Synesthetic Visualization:
Balancing Sensate Experience and Sense Making in Digitized Print Collections

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Large-scale digitization appears to put literary collections at one's fingertips, but, as some critical observers warn, the books themselves are increasingly out of reach as libraries continue to shift from being "physical repositories and research spaces" to becoming "access portals" to digitized materials (Stauffer, 2012). The digital surrogates of print books preserve verbal content but not their many meaningful physical features, which are largely obscured in digitization processes. As many critics recognize, with the passing of the age of print we have become increasingly aware of "the assumptions, presuppositions, and practices associated with it" (Hayles, 2012), and by contrast we glimpse the devaluation of materiality that appears to haunt digital culture (Hayles, 1999). What are the best ways to treat print-based collections digitally? How can we harness the potential of digital media to better represent and analyze cultural collections, accentuating their unique aesthetic and material qualities while also allowing for diverse perspectives and rich linking supported by computer-assisted content analyses?

In this paper we synthesize perspectives from book history, reception studies, literary studies, information visualization, human computer interaction (HCI) and digital arts to discuss practical approaches to these questions. Working with the Bob Gibson anthologies of speculative fiction—a unique collection of periodical-based science fiction selectively assembled, annotated, and bound into 888 handcrafted booklets by an avid science fiction fan, collector and artist—we explore possibilities for digital synesthesia and multi-modal interaction in sketching how digital representations of print collections can go far beyond typical digital library interfaces. By embracing a synergy between content-related metadata and physical artifactual characteristics (e.g. size, weight, paper texture, typography), we seek to engage multiple sensory modalities and provoke critical and aesthetic engagement with digitized print collections.

THE PERILS OF CONTENT-CENTRIC DIGITIZATION

The dominant approach to digitization (whether conducted by Google Books or a research library) ensures that minimal resources are expended to produce the maximum volume of digitized materials (Greene and Meissner, 2005). The guiding assumption seems to be that what matters most about *any* print text is its verbal content, and that this verbal content functions independently of its underlying material instantiation. And yet, as scholars of the "textual condition" (McGann, 1991) have long argued, the physical features of print texts are fundamental to their significance. Books are not just passive conduits of semantic meaning, but "scenes of evidence," containing valuable historical traces of print technologies, markets, and readerly interactions (Stauffer, 2012). Numerous studies show that semantic interpretation is *only one* way to interact with books (e.g. Silverman 2016; Price, 2012; Litau, 2006; Cormack and Mazzio, 2005; Jackson, 2001; Bogdan *et al*., 2000; Cressy, 1986; Davis, 1983). While many readers may privilege linguistic interpretation, others (bibliophiles, book historians and reception theorists among them) value sensory experiences—the pleasure and sensate knowledge of embodied interaction with books. The more unusual the print object, the more its "total form" (McKenzie 307), including binding, page size, texture, and weight, *matters*.

The Gibson anthologies are a case in point (see Fig.1). The significance of these 888 utterly unique handcrafted booklets depends both on their content (more than 13,000 little-known specimens of speculative writing and illustration harvested from hundreds of English-language popular periodicals, c1840s-1990s) and the ways in which this content is assembled, categorized, annotated, and illustrated by the collector. Anyone who has handled a Gibson anthology, an old book or some other physically unique print text would likely agree that its physical features and semantic content are inextricably interwoven. In exploring ways to preserve the multivalent value of print artifacts and the multi-sensory experience of reading, our goal is to *translate, re-interpret,* and *transform* (critically and creatively) embodied experiences with physical print objects into digital environments, understanding the strengths and limitations of each medium without subordinating one to another. This involves understanding both print and digital objects as fundamentally social, and the act of embodied reading as a generative act. Gibson's reading, much like ours, is also a form of making and sharing reading materials.

