Abstract Submitted
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CMOL: A New Concept for Nanoelectronics[1] KONSTANTIN LIKHAREV, Stony Brook University — I will review the recent work on devices and architectures for future hybrid semiconductor/molecular integrated circuits, in particular those of "CMOL" variety [1]. Such circuits would combine an advanced CMOS subsystem fabricated by the usual lithographic patterning, two layers of parallel metallic nanowires formed, e.g., by nanoimprint, and two-terminal molecular devices self-assembled on the nanowire crosspoints. Estimates show that this powerful combination may allow CMOL circuits to reach an unparalleled density (up to 10^{12} functions per cm^2) and ultrahigh rate of information processing (up to 10^{20} operations per second on a single chip), at acceptable power dissipation. The main challenges on the way toward practical CMOL technology are: (i) reliable chemically-directed self-assembly of mid-size organic molecules, and (ii) the development of efficient defect-tolerant architectures for CMOL circuits. Our recent work has shown that such architectures may be developed not only for terabit-scale memories and naturally defect-tolerant mixed-signal neuromorphic networks, but (rather unexpectedly) also for FPGA-style digital Boolean circuits. [1] For details, see http://rsfq1.physics.sunysb.edu/∼likharev/nano/Springer04.pdf

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Konstantin Likharev
Stony Brook University

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