

## **Microfluidic Large Scale Integration**

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#### **Abstract**

We developed high-density microfluidic chips that contain plumbing networks with thousands of micromechanical valves and hundreds of individually addressable chambers. These fluidic devices are analogous to electronic integrated circuits fabricated using Large Scale Integration (LSI). A key component of these networks is the fluidic multiplexor, which is a combinatorial array of binary valve patterns that exponentially increases the processing power of a network by allowing complex fluid manipulations with a minimal number of inputs. We used these integrated microfluidic networks to construct the microfluidic analog of a comparator array and a microfluidic memory storage device whose behavior resembles random access memory (RAM). We have also fabricated microfluidic chips for a variety of biological applications, ranging from structural genomics applications to high throughput screening.