Digitize This!

A.D. Wissner-Gross & T.M. Sullivan say printing advances enable entire books on posters

From Codex to Poster

Imagine a book on one poster, an entire volume reproduced and readable on a single poster-sized piece of paper. High-resolution printing technology enables the unexpected condensation of vast texts in this way. For properly displayed fonts, "books on poster" can also be legible at a reading distance of a few inches. This novel medium may have profound consequences for education and literacy.

The perceived size of a book is proportional to the time taken to read it. This is, in turn, proportional to the time taken to scan rapidly each line. Also, line scanning time is proportional to character width for a common adult scanning speed.

The actual size of books is proportional to the area the text takes up. Writing is fundamentally two-dimensional, which has led to a long history of two-dimensional information storage media, including hard drives and magnetic tape. Since we live in three spatial dimensions and require one for random access, it is unavoidable that we densely pack information into two dimensions. In traditional books, random access begins when a particular page has been selected for reading.

Character readability at a fixed reading distance is measured by the angle stretched beneath character features. Thus, for sufficiently small character widths, the readability is surprisingly good, based on character width. Since readability scales with character width, it is possible to achieve this surprising result while maintaining legibility at a short reading distance. With 300-dpi (dots per inch) printing, anti-aliasing (font smoothing), sans-serif fonts, and heavyweight paper that avoids bleeds, works may be compressed into a surprisingly compact form factor and remain legible.

It's regular ink

This precise format has received little attention before, despite the well-known advantages of archiving large texts in analog form (e.g., considering the upcoming black hole of digital data). Electronic ink enables a single page to display entire books, but it remains expensive.

Norsam Technologies' High Definition Rosetta technology employs electron beams to inscribe microscopic English text into nickel plates intended to last for thousands of years. However, Rosetta and the more traditional microfilm format are not readable by humans. In contrast, texts condensed to a 2' x 3' sheet of paper can be legible to the naked eye for young adults and with the aid of a simple magnifying glass for others. Given the compact size, lightweight character, and affordable production cost, the societal impact of this format is potentially large.

For children

As children perfect their fine motor skills, they often take interest in small writing, so this represents an ideal method for promoting literacy. Encouraging children to read books on posters as if they were completing a contest or puzzle

makes reading a pleasurable and challenging activity. Demonstrating that dauntingly "long" books are in fact no larger than the size of a single sheet of paper can help overcome the psychological barrier toward reading more difficult works of literature.

Developing world

More ambitiously, consider a lightweight Third World airdrop, which would give children and adults alike access to great works from the Western canon. In areas that are arduous to access or where educational opportunities are insufficient, whole libraries of information might be made available to villages and schools that would otherwise never be exposed to this literature. Libraries and information providers have begun to address these needs with the AGORA, HINARI, and TEEAL projects.

In regions where education is suf-

The Divine Comedy
Dante

Every circle: The entire text of a Western classic printed on a 2' x 3' poster—and it's legible

ficiently advanced and standard books plentiful, educators and scholars can use this new book format to view the overall structure of a text and investigate with relative ease both the visual and spatial relations between important lines and passages. By marking up the text on a single surface with aids such as highlighters, and connecting these passages, relationships can be better appreciated. Indeed, books may be skimmed so vast works can be summarily understood in hours.

The new reference book

Posters that contain large lists can be put to use in numerous ways for easy refer-

ence. For instance, a poster listing the caloric content of 1000 common foods would prove useful in the office of a physician or nutritionist, as well as in the kitchens of the diet-conscious. The lists of casualties from international conflicts might be kept as personal memorials by those who have lost loved ones. A Spanish-English dictionary might be posted in classrooms or bedrooms for language students, or in retail stores for when communication breaks down owing to a language barrier. The religiously observant may use complete holy texts such as the Gospels, Torah, or Book of Mormon in order to read important passages at a glance.

Considering its utility, the single-page book may just be situated at the juncture of the scroll, the codex or bound book, hypertext, and electronic ink. Of the early media for recording and transmitting literature, the scroll was among the most important and prestigious. In the West, it was the accepted format for the dissemination of serious literature and still lives on within certain religious traditions and in the virtual forms of computer software and television, where "scrolling" through long documents is common.

Like the book on poster, the scroll permits a vast text to be written upon a single surface, if not a single sheet of paper. However, the similarity goes awry with respect to random access, which is considerably impaired in a format that requires skimming and adjusting a long document in order to reference an individual passage. Scrolls were somewhat cumbersome to use and offered no opportunity to appreciate the relationships among widely separated passages. Julius Caesar recognized this weakness and is said to have folded his scrolls accordion-style for easy reference, a sort of proto-codex.

Caesar could have found a better solution in the codex, or handwritten book consisting of 24 pages stitched together. Codices are thought to have developed in the first century C.E. but were not fully accepted for works of serious literature for several centuries. While the scroll as a form did not entirely die out in the West, the codex proved the most popular form of book during the Middle Ages and continued in large-scale production into the early Renaissance. With the consecutive developments of movable type, the printed bound book, and the indexed bound book, random access became a matter of considerably greater ease.

It still requires effort, however, to locate passages among often hundreds of sheets of paper and make direct com-

parisons among texts on widely separated pages. Moreover, codices and printed books consume significant cubic volume, evidenced by the need for research libraries to expand to startling sizes.
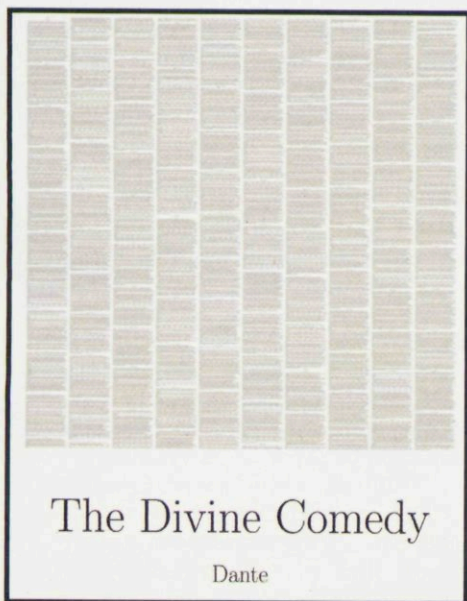
Who needs linking?

Much more recent developments in the history of the book solve the problems posed by the scroll and the codex but fall short for different reasons. Hypertext, developed in the 1960s, overcame the linearity of text by providing intratext links among related passages and documents. Electronic paper also seeks to resolve the problem of the codex by using a low-power paper-like display that allows the viewing of vast texts on single electronic sheets. While both hypertext and electronic ink present interesting solutions, they, too, share similar problems with earlier forms of media.

Hypertext needs computer access and, unless used under exceptional conditions, doesn't permit widely disparate passages to be compared in context yet simultaneously. E-ink remains expensive and has the same problems that we have cited with regard to hypertext.

Alternatively, the book on poster can be part of an energy-friendly, low-tech environment. Used in conjunction with a simple magnifying glass, it also can be enjoyably legible. Better yet, this form of publishing has significant potential for the dissemination of literature and the promotion of literacy. ∎

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