. The search feature is a mode the user can switch into at any point, in order to explore the content in a way that promotes serendipitous discovery. During this extended preparation phase, I outlined how the system might appear, using color to differentiate the modes of viewing the same content, as shown in Figure 7.2.24. This process suggested the potential of a unified system rather than separate imagined tools. This question, and the incorporation of systems level thinking, prompted the shift of the investigation.

Because the social digital library is maintained at a local level of users, along with a curated selection of books, both of these numbers remain low and the operation of the proposed system is more feasible and effective. Figure 7.2.22 depicts what the user would see upon entering the search space. Books are shown as their book covers all across the screen, around the same size, some stacked on top of one another. The stacks of books are stacks that have been created by other users. The organization of the books in the search space is largely dependent on the actions of other users as well as algorithms used to sort books according to the user's preferences, similar topics, and popularity. The books are all tied by an invisible web of similarities which the user can then explore and rearrange. Each time stacks are made and books are viewed, the system realizes more connections and incorporates them into the organization of the space.

Observations

The user can move books around in the space, throw them off the screen, enlarge them, and make stacks of their own to show up on fellow users' search spaces (Figure 7.2.22). Overall, there is not one singular interface that all users are viewing at the same time, although that is the intended impression. Changes that an individual user makes to their own screen do not have a one-to-one relationship with what happens on every other user's screen, although they can have an influence. Figure 7.2.23 shows how the user can click and drag the screen to navigate the seemingly 3D space. This design is reminiscent of a virtual environment and lends itself to some of the spatial affordances of virtual reality but is designed for the more accessible desktop technology. As the books move across the screen, some appear and disappear (Figure 7.2.26), some wiggle (7.2.27), and some glow (7.2.28). These subtle changes to books as they pass by on the screen all indicate the action of other current users in the space. The books that disappear have been "picked up" by other users to inspect further, while the books that appear on the screen have been "put down." The glowing books are those that another current user has "recommended." This feature translates the way that a library patron might run into someone at the same shelf and suggest or overhear a conversation on the other side of the shelf about a book that sounds interesting. This feature allows a user to select a book and recommend it to someone, in the knowledge that the next current user who scrolls past the book will have it highlighted in their space. Wiggling books are books that are currently available for annotation, as explored in the previous study.

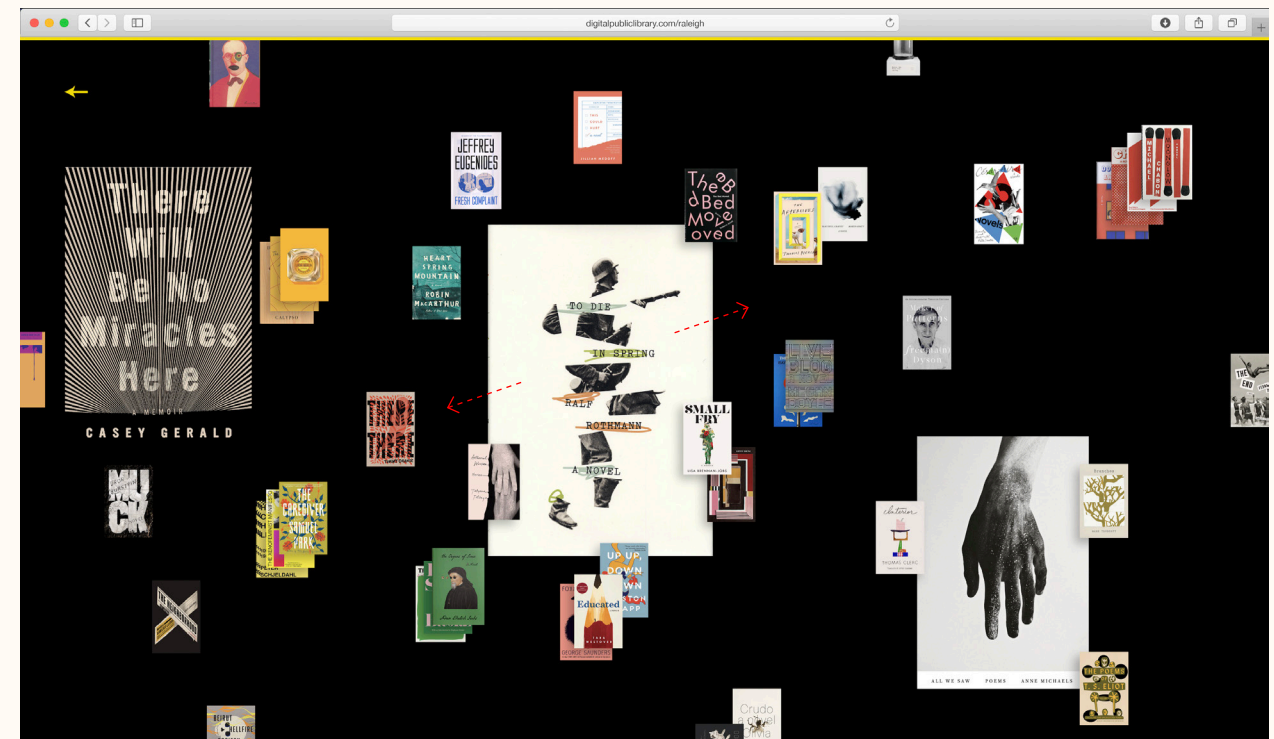


Figure 7.2.22
User interface
entering the
search tool.

