
**Cover image**
Close-up of a 300-mm silicon test wafer of the latest 45-nm transistor technology generation. Now commercially available, this latest generation sees substantial changes to the materials used as the gates of the transistors. (Image courtesy of Intel.)

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# Information storage

The demand for information storage is enormous and expected to increase even further as new technologies such as high-definition video and on-demand TV are established in the consumer market. Increasingly powerful computer processors enable sophisticated processing of large quantities of data for applications deemed science fiction not too long ago.

Indeed, the speed of progress has been phenomenal. Sixty years ago, on 16 December 1947, the first crude transistor was demonstrated at Bell Labs. Later, the invention of the integrated circuit in July 1958 led to microprocessors and, as they say, the rest is history. Personal computers, graphical user interfaces and the Internet — all have revolutionized our way of life within just a few decades.

In this Insight we aim to capture some of the exciting advances in materials science that will continue to push forward present technology, or perhaps even lead to entirely new technologies. For example, transistors will leave the present planar design, as three-dimensional structures make higher integration densities possible. The fundamental properties of electron spin and its influence on magnetization dynamics are of increasing significance for improved hard disks. Recent advances in our understanding of phase-change materials are crucial towards the developement of future rewritable optical disks and memory devices. Novel memory devices may not only arise from the use of electronic properties and changes in crystal structure, but also from ionic effects — in inorganic or organic materials. Last but not least, bottom-up approaches for controlling the assembly of nanotubes and nanowires into electronic circuits may provide an easier solution to high-density integrated nanoelectronics than top-down concepts.

We hope that you enjoy the glimpse into the future of information storage that this collection provides. The fruits from this exciting research certainly will continue to dramatically advance our way of life.

**Joerg Heber, Senior Editor**

## INTERVIEW



## COMMENTARY



## REVIEW ARTICLES



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