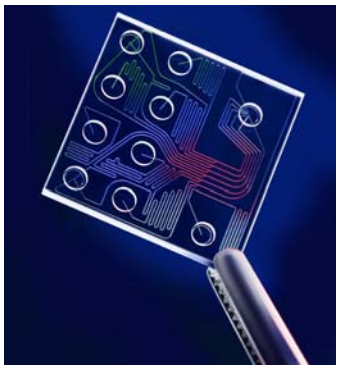
Agilent Technologies

Media Backgrounder – perspective and detail for journalists:

AGILENT TECHNOLOGIES IN MICROFLUIDICS

Based on innovations in semiconductors and nanotechnology, microfluidics promises to transform research by bringing unprecedented automation, integration and ease of use to the laboratory. Agilent Technologies has been a leader in this market since its beginnings in the 1990s. Since then, Agilent has pushed the progress of this technology with innovative products and