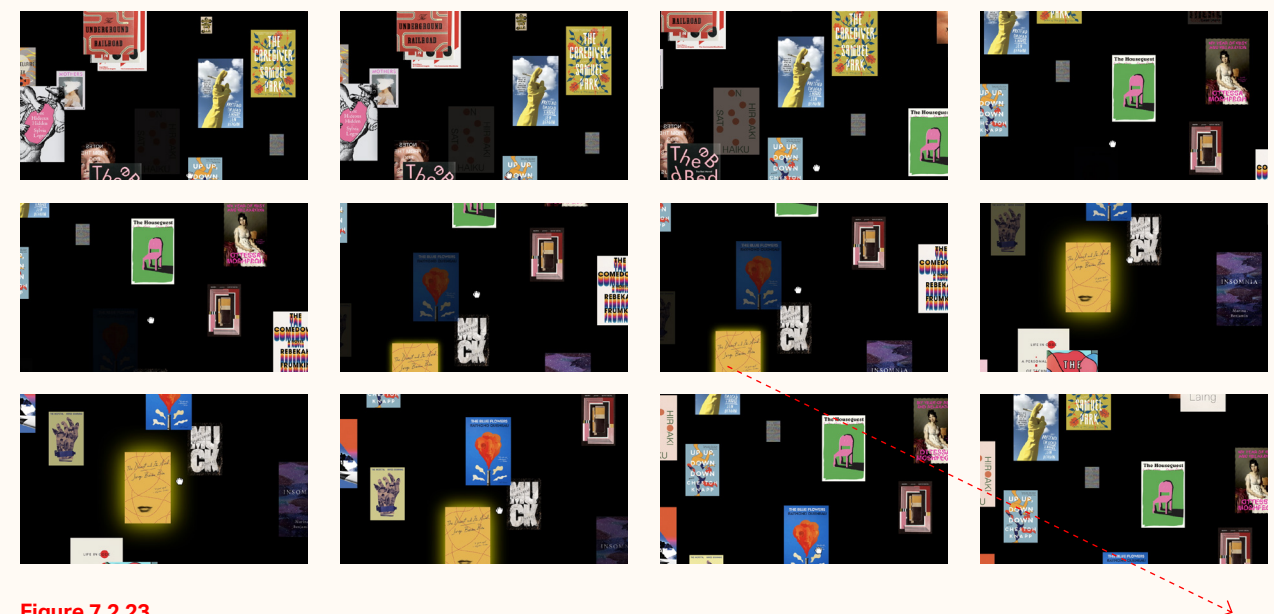


Figure 7.2.23
The user is able to click and drag to navigate the search space.

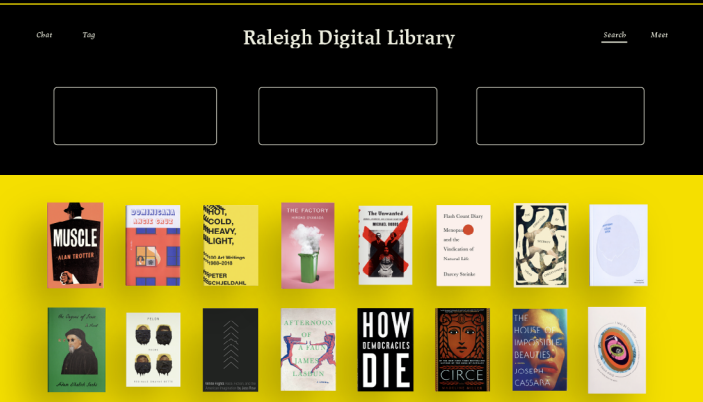
Home



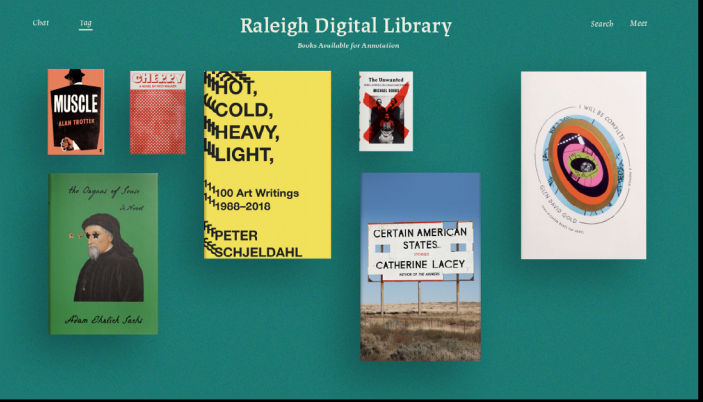
Chat



Search



Tag



Meet

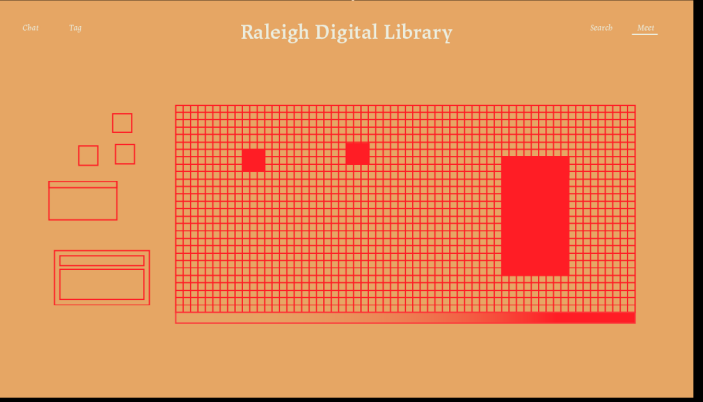


Figure 7.2.24
An overview of the whole system.

