

# Editing and Using Electronic Books in the Sciences: A New Frontier

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As a scientist and a science writer in training, I typically carry a bag filled with crumpled journal articles and a laptop for reading the articles I have yet to print out. Adding pounds to the weight of my bag are several carefully wrapped books. Although many scientific journals publish electronic editions and have digitized archives, until recently it has been much harder to find electronic versions of scientific books. That is rapidly changing. Science and technology book publishers are making strong efforts to digitize their book collections. New devices for storing and reading electronic books, called e-book readers, are as lightweight and portable as a small paperback, function for days on a battery without needing to recharge, and do not cause more eyestrain than newsprint.

Those advances in content and technology raise various questions: Just what is an electronic book? What is it like to use such a book? What can such a book become? Am I ready to trade the heavy books in my bag for an e-book reader?

To explore those questions, I tried two e-book readers and talked to several publishers of scientific books.

The new e-book readers are supposed to eliminate the eyestrain that comes from reading from a computer screen for long periods. To see for myself, I ordered, on a trial basis, an Amazon Kindle for \$360 and the iRex Iliad Book Edition for \$599. I chose them because they both let the user save quotations from electronic books and write comments, which mark the text just as permanently as notes in the margins of a printed book. On the Kindle, one can type notes by using a small attached keyboard.

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OLGA KUCHMENT, *who received a PhD in chemistry from the University of California, Berkeley, last year, recently completed a Science Editor internship.*

On the Iliad, one can write directly on the screen with a stylus or type by using the stylus and a virtual keyboard.

One or two weeks after ordering the e-book readers, I received them and started looking for electronic reading material. I began by displaying the documents stored on my computer. Both readers connect to my computer through a USB port and act like removable disk drives to which I can save documents. The Iliad also has ports for a USB drive (see photo) and an SD card, from which it can display documents in a number of formats, including Adobe PDF, the format of many electronic books. The Kindle can display only a few file formats, and PDF is not one of them. One can use free software to convert PDF files to Kindle-supported formats, but the file conversion can lead to changes in formatting—as can be seen in the photo on the next page.

When I exhausted the readable contents of my computer, I downloaded free previews of electronic books from Amazon and free books from the Project Gutenberg online library. The Kindle comes with a free and fast wireless Internet connection, which allows one to browse the Internet and to download electronic books without a computer.

Many electronic books are simply digital recreations of the print version, derived from a PDF file similar to one that book publishers send to the printer. But some things may need to be changed to make a printer's PDF usable as a digital book. Without special care, for instance, the page numbers of a PDF will not match the page numbers in the table of contents, because the pages in front matter will be counted with those in the main text. In addition, chapter and subchapter headings need to be specially encoded to allow searching and indexing. Some of that can be done by automatic scripts, but sometimes the cleanup must be done by hand in a poten-

tially tedious process. "Depending on the book, it can take 5 to 10 minutes or many hours," says Charles Backus, director of the Texas A&M University Press.

MIT Press was one of the first publishers to start producing electronic books. "We had a very forward-looking director and production director in the 1990s, and we began archiving printers' PDFs," says Gita Manaktala, marketing director of MIT Press. "A lot of other publishers were not doing that at that time." If a publisher does not have the PDF of a book it would like to produce digitally, the book will need to be scanned, and this requires a large time investment.

For instance, the University of California Press had not been archiving PDF files when it started to publish electronic books. Rather, it was approached by the digital-book distributor NetLibrary, which offered to scan printed books for free. The distributor used an inexpensive scanning method, known as destructive scanning, in which the binding is cut off the book and the sheaf of loose pages is fed into a standard scanner. "We would send them piles of books for destructive scanning," recalls Eric van Rijn, assistant marketing director at the University of California Press.

The resulting hundreds of files ended up in the University of California Digital Library e-book division, eScholarship Editions. "It was pretty ugly and needed a lot of hand cleanup," recalls Kirk Hastings, publishing-systems architect at the University of California Digital Library. "I hired a guy, and he worked for a year on this. Probably, we should have sent the books to conversion firms."

Many scientific publishers have in recent years made commitments to produce more electronic books. Springer—which identifies itself as the world's largest publisher of books on science, technology, and medicine—offers more than 30,000 electronic books and adds about 3,000 to its collec-

*E-books continued*

**A printed issue of *Science Editor* as compared with the issue's pre-production PDF file displayed on the IREX Iliad and the Amazon Kindle. The photo shows some of the difficulties of viewing a PDF file on these e-book readers: decreased font size on the Iliad (although one can magnify portions of the page) and formatting problems on the Kindle.**

tion every year. Elsevier ScienceDirect now has more than 4,800 electronic books available online, spanning 18 scientific disciplines, and plans to make 80% of its book holdings available electronically by 2012. Many academic presses are collaborating with electronic-book distributors, such as ebrary, and some are distributing electronic versions of their books themselves.

"We are seeing a shift now," says Trevor C Lipscombe, editor-in-chief of Johns Hopkins University Press. "With the appearance of Kindle and Sony Reader, there is a growing interest in reading books in an electronic format."

The Sony Reader is similar to the Kindle and the Iliad, and all three use a technology called E-Ink. On the readers I tested, black words and images appear on a velvety-gray background that resembles the screen of an Etch-A-Sketch. The letters and background are composed of thousands of pixels, tiny globes containing microscopic flakes of gray and black paint in liquid. The two colors of flakes respond differently to an electric charge. When I advance a page, each globe receives an electric signal that

causes either the black or the gray flakes to rise to the top of the sphere. The screens flashes dark for a fraction of a second as the globes "reset" before the next page appears. According to the E-Ink Corporation, E-Ink can be used to print on a sheet as thin, light, and flexible as paper, although it is slightly more challenging to print the electric circuits that convey signals to each pixel. A screen covered with E-Ink reflects and absorbs light just as a printed sheet of paper does.

