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GOOD NEWS

Eat Your Computer Soup, *Mein Kind*

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28 February 2003

The popular nature journal *National Geographic*, among many others, has reported on a tremendous development that has come out of the Weizmann Institute of Science in Rehovot. It is a computer with its own energy source. And it is made from a DNA molecules and enzymes.

A year ago, Prof. Ehud Shapiro of the Weizmann Institute made international headlines for devising a programmable computing machine on the molecular level from DNA and attendant enzymes. A spoonful of the Israeli "computer soup" can contain 15,000 trillion such computers, together performing 330 trillion operations per second with 99.9% accuracy per step; that is, more than 100,000 times the speed of the fastest PC. Due to the size of the microbiological computer, output is a measurement of the length of the DNA molecule produced after mixing the "hardware" and "software" solutions.

In addition to its recognized scientific, medical and bioengineering value, the microscopic nanocomputer recently entered the *Guinness Book of World Records* for the "smallest biological computing device." A brief of the Weizmann team's research has also been published on the online edition of the *Proceedings of the National Academy of Sciences*.

With the latest development, the Israeli researchers - Yaakov Benenson, Dr. Rivka Adar, Dr. Tamar Paz-Elizur, Prof. Zvi Livneh and Prof. Ehud Shapiro of the Institute's Biological Chemistry Department and the Computer Science and Applied Mathematics Department - have met another challenge for their microscopic machine. The single DNA molecule that provides the computer with the input data can now also provide all of the nanocomputer's the necessary fuel. The redesigned device breaks two bonds in its DNA input molecule, releasing the energy stored in these bonds as heat. This process generates sufficient energy to carry out computations to completion without any external source of energy, reports the Weizmann Institute. That makes it its over a million times more energy

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While nanotechnology is in its infancy, it is, in part thanks to Israeli research, growing up fast. According to *National Geographic*, "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." The nature magazine quotes Prof. Shapiro on this topic, as well: "Autonomous bio-molecular computers may be able to work as 'doctors in a cell', operating inside living cells and sensing anomalies in the host.... Consulting their programmed medical knowledge, the computers could respond to anomalies by synthesizing and releasing drugs."

Will the microcomputer medicine be delivered, perhaps, in a spoonful of the 21st Century *bobbe's* chicken soup?

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