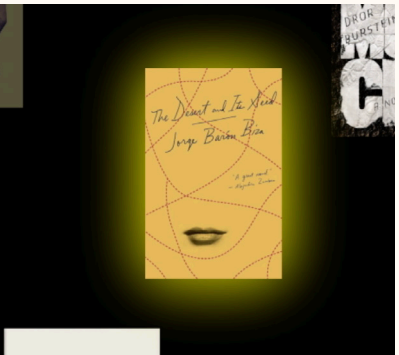
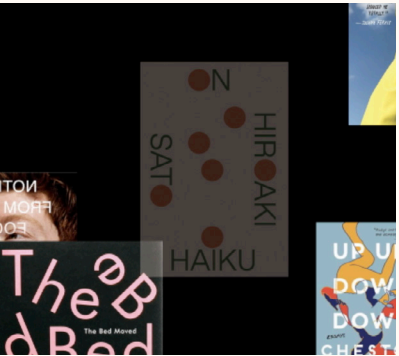
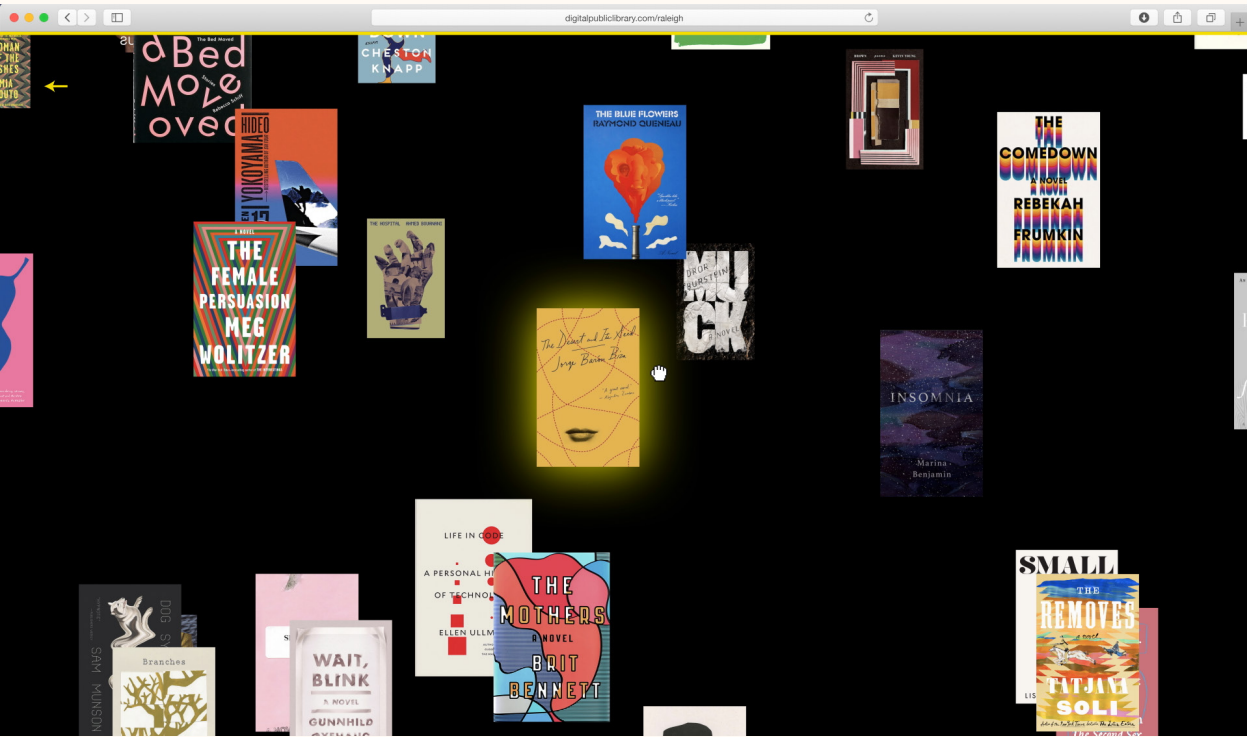
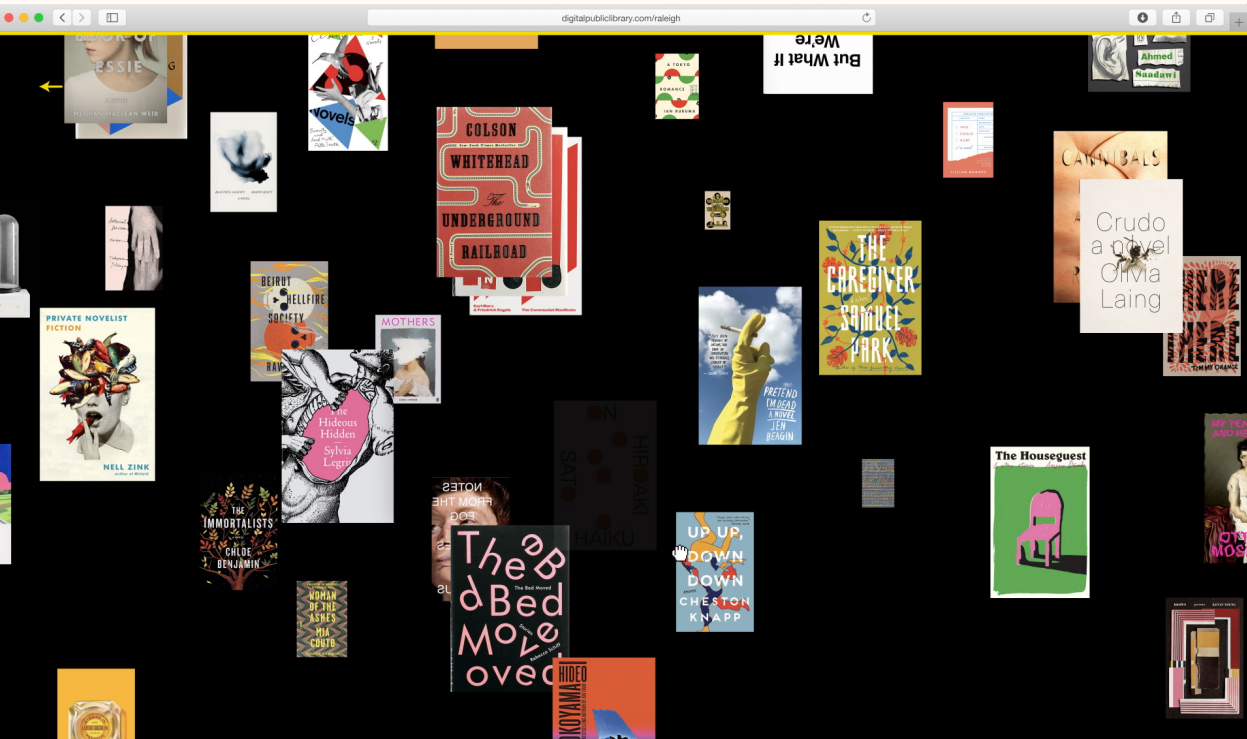