But can reading on a mechanical device be as pleasant as reading from crisp off-white paper in a beautifully bound book? Not yet—the light-gray background of my two e-book readers offers a reading experience similar to reading a newspaper—but maybe soon. According to the E-Ink Corporation, whiter backgrounds and higher-resolution screens are being developed.

But the screens of the new readers do have two benefits over computer screens: They do not emit light, and they do not refresh unless a page is turned; thus, they avoid two factors that contribute to eye-strain when reading on a computer. The

readers' images are static, like the images on paper, and require ambient light to be seen. Because E-Ink requires electricity only to change the image, the devices consume battery power by page turns, not hours or days. Technically, that means that one can use e-book readers on airplanes during takeoff and landing as long as no pages are turned. When the airplane is at cruising altitude, the battery lasts long enough for a user to read thousands of pages—enough to last through an overseas flight.

Lipscombe would like all books from Johns Hopkins University Press to be made available electronically. "We are distributors of information—that's why we exist," Lipscombe says. Currently, about 1,000 books from the Press are available electronically—one-third of the publisher's print collection.

Digitized books often convey information in ways that that print books typically cannot. They can allow readers instantly to look up words or phrases from a book in a dictionary or encyclopedia or to search through many books for a particular quotation. "Take a 19th-century novel: it has

Latin quotations and French quotations,” Lipscombe says; or take a modern scientific work. Many e-book readers contain digital dictionaries; some can connect to online dictionaries and encyclopedias. These e-book readers let users instantly look up phrases that they are not familiar with or track works’ references.

Readers and authors constitute a big part of what is driving publishers to issue electronic books. Many researchers want their books to have the increased visibility and improved access that come with electronic publication. “Often, our authors ask for their work to exist in an electronic format. People who write scholarly work want to disseminate their ideas. There is not the same expectation for making money from the work,” says Manaktala of MIT Press.

The readers’ push for electronic books comes from “what many people perceive as an outrageous increase in pricing” of printed science books, Backus says. The increase is “justified in some ways, but it also stretches the limits of what is financially viable,” Backus says.

“Printing and binding account for less than 20% of the cost of publishing a book,” Backus says. An electronic publication incurs the same acquisition, permissions, marketing, and royalty fees as a printed one.

Although authors are often eager to see their work published electronically, illustrators are likely to feel differently. Illustrators are often concerned that their work will be reproduced illegally and are reluctant to grant electronic rights to it.

“Scientific books are highly illustrated, and it’s a challenge to get rights to the illustrations,” says Shannon Davies, senior editor of natural sciences at Texas A&M University Press. “The concept of granting e-rights has been with us for only 10 to 12 years. At first, rights holders didn’t grant e-rights, fearing that anyone could reproduce the material, and they would have no control.” Texas A&M University Press has managed to overcome that difficulty in part by reducing the quality of the digital images to discourage unwanted reproduction. “Some e-books, ironically, may not have as much visual or proprietary

content as a print book does,” Backus says. Gaining electronic rights for illustrations is less of a problem for large publishers, such as Springer and Elsevier, that have in-house art departments and so already hold the rights to many of the images in their books.

To try to prevent the illegal reproduction of electronic books, “we’ve explored all kinds of encrypting possibilities,” Hastings says. But “in some way, you could get that PDF.” Publishers have evidence that people do print books from the PDF, Hastings says. Students find ways to share files of digital textbooks.

But publishers are undeterred. They are exploring how a digital book can allow them to present information and yet recoup costs. “The whole idea of an e-book is changing,” Davies says. “We are exploring, with the Texas Digital Library, whether we can put data online. The e-book becomes a multifaceted resource.”

Texas A&M University Press recently published the book *Small Animal Neurology* on DVD. The book includes videos of animals with neurological problems. It also contains interactive tutorials on such techniques as magnetic resonance imaging and shows students “what are artifacts and what are not”, Davies says. This approach is applicable to many academic fields.

Some electronic books from Texas A&M University Press offer videos and full-color illustrations, and some offer the ability to rotate objects by 360°. Those functions require that the books be read on a computer and not on an e-book reader. Only black and white E-Ink is available, although color E-Ink is being developed. Moreover, a typical E-Ink screen can show only about two images per second, whereas a typical computer screen can show more than 60. Moving images therefore tend to blur when seen on E-Ink devices. The low E-Ink refresh rate can also make browsing the Internet a chore.

Some electronic books can be viewed only online. MIT Press has recently developed CISnet, an online computer and information science library. “The idea is that if you are someone who may buy one or two MIT titles per year, for the

same money or less you would subscribe to a library,” Manaktala says. One year’s subscription costs \$125. The books are not available for downloading, but the press would like to work with a partner to develop a downloadable option for an e-book reader.

New, improved e-book readers are constantly being announced. By the time this article appears, there will be e-book readers with screens that can be controlled by the touch of a finger and have much higher refresh rates. Within 2 years, we are likely to see commercially available readers with flexible screens that can show colors and play videos. All now exist in prototype.

In the end, I decided to return both the Kindle and the Iliad. I wanted to be able to browse the Internet on the Iliad, and the sluggish refreshing made it difficult to write quickly on the screen. The Kindle’s need to convert PDF files interfered with downloading and reading of many scientific books and articles.

In a few years, e-book readers may allow users to read and write with the same ease as on paper and to browse the Internet and watch videos as easily as on a computer screen. I decided to wait for the future models. For now, my bag remains laden with articles, laptop, and printed books.

*Note added in production:* Kindle 2 replaced the original Kindle on 24 February 2009. The two differ in appearance, but judging from Amazon’s description of Kindle 2, the observations made in this article remain applicable. 🔥