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World's Smallest Computer Made From DNA and Enzymes

By [Drog](#), Section [News](#)
 Posted on Tue Feb 25th, 2003 at 05:21:04 AM EST

In 2001, researchers at the [Weizmann Institute of Science](#) in Israel, made headlines when they created a computer so small that a single drop of water would hold a trillion of the machines. The device used DNA and enzymes as their software and hardware and could perform a billion operations per second with 99.8% accuracy. Now, as [reported by National Geographic](#), the same team, led by Professor Ehud Shapiro, has announced a new version of its biomolecular computer, 50 times faster than its predecessor, that not only reads DNA as data but actually uses it for fuel. The Guinness Book of World Records has recognized it as the world's "smallest biological computing device". "Once the input, software, and hardware molecules are mixed in a solution it operates to completion without intervention," said David Hawksett, the science judge at Guinness World Records. "If you want to present the output to the naked eye, human manipulation is needed." Two spoonfuls could hold up to 30 million billion of the computers, and they could perform 660 trillion operations per second--nearly 20 times the speed of the [Earth Simulator](#) in Yokohama, Japan, the world's most powerful supercomputer.



Shapiro and his colleagues described their new DNA computer in a report [published online in the Proceedings of the National Academy of Sciences](#). DNA computing is in its infancy, but it could one day transform the future of computers, especially in pharmaceutical and biomedical applications. Some scientists predict a future where our bodies are patrolled by tiny DNA computers that monitor our well-being and release the right drugs to repair damaged or unhealthy tissue. "Autonomous bio-molecular computers may be able to work as 'doctors in a cell,' operating inside living cells and sensing anomalies in the host," said Shapiro. "Consulting their programmed medical knowledge, the computers could respond to anomalies by synthesizing and releasing drugs."

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I probably should have mentioned that the chances of DNA computers eventually replacing conventional silicon computers are pretty slim. There are some computing tasks they inherently cannot do. Shapiro's device, for instance, can check whether a list of zeros and ones has an even number of ones, but it can't necessarily count how many ones are in that list, since it has a finite memory. Also, it can only answer yes or no to a question. Some speculate, however, that hybrid machines may one day be possible, employing silicon for normal processing tasks and DNA co-processors for suitable massively parallel processing tasks.

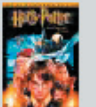
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