Figure 7.2.26
Books will appear and disappear as other users in the search space interact with them.

Figure 7.2.27
Books available for annotation will be shown with the wiggling visualization of their activity.

Figure 7.2.28
Books that have been recommended by other users with glow as they are scrolled by.

Figure 7.2.25
The user has the ability to move through the space and resize books.

<https://college.design.ncsu.edu/thenfinally/herndon/search.mp4>

7.2.4 How can a digital library platform synthesize search, discussion, and annotation tools to facilitate community benefits?

Question

The fourth differs from the rest. Rather than produce another series of iterations, this study follows a more traditional user experience investigation aimed at a singular “solution.”

Process

In order to synthesize the three features explored in earlier studies — a search tool, a discussion platform, and an annotation tool — I first envisioned a scenario in which a user navigates these features seamlessly. The most important part of building this scenario was observing the places where the features might overlap and why. In addition, the question arose of how each feature is distinctly different from the others in the experience it provides the user.

Scenario Jessica is in search of a new book to read over her upcoming weekend vacation at the beach. She is particularly interested in reading something that other people in her community are also reading as she loves to be in the know and have conversations about what she is reading. She doesn’t like to waste her time reading books she doesn’t like and typically does plenty of research on a book before she commits. After logging onto her local digital library, Jessica begins her journey to find a book, using the search feature. Although she is tempted by the glowing book that passes by, she also notices one that has a rippling movement to it and is intrigued. She finds that the book is available for annotation only for a limited time, meaning that she and other members of the same local digital library all have access to a copy of the book that they are able to comment and take notes on. Scrolling through the first chapter of the book, Jessica likes the annotations that she sees and the selection

she reads. However, she decides to look further into discussion around the book by switching into discussion mode. Here Jessica sees the most recent comments on the book larger and opaque, while older comments fade into the background. Jessica recognized that many themes that she is fond of in literature seem to be present in the comments and she decides to commit to the book after both confirming that it caters to her interests and that many others are currently reading the same book.

Figure 7.2.29 shows the sequence of Jessica’s journey throughout the digital library platform. She first uses the platform’s search feature, and is initially intrigued by a book. Upon further investigation, Jessica uses the annotation tool to preview the first chapter and the notes left by others. Finally, continuing onto the discussion space for the book, Jessica confirms after browsing the comments that this book suits her literary tastes.

Observations

Although study four differed from the other three studies — i.e., it was more focused on synthesis than the creation of new outcomes — the process of synthesizing opened up unexpected possibilities. There is no linear path that a user is prescribed to take when interacting with this platform. The combination of features revealed that there are infinite routes of exploration for users to take even within a platform of only three features. The opportunities for users to design their own path affirmed the aggregation of the features in this way. Steeped throughout each study is the value of awareness of others in digital spaces in a seamless way. For example, the rippling motion indicating the activity level of an annotation book is repeated in the search feature.

Each exploration space is delineated by its own colored bar at the top of the screen but otherwise transitions from one space to the next without significant interruption. The movement from space to space in the platform embodies the spirit of wandering through a physical library, engaging with both people and content in shifting modes.



