



## A bright future for eReader technologies

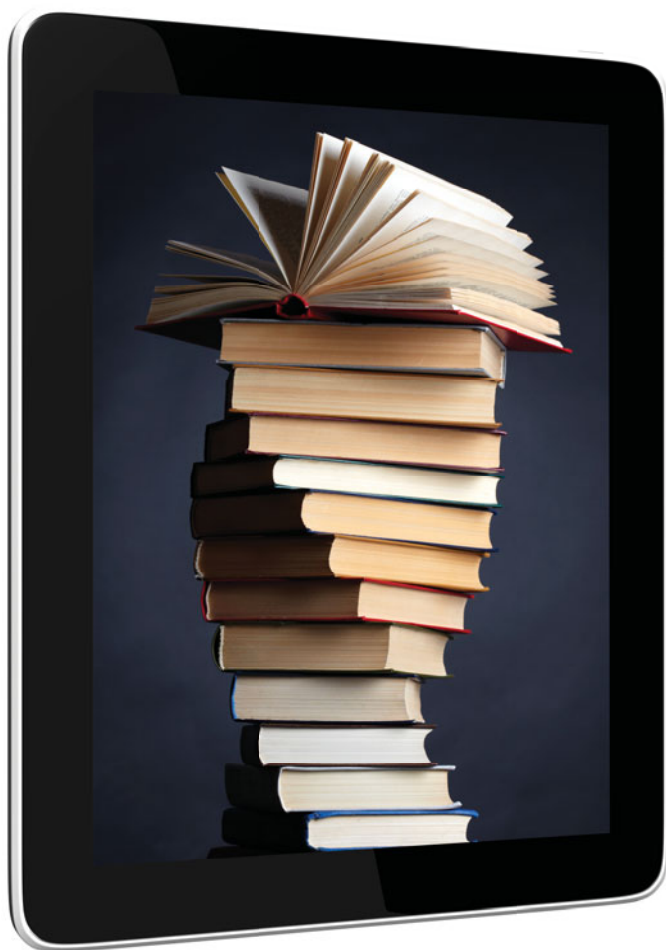
Like many of you, I am a voracious reader. It is part of my job and part of who I am. On almost every day, I am searching the scientific literature for new work that will help my staff and me to understand physical phenomena across a broad range of materials research. My office and filing cabinets (both at work and at home) are crowded with thousands of technical papers spanning more than 40 years of my career. My offices at home and at work contain several thousand volumes of technical books that I have collected in an attempt to mitigate my ignorance. At home, I have a collection of technical journals (now stacked in my garage) that span a volume 6'×6'×5'. I have a few journals at the office (spanning maybe 10 linear feet of space), which is so small only because I have access through work to an excellent library that has online connection to thousands of technical journals. I have approximately 20,000 non-technical books covering fiction, poetry, philosophy, politics, music, and a range of other interests. I read copy from several newspapers each day, and I have subscriptions to almost 30 magazines which I read monthly.

I started this habit at a very early age. I remember hiding a flashlight and a book under my bed when I was very young so that I could read well into the night after my parents and siblings were safely abed. For as long as I can remember, one of my leisure-time activities involved haunting new and used bookstores across the country. On any visit, anywhere, I would try to locate the best booksellers and find time to search their collections. Most often, I would come back from travel with many new books. I have mounds of books everywhere in my house. My friends make jokes about my likely demise as being buried under a mountain of my books after the next big earthquake. I note that, although I collect books, I do so to read them, not as an investment or under any illusions about having a collection of fine, rare books. At some point a few years ago, it became clear to me that this could not go on. My neighbors were beginning to express concern about the pending collapse of my three-story townhome under the weight of all the paper.

With trepidation, I purchased a Kindle and started populating it with books. I made it a habit to buy as many books in electronic form as I could, only bowing to paper when a book that I wanted was not available in Kindle format. Some authors and publishers, neo-Luddites that they are, refuse to publish Kindle editions. When the Kindle 2 came along, I purchased that. And when the Kindle 3 came out, I upgraded to that. The Kindle was fine for my leisure reading. In fact, the reading experience was (for me) better than reading from paper for a wide variety of reasons. I never purchased the Kindle DX (the device with the large screen) because I never saw the utility for it. None of the Kindles has (at least to date) color capability, and I have not (to date) found any of them suitable for technical books. Color graphics and equations required something better.

In the spring of 2010, the answer to that issue arrived in the form of the iPad. I purchased an iPad, loaded onto it the Kindle app and started buying technical books to download to my iPad through the Kindle store. I am very satisfied with the reading experience for technical books using the Kindle app on the iPad. So much so that I have stopped buying technical books in paper. I only buy technical books for my iPad.

I have also stopped buying paper versions of newspapers and magazines. I am getting all of my newspapers and magazines through iPad apps. As subscriptions to paper issues of magazines expire, I am converting them to iPad subscriptions. I bought the 64 GB version of the iPad and I am nowhere close to using all of its storage. The process has reduced the paper



clutter in my house as well as my trips to our dumpster. I have iPad apps for the *Nature Reader*, *Optics and Photonic News*, *IEEE Spectrum*, and *Microscopy & Analysis*. I look forward to the day that the *MRS Bulletin* as well as all MRS content is delivered through iPad apps.

This has greatly simplified my travel experience. I no longer lug many pounds of paper books to and from travel. I travel with my Kindle and my iPad. I have access to my books, newspapers, and magazines regardless of my location (unless I am so far in the boonies that I do not get a signal).

None of this would have been possible without significant advances in materials research. The success of the Kindle and other eReaders is based upon electrophoretic ink. See Wikipedia, [http://en.wikipedia.org/wiki/Electronic\\_paper](http://en.wikipedia.org/wiki/Electronic_paper), for a discussion of the development of electronic ink. The Kindle has a transparent conductive screen for applying the electric fields that convert the electrophoretic ink to words and images. The iPad is based upon a nematic liquid crystal display (LCD), which is backlit by light-emitting diodes (LED),

and uses capacitive touchscreen technology (see Wikipedia, <http://en.wikipedia.org/wiki/IPad>). The iPad touchscreen has an oleophobic coating to aid in cleansing it of fingerprint oils and other residue (see <http://www.apple.com/ipad/specs/>). Both the Kindle and the iPad use advanced battery technology. I get about 30 hours of use out of my Kindle between charges and about 10 hours of use out of my iPad between charges. Not to mention the improvements in microelectronics technology that make the processors and the memory ICs possible. Without the advances of materials research in all of these areas, many of which have been promoted in talks at the MRS Fall and Spring Meetings, none of this would be remotely possible.

I am excited about the future of these technologies and look forward to many years of happy reading using some form of lightweight electronic reader. I know better than to try to predict winners in technology, but I believe strongly that the future is bright for eReader technologies. I can see tablets in every student's hands containing all of their textbooks and other reading material as well as learning apps. Picture that instead of the backpacks that many students currently carry loaded with far too much weight. I envision a brighter future for readers with limited mobility, who no longer need to actually visit a store and move through the aisles to acquire books. I envision better access to information for those who live in remote areas.

Finally, let me applaud the many organizations who are embracing these new technologies for their products as well as organizations (e.g., Project Gutenberg and the British Museum) that are working to make thousands of books freely available in many formats including those compatible with many eReaders. I look forward to the day when I no longer use paper-based products for reading in any form—such as books, journals, magazines, and newspapers.

**Steve Moss**

