



#### **UNDER DEVELOPMENT** Molecular computing

## Powerful DNA

**PORTABLE COMPUTER VENDORS** like to boast about their small and lightweight devices. But their best efforts are nothing compared with programmable molecular computing machines composed of an enzyme and DNA molecules.

Now the scientists at the [Weizmann Institute of Science](#) who developed a DNA computing device in 2001 have made a powerful new discovery. About two years after professor Ehud Shapiro of the institute devised a molecular computing machine, his team found that the single DNA molecule that provides the computer with input data can also provide all the necessary operational energy.

The fuel for the first device was a molecule called ATP, the standard energy source for all life. But the latest version of the tiny computing device breaks two bonds in the DNA input molecule, releasing the energy that's stored in those bonds as heat. The process produces enough energy to perform computations without an external power source.

Shapiro says the latest discovery—while not as significant as the earlier development that showed the possibility of building a molecular scale computing machine—indicates that rapid developments in the field will bring DNA computing closer to practical applications.

"This latest development throws new light on the relationship between energy and computing," says Shapiro, a professor of computer science and applied mathematics, and biological chemistry. "The fact that you can provide energy and information [from the same source] is something you couldn't dream about with electronic computing.

This shows what you can do when you approach computing from a different perspective." Shapiro says programmable DNA computing devices have potential applications in the medical, biotechnology and pharmaceutical industries. It might be decades, however, before the devices are ready to be used for applications such as research on new medicines. Still, he says, "there are tremendous opportunities made possible by the interface between computer science and molecular biology."

—Bob Violino