Figure 7.2.29
An grid above follows a user journey through all three features.

<https://college.design.ncsu.edu/thenfinally/herndon/synthesis.mp4>

8.0 DISCUSSION

8.1 Design Principles

Over the course of this investigation, several principles stood out as both more compelling and consistently effective. The following principles have the potential for implementation within and beyond the field of design.

Purposeful Limitation can Increase Awareness of Other Users

The idea of purposeful limitation refers to both the limitation of digital content available as well as the limitation of data and technology use. Digital designers and platforms have the ability to supply nearly infinite content with access to quickly developing technology, fueled by unmitigated access to user data. However, it is important for designers to carefully consider the necessity of using the full potential of content, technology, and data. To put it simply, just because we can, does not always mean we should.

Content. The functionality of the digital library platform that I have designed is reliant on constrained and curated literary content. Although the online platform has the capability to supply an unlimited number of copies of books to users, it appears a justifiable design decision to cap the number of results in a more finely tuned and intentional system. Although counterintuitive, denying users their own copy of digital content may resurrect the sentiment of shared resources. There is a resulting increased awareness of others inhabiting the same digital space. (Studies 2 & 3)

Technology + Data. The limitation of the use of technology and data requires the designer to ask themselves the same question as the limitation of content: will this technology [data use, content] provide platform users with a meaningful experience where they are aware of one another’s presence? If the answer to this question is no, then

I am arguing that the feature in question should be left out of the design. The digital library platform that I have proposed approximates numbers in the visualization of diversity by using the terms high, medium, and low, in order to provide users with information while refusing to cross the line of oversharing their data. (Study 1)

Motion can Communicate Presence Online

The principle that motion can communicate the presence of other users online is the most consistently executed strategy throughout this investigation. From the initial iterations I made for the first study, it was apparent that the experiential nature of motion was most reflective of activity and presence in a physical space, therefore immediately effective at communicating presence online. This principle is also one of the most scalable outside of the digital library space, relevant to most digital design attempting to communicate online presence. The awareness of a movement in a digital environment evokes a sense that something is happening beyond the user’s own environment, connecting the user to the community of others inhabiting the same space. (Studies 1, 2, 3 & 4)

User Autonomy can Aid in Engagement

Study 3 best illustrates the principle that when the user manipulates or interacts with an interface, they are more likely to participate and ultimately feel a sense of ownership over the platform. While it is uncommon that a user would be capable of manipulating foundational modules of the interface, this principle argues that it could be beneficial for this to be possible. An interface that allows user manipulation invites that user to be an active piece of the platform and system itself, rather than assuming that they are a passive audience. In turn, when users are both capable of taking action within an interface as well as viewing others’ actions, their awareness of others in the same space increases and is more reflective of their physical experience. (Study 3)

8.2 Future Work

While the listed principles remain reliable throughout my studies, they only hint at the future possibilities for furthering this investigation. These principles point to potential within the field of library sciences, within the field of design, but are also transferable to other fields entirely.

Project Continuation

User Testing. The principles listed above are suspicions supported by the limited investigation that I have conducted. In the continuation of this project, even within the same scope and parameters, the validity of these principles would have to be supported by legitimate user testing.

Additional Expertise. In addition to further implementation of research methods such as user testing, the continuation of this study would also benefit from the invitation of additional expertise. Partnership with collaborators within the field of library sciences would expose blind spots within the investigation as well as open up new opportunities for testing and implementation. Further, partnership with data scientists and developers could aid in smoothing out technological possibilities when considering a digital library platform that could be a realistic product rather than a speculative investigation.

What is a Library? Within the same basic investigation parameters, there is potential to broaden the definition of library provided in this study. Although the primary facet of libraries is the provision of literary content, there are many interesting roles that libraries play in the community, such as a voting place, a maker space, and a tools collection, which could be worthy investigations to explore translation to digital platforms.

Hybrid Libraries. An additional alteration to the original investigation parameters could be broadening the narrow scope of physical to digital design to the design of hybrid digital and physical library spaces.

Digital Design

Social Infrastructure Online. We are increasingly spending time online and forming communities in digital spaces. It is important that designers consider the type of physical infrastructure in place that fosters community and what can be borrowed from it when designing online spaces. An interesting avenue of exploration tangential to this

investigation is how other physical institutions of social infrastructure could be translated into digital environments.

Presence and Social Benefits Online. Similarly, due to an increased social time spent online, it is important for designers to consider how users will be made aware of one another. Within the field of social media, it is more apparent how the principles of this study might be applied to create new ways of depicting people and their activity. However, these principles can also be applied to digital spaces that are not seen as social spaces, such as large search engines like Google. The recent outbreak of COVID-19 has placed a relevant urgency on the design of social spaces online when they are not available in traditional ways. Designing spaces online to allow for the awareness of others has powerful implications both for the future of how we might exist online as well as creating more human digital spaces today.

8.3 Conclusion

Within its design, this investigation addresses how a digital library can afford the community benefits of a physical library. However, in its results, it implies broad reaching applications. The studies in this investigation explore how a user of a social digital library could discuss, annotate, and search through content with an increased awareness of others inhabiting the space and contributing to the platform. These studies asked how these features could visualize diversity, content traffic, and allow for serendipitous discovery, with multiple proposed outcomes not exhaustive of all possibilities.

