



## Life Engineering Symposium


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### ***Reprogramming Molecules: DNA and Viruses***

#### *Injecting Life with Computers*

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#### ***Abstract:***

Although electronic computers are the only "computer species" we are accustomed to, the mathematical notion of a programmable computer has nothing to do with wires and logic gates. In fact, Alan Turing's notional computer, which marked in 1936 the birth of modern computer science and still stands at its heart, has greater similarity to natural biomolecular machines such as the ribosome and polymerases than to electronic computers. Recently, a new "computer species" made of biological molecules has emerged. These simple molecular computers inspired by the Turing machine, of which a trillion can fit into a microliter, do not compete with electronic computers in solving complex computational problems; their potential lies elsewhere. Their molecular scale and their ability to interact directly with the biochemical environment in which they operate suggest that in the future they may be the basis of a new kind of "smart drugs": molecular devices equipped with the medical knowledge to perform disease diagnosis and therapy inside the living body. They would detect and diagnose molecular disease symptoms and, when necessary, administer the requisite drug molecules to the cell, tissue or organ in which they operate. In the talk we review this new research direction and report on preliminary steps carried out in our lab towards realizing its vision.