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Using Lithography to Integrate Optoelectronic and Optofluidic Nanodevices into Systems - and Commercial Products

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Lithography has fueled the trend towards ever-smaller and denser electronic integration over the past 50 years. Gordon Moore observed in the 1960s the trend towards increased electronic complexity and functionality within an area of a silicon chip, resulting from a relatively constant real-estate price and the cost of moving information from one chip to another The opportunity of highly accurate definition of microdevices and their precise alignment on top of each other by lithography also holds tremendous promise for increasing the complexity and functionality of optical, fluidic, and magnetic systems. Data communications has recently adopted the intimate integration of optics and electronics within silicon photonics chips. Useful medical diagnosis tools can be constructed through integration of electronics, optics and fluidics. Indeed, biomedical devices today can be constructed using two- and three-dimensional soft and hard lithography approaches, in which pico-Liter volumes can be manipulated and analyzed on optofluidic chips. In the near future, we can expect the emergence of lithographically integration of optics, fluidics and electronics for many other commercial applications. Here, a very subjective and biased view of the evolution of optofluidics and silicon photonics from concepts in the laboratory to commercial products will be presented. This talk will also emphasize future technological opportunities as well as pitfalls in the journey from laboratory devices to commercial systems.