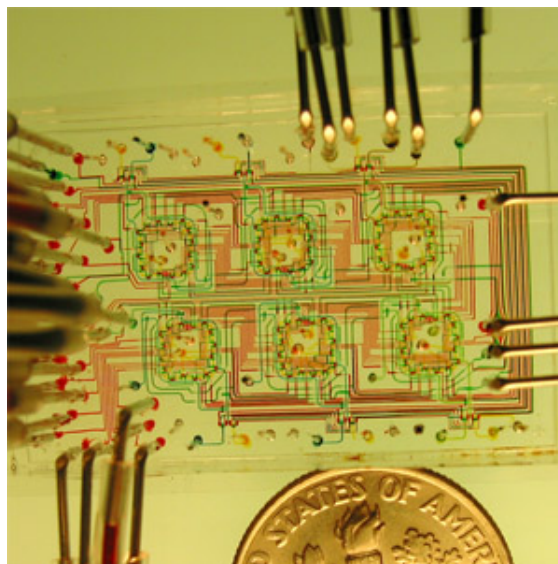


2012 Winner of the \$500,000 Lemelson-MIT Prize *Dr. Stephen Quake*

Microfluidic Large Scale Integration

Dr. Stephen Quake developed the biological equivalent of the integrated circuit: microfluidic large scale integration (LSI) to streamline biological measurement techniques. Quake fabricated chips with thousands of integrated microfluidic valves – similar to miniaturized plumbing – that each enable control over their biological contents. Much the way a transistor controls the flow of electrons in a computer chip, Quake’s microfluidic valve performs the same function for the life sciences industry in a microfluidic chip made of rubber.

This technology paved the way for large scale automation of biology and has been used for numerous applications including automated processors for single cell analysis, chemical synthesizers for pharmaceuticals, miniaturized chemostat bioreactors, and automated cell devices. In 1999, Quake co-founded [Fluidigm](#) to commercialize the microfluidic valve.



Microfluidic integrated circuit.

Non-Invasive Prenatal Testing

As Quake’s research shifted into genomic technologies, he developed a “molecular counting” approach to the study of cell-free DNA, which led to the creation of a non-invasive method for prenatal testing of Down syndrome and other chromosomal abnormalities. Existing procedures such as amniocentesis carry risks of miscarriage and damage to the fetus. Quake developed a testing method that mitigates these risks and uses a counting approach to measure over-representation of chromosome 21 DNA relative to other chromosomes from a small sample of the mother’s blood. The method represents the first application of next generation sequencing for prenatal diagnosis, a method which forms the basis for the veriFi™ prenatal test, commercialized by [Verinata Health](#).

Immunogenomic Research

Quake pioneered the application of high throughput sequencing to analyze an individual’s complete immune system. The new technology is becoming a popular tool to characterize the immune system in a variety of clinically important conditions, ranging from solid organ transplantation to autoimmune disease. Quake has also used this approach to study the effects of vaccination and autoimmune disease on the immune system. In 2012, Quake and business partner Dan Seligson co-founded [ImmuMetrix](#), LLC. The early stage company has plans to commercialize applications of the immunogenomic research developed in Quake’s lab.