Maskless Photolithography: Changing the Game in Nano and Micro Manufacturing

Micro and nanotechnologies have had, and will in the future have, their most transformative impact when they provide structures of high functionality, not just passive properties. High functionality, such as in electronics, photonics, microfluidics and MEMS, depends directly on high levels of structural complexity. With few exceptions, the planar-fabrication process, i.e., lithography followed by pattern transfer, is what puts high levels of structural complexity into materials. It is commonly assumed that the stunning success of semiconductor industry manufacturing provides the template for future nanomanufacturing of highly functional structures, regardless of the sphere of application. This talk will indicate the flaws in that assumption and describe a maskless photolithography technology, spun off from research at MIT, that is appropriate for research as well as development and customized manufacturing, in the broad field from electronics and photonics to tissue scaffolds and stem-cell applications. LumArray's innovation, which breaks with traditional photolithography, is enabled by recent advances in computation, communication, nanofabrication, chemistry and electromagnetic simulation tools, available only in recent years.

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Henry I. Smith received the BS degree from Holy Cross College in 1958, and the MS and Ph.D. degrees from Boston College in 1960 and 1966, respectively. From 1960 to 1963 he served as an officer in the US Air Force. He was an Assistant Professor of Physics at Boston College, 1966-68. From 1968 to 1980, Dr. Smith was at MIT Lincoln Laboratory where he worked on surface-acoustic-wave devices and pioneered the development of techniques for fabricating nanometer structures. He founded the Submicrometer Technology Group at Lincoln Lab in 1977 and served as its leader until 1980 when he left to pursue full-time teaching and research at MIT. He was appointed a Professor of Electrical Engineering and Director of the NanoStructures Laboratory, which he founded. From 1990 to 2005 he held the Joseph F. and Nancy P. Keithley Chair in Electrical Engineering. He relinquished the chair in 2005 and in 2012 retired from active teaching. He continues to supervise graduate-student research at MIT.