Purposeful limitation of content and technology, using motion to communicate presence online, and leveraging user autonomy are strategies that have applications far beyond the fields of design or library sciences. The studies conducted in this investigation, while rich in their discovery, only point in the direction of what is possible. Communities are increasingly at risk of losing the social benefits of libraries and other public spaces in translation to a digital world. There is mounting importance for designers to consider incorporating social infrastructure into online spaces. This investigation emphasizes the value of social infrastructure and its preservation in both physical and digital environments. The results of this investigation can hopefully contribute further work within this problem space and continued investment by designers to create palaces for the people.

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10.0 APPENDICES

10.1 Appendix A: List of Figures

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Figure 5.1.2
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Figure 7.1.1
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Figure 7.1.2
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Figure 7.1.3
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Figure 7.1.5
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A visualization of what a discussion could look and feel like if it were an object.

<https://college.design.ncsu.edu/thenfinally/herndon/cube.mp4>

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<https://college.design.ncsu.edu/thenfinally/herndon/card.gif>

Figure 7.2.4
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<https://college.design.ncsu.edu/thenfinally/herndon/gradient.mp4>

Figure 7.2.5

A visualization representing the community as a moving entity.

<https://college.design.ncsu.edu/thenfinally/herndon/blob.gif>

Figure 7.2.6

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<https://college.design.ncsu.edu/thenfinally/herndon/grid.mp4>

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A wireframe showing a visualization depicting diversity levels of race and income for the conversation to the right.

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A detailed view of the visualization in the previous wireframe depicting the metrics.

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A wireframe showing a visualization depicting diversity levels of race, income, age, and education for conversations using the screen as a scatterplot.

Figure 7.2.10

A wireframe depicting the view once a user has selected a conversation to explore.

Figure 7.2.11

The Digital Public Library homepage.

Figure 7.2.12

A visualization of the activity level of annotations on two books using moving color.

<https://college.design.ncsu.edu/thenfinally/herndon/blob2.mp4>

Figure 7.2.13

A visualization of the activity level of annotations using a warped pattern movement.

<https://college.design.ncsu.edu/thenfinally/herndon/wiggle1.mp4>

Figure 7.2.14

The warped pattern movement shown on all books offered for annotation.

<https://college.design.ncsu.edu/thenfinally/herndon/wiggle2.mp4>

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Figure 7.2.16

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Figure 7.2.19

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Figure 7.2.20

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Figure 7.2.21

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Figure 7.2.23

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Figure 7.2.24

An overview of the whole system.

Figure 7.2.25

The user has the ability to move through the space and resize books.

<https://college.design.ncsu.edu/thenfinally/herndon/search.mp4>

Figure 7.2.26

Books will appear and disappear as other users in the search space interact with them

Figure 7.2.27

Books available for annotation will be shown with the wiggling visualization of their activity.

Figure 7.2.28

Books that have been recommended by other users with glow as they are scrolled by.

Figure 7.2.29

An grid above follows a user journey through all three features.

<https://college.design.ncsu.edu/thenfinally/herndon/synthesis.mp4>

10.2 Appendix B: Book Covers

001 Birthday
César Aira

002 Muscle
Alan Trotter

003 Dominicana
Angie Cruz

004 Hot, Cold, Heavy, Light
Harry N Abrams

005 The Factory
Hiroko Oyamada

006 Tears of the Truffle-pig
Fernando A Flores

007 The Unwanted : America, Auschwitz, and a Village Caught in Between
Michael Dobbs

008 Flash Count Diary: Menopause And the Vindication of Natural Life
Darcey Steinke

009 Organs of Sense
Adam Ehrlich Sachs

010 Felon: Poems
Reginald Dwayne Betts

011 White flights : race, fiction, and the American imagination
Jess Row

012 Afternoon of a Faun
James Lasdun

013 How Democracies Die
Steven Levitsky

014 Circe
Madeline Miller

015 Cherry
Nico Walker

016 My Year of Rest and Relaxation
Ottesa Moshfegh

017 Underbug: a Tale of Termites and Technology
Lisa Margonelli

018 The Pisces
Melissa Broder

019 Calypso
David Sedaris

020 The House of Impossible Beauties
Joseph Cassara

021 Playing Changes: Jazz for the New Century
Nate Chinen

022 The Condition of Secrecy
Inger Christensen

023 Certain American States
Catherine Lacey

024 I Will Be Complete: a Memoir
Glen David Gold

025 Poems of T.S. Eliot
Thomas Stearns Eliot

026 A Separation
Katie Kitamura

027 Why?: Explaining the Holocaust
Peter Hayes

028 Fresh Complaint
Jeffrey Eugenides

029 All We Saw: Poems by Anne Michaels

030 The Communist Manifesto
Karl Marx & Friedrich Engels

031 To Die in Spring
Ralf Rothmann

032 The Book of Disquiet
Fernando Pessoa

033 Life in Code: A Personal History of Technology
Ellen Ullman

034 The End
Fernanda Torres

035 The Mothers
Brit Bennett

036 Moonglow
Michael Chabon

037 The Bed Moved
Rebecca Schiff

038 Beautiful Gravity
Martin Hyatt

039 The Hideous Hidden
Sylvia Legris

076 The Female Persuasion
Meg Wolitzer

077 Insomnia
Marina Benjamin

078 The Desert and Its Seed
Jorge Barón Biza

040 But What If We're Wrong?
Chuck Klosterman

041 Against Everything
Mark Greif

042 The Underground Railroad
Colson Whitehead

079 Interior
Thomas Clerc

080 Crudo
Olivia Laing

081 The Houseguest
Amparo Dávila

043 Cannibals in Love
Mike Roberts

044 Private Novelist
Nell Zink

045 On Trails
Robert Moor

082 The Caregiver
Samuel Park

083 On Gravity
A. Zee

084 The Book of Essie
Meghan MacLean Wei

046 Severance
Ling Ma

047 Madness is Better Than
Defeat
Ned Beuman

048 Sexographies
Gabriela Wiener

085 The War of the Worlds
H. G. Wells

086 The Comedown
Rebekah Frumkin

087 Against Creativity
Oli Mould

049 Pretend I'm Dead
Jen Beagin

050 Frolic of the Beasts
Yukio Mishima

051 Things That Helped
Jessica Friedmann

088 The Hole
José Revueltas

089 Frankenstein in Baghdad
Ahmed Saadawi

090 King Zeno
Nathaniel Rich

052 Educated
Tara Westover

053 The Neighborhood
Mario Vargas Llosa

054 The Afterlives
Thomas Pierce

091 The Doctor Stories
William Carlos Williams

092 Muck
Dror Burstein

093 The Hospital
Ahmed Bouanani

055 Black Swans
Eve Babitz

056 The Xenofeminist Manifesto
Laboria Cuboniks

057 Seventeen
Hideo Yokoyama

094 There There
Tommy Orange095

095 Brown
Kevin Young

096 A Tokyo Romance
Ian Buruma

058 The Blue Flowers
Raymond Queneau

059 On Haiku
Hiroaki Sato

060 Heart Spring Mountain
Robin MacArthur

097 Evening in Paradise
Lucia Berlin

098 The Penguin Book of
Japanese Short Stories
Jay Rubin

099 Up Up, Down Down
Cheston Knapp

061 Fox 8
George Saunders

062 Dog Symphony
Sam Munson

063 Branches
Mark Truscott

100 Liveblog
Megan Boyle

064 Wait, Blink
Gunnhild Øyehaug

065 The Shutters
Ahmed Bouanani

066 Aetherial Worlds
Tatyana Tolstaya

067 Woman of the Ashes
Mia Couto

068 The Independent Woman
Simone de Beauvoir

069 Green
Sam Graham-Felsen

070 There Will Be No Miracles
Here
Casey Gerald

071 Impossible Owls
Brian Phillips

072 Small Fry
Lisa Brennan-Jobs

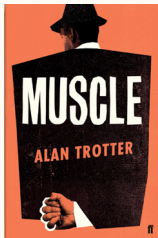
073 In Pieces
Sally Field

074 The Removes
Tatjana Soli

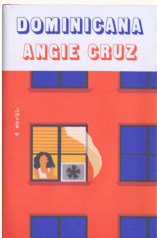
075 Maker of Patterns
Freeman Dyson



001



002



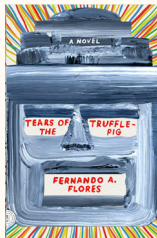
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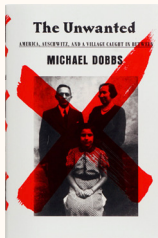
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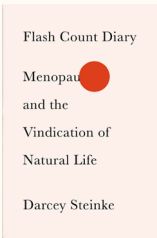
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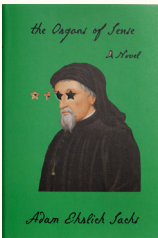
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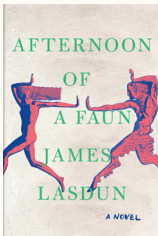
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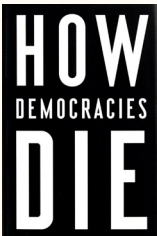
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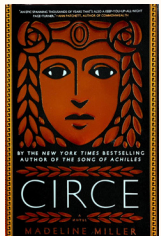
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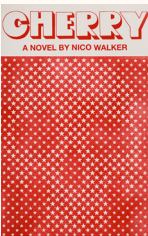
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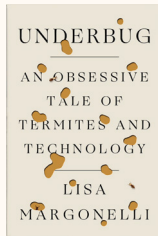
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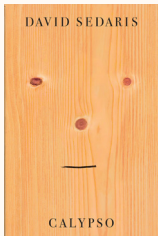
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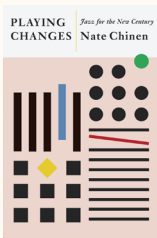
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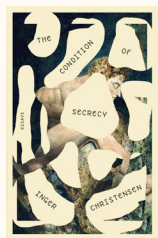
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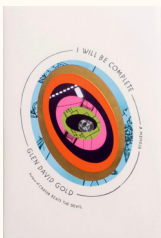
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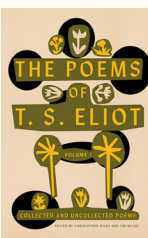
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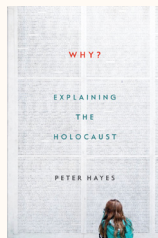
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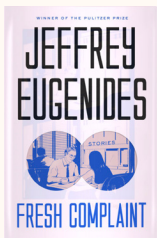
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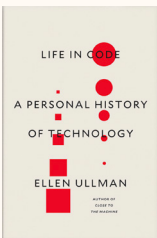
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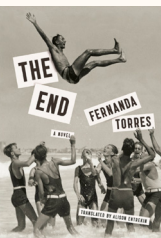
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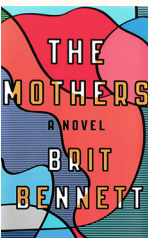
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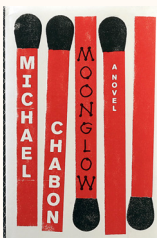
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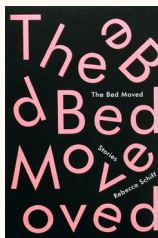
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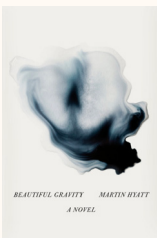
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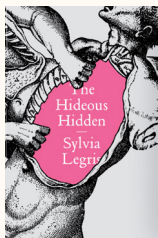
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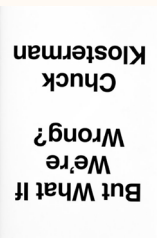
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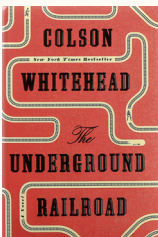
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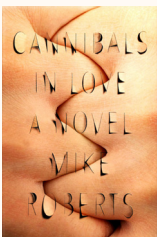
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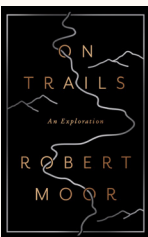
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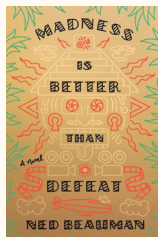
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046



