

Diabologic: Smorgasbörd

by Frank Dolinar

This month, I've gathered items from a number of topics that I found interesting.

Energy

2008 may be the year that the incandescent light bulb finally sees its approaching demise as the US Department of Energy invests over \$20 million for a baker's dozen research projects in solid-state lighting (SSL). These devices efficiently convert electric power directly into light, with little or no residual heat. High on the list are light-emitting diodes (LEDs) and organic light-emitting diodes (OLEDs).

And in a bit of technological "heresy" that combines both energy and environmental considerations, *Wired* magazine reports a new method to produce fuel with lots of concentrated sunlight and carbon dioxide (<http://www.wired.com/science/discoveries/news/2008/01/S2P>) in a process that reverses combustion and may make liquid hydrocarbons a renewable fuel.

Nanotech

Self-cleaning clothes have come one step closer according to an article in MIT's Technology Review magazine (<http://www.technologyreview.com/Nanotech/20306/>). According to the article, "Researchers at Monash University, in Victoria, Australia, have found a way to coat fibers with titanium dioxide nanocrystals, which break down food and dirt in sunlight." The crystals do not harm the fabric or human skin. An additional benefit of the cleaning process is that the coating can also destroy pathogens, making such self-cleaning fabrics of interest to hospitals and other medical environments.

Computers

The computer industry's mantra seems to be "more, more; faster, faster". According to Intel, its dual-core Xeon processor is rated at about 1.5 billion (1.5×10^9) floating point operations (FLOP) per second (aka 1.5 'gigaflop'). The quad-core Xeon rates at about 2.5 gigaflop. That's not near enough for some researchers trying to solve extraordinarily complex problems. They need every bit of processing power they can get. For example:

- In the UK, the largest and fastest supercomputer, called HECToR, based on an array of Cray XT4 processors, clocks in at 60 teraflop (6.0×10^{13}) – about 24,000 times an Intel quad-core Xeon.
- Texas has a new Ranger, a supercomputer housed at U. Texas, funded by the NSF, and built by Sun Microsystems. Its 15,744 processors have an aggregate processing power of 504 teraflops (5.04×10^{14}), about 8.3 times faster than HECToR. Ranger is one of the world's fastest supercomputers. (<http://www.top500.org>)
- Researchers from Sandia and Oak Ridge National Labs have created the Institute for Advanced Architectures to explore new technologies to develop a computer rated at an exaflop (a million, trillion flop), 2000 times faster than Ranger and **400 million** times faster than my humble desktop.

Astronomy & Cosmology

Humans have been looking at the sky, particularly the night sky, since the dawn of history, wondering about the universe and our place in it. Each answer generates new questions.

Here's an example of reality catching up with science fiction. NASA has awarded a \$500K grant to MIT's Kavli Institute for Astrophysics and Space Science to develop plans for an array of radio telescopes on the far side of the moon. (<http://web.mit.edu/newsoffice/2008/moonscope-0215.html>) Placing the array on the far side of the moon will shield it from Earth's electromagnetic interference and will make it

possible for the array to make observations not possible from Earth. According to the article, "*The new MIT telescopes would explore one of the greatest unknown realms of astronomy, the so-called "Dark Ages" near the beginning of the universe when stars, star clusters and galaxies first came into existence.*"

Brian Whitworth, a physicist at Massey University in New Zealand, has written a paper suggesting that the universe may actually be a virtual reality simulation, one of the strangest cosmological suggestions I've ever heard. (Abstract: <http://arxiv.org/abs/0801.0337>) The paper claims it should be possible to perform experiments to prove the hypothesis. But I wonder, if we do live in a simulation, how could we ever know?

General Science / Critical Thinking

Finally, here's something that relates to our understanding of technology in our lives – a concept I believe to be of some importance.

Ars Technica published an article on credible science. There are so many people with impressive credentials who often argue for completely incompatible and contradictory positions that the public (in which group I include myself) is often confused about who or what to believe and why. The article, by John Timmer, is clearly stated and provides a number of links to additional resources. It's worth reading. (<http://arstechnica.com/news.ars/post/20080224-getting-the-public-to-pay-attention-to-good-science.html>)