Scientists develop advanced biological computer

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(Phys.org) —Using only biomolecules (such as DNA and enzymes), scientists at the Technion-Israel Institute of Technology have developed and constructed an advanced biological transducer, a computing machine capable of manipulating genetic codes, and using the output as new input for subsequent computations. The breakthrough might someday create new possibilities in biotechnology, including individual gene therapy and cloning. The findings appear today (May 23, 2013) in *Chemistry & Biology* (Cell Press).

Interest in such biomolecular computing devices is strong, mainly because of their ability (unlike electronic computers) to interact directly with biological systems and even living organisms. No interface is required since all components of molecular computers, including hardware, software, input and output, are molecules that interact in solution along a cascade of programmable chemical events.

"Our results show a novel, synthetic designed computing machine that computes iteratively and produces biologically relevant results," says lead researcher Prof. Ehud Keinan of the Technion Schulich Faculty of Chemistry. "In addition to enhanced computation power, this DNA-based transducer offers multiple benefits, including the ability to read and transform genetic information, miniaturization to the molecular scale, and the aptitude to produce computational results that interact directly with living organisms."

The transducer could be used on genetic material to evaluate and detect

specific sequences, and to alter and algorithmically process genetic code. Similar devices, says Prof. Keinan, could be applied for other computational problems.

"All biological systems, and even entire living organisms, are natural molecular computers. Every one of us is a biomolecular computer, that is, a machine in which all components are molecules "talking" to one another in a logical manner. The hardware and software are complex biological molecules that activate one another to carry out some predetermined chemical tasks. The input is a molecule that undergoes specific, programmed changes, following a specific set of rules (software) and the output of this chemical computation process is another well defined molecule."

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