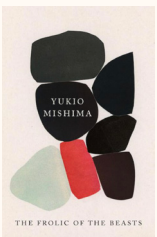
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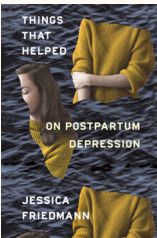
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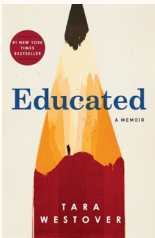
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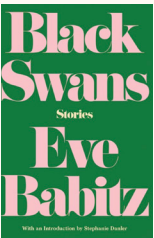
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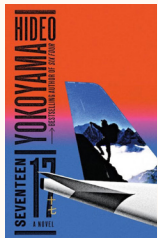
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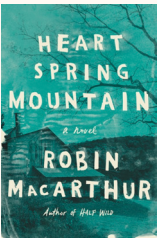
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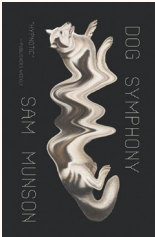
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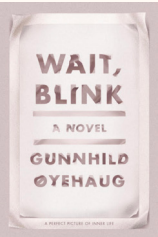
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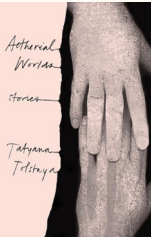
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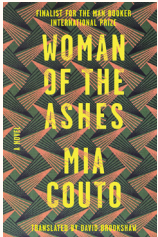
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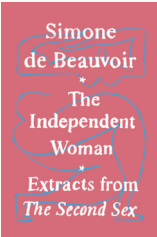
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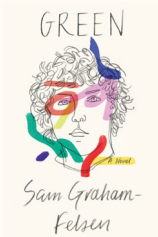
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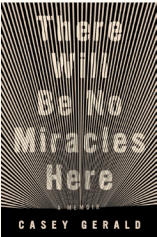
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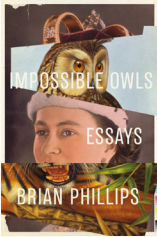
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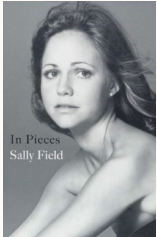
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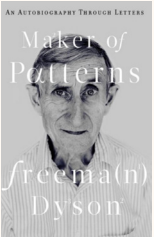
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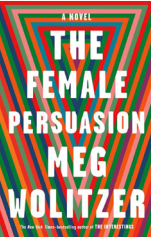
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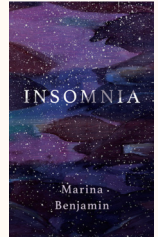
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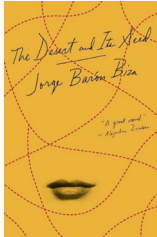
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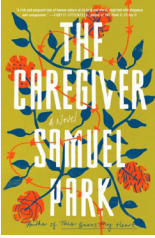
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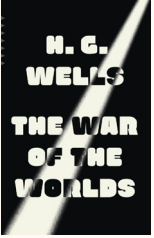
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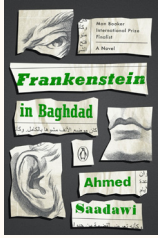
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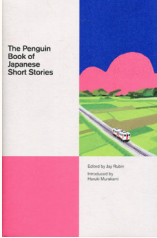
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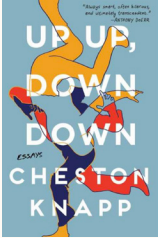
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