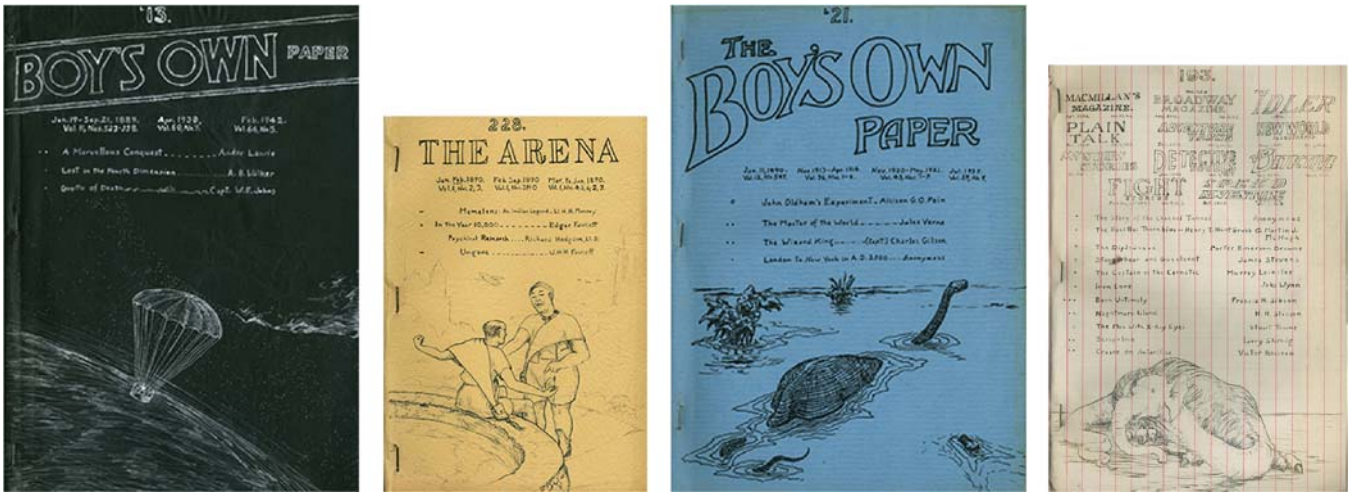

Figure 1. The Gibson Anthologies of Speculative Fiction.

TOWARD SYNESTHETIC VISUALIZATIONS

Efforts for designing interfaces for digital collections that promote both their content and their unique visual and material "flavours" have been ongoing, mostly in the areas of information science, HCI, visualization and design (see, e.g., Hinrichs, 2008; Hinrichs, 2016; Glinka, 2016; Thudt, 2012; Whitelaw, 2015a, Whitelaw, 2015b). However, current approaches still predominantly focus on the salient visual features of print-based artifacts, for example, their aspect ratio, cover artwork and inherent use of colors (see Thudt, 2012 or Whitelaw, 2015b). More subtle yet evocative visual and physical characteristics such as original size, weight, paper texture, cover material, and bindings are often not considered in interface design, if they are recorded as metadata at all.

Recent advances in visualization and HCI, namely data physicalization which includes "physical artifacts whose geometry or material properties encode data" (Jansen, 2015) and multi-modal interaction (e.g., Hogan & Hornecker, 2015) offer new avenues to digitally explore such characteristics. In addition, we draw inspiration from the concept of synesthesia, "a condition in which stimulation in one sensory modality also gives rise to an experience in a different modality" (Sagiv, 2005; p. 3), and its reinterpretation by writers and artists (from the nineteenth-century Romantic and Symbolist poets and Aesthetes to contemporary digital artists (Gsöllpointner, 2016)) who experiment with sensory mixing for different aesthetic ends. Building on these concepts, we seek to remediate specific sensory experiences of interacting with the Gibson anthologies through digital means by coupling visual representations with cues for other sensory modalities that are routinely engaged by these print texts. This *synesthetic visualization* can take many different forms, of which we illustrate two:

On-Screen Representation of Material Features. We explore ways to capture and systematically translate the physical features of the Gibson anthologies into a digital space driven by visual, auditory and screen-based interaction. This is based on the characterization and documentation of the collection's paper materials. Made of pages culled from popular periodicals—ephemeral forms of text—and with covers assembled from recycled household scrap paper, the Gibson anthologies are as fragile as they are unique. Gathering metadata and visual samples of physical traces of frequent handling (folds, tears) and environmental exposure (sun, water, or even mold damage) allows us to translate these characteristics on-screen. For example, close-ups of visual samples of the original paper can shape a visual backdrop for the actual stories; samples of the cover paper can serve as visual thumbnails of an anthology with computationally derived ribbed edges to indicate its level of wear and tear. A general "fragility" rating of an anthology (qualitatively or quantitatively derived) may translate into how its digital representation reacts to touch interaction, with frequent interaction resulting in a subtle deterioration of the anthology where bits of paper fall off, or paper patina changes. Sound could accompany interactions to further highlight different paper qualities and "feel". In all of these explorations, working with direct-touch technology may be key in translating the experience of "handling" a print text.

Digitally-Enhanced Physicalization. In parallel to on-screen representations, we also explore ways to create digitally enhanced physical artifacts that combine content and materiality-related metadata from specific anthologies. Here we deliberately move away from print-based reproductions of the anthologies, seeking to provide compact data-driven physicalizations that can be used as an entry point to rich on-screen explorations of the collection as a whole. For example, physical tokens could be designed to summarize the major science-fiction motifs compiled by Gibson (ranging from the supernatural to technology). The token's physical form and texture could be based on the underlying anthologies, their themes, authors, source magazines and other metadata. Placed on a tabletop display, these tokens could provide access to individual digitized science fiction items and enable more elaborate explorations and searches. In another example, we invite people to engage with the collection the way Gibson did: cutting, pasting and remediating existing materials into new anthologies. People could select items of interest from different anthologies which would compile into data-driven geometric models to reflect these selections and their overarching characteristics (both content-related as well as physical). Physical fabrication (e.g., 3D printing) would transform such models into physical manifestations—people's very own anthologies. Interacting with these fabricated models on a tablet display, in turn, could reveal the underlying science fiction items for reading.

CONCLUSION

The primary purpose of the design explorations we present in this paper is to demonstrate the importance of capturing and representing metadata about the physical features of print materials as we continue to migrate our cultural heritage into digital environments. We argue that the combination of content- and materiality-centric metadata is key to developing more holistic approaches to digital preservation and curation, and to promoting opportunities for meaningful engagement with digitized print materials for academic and general audiences alike while enhancing appreciation of both print and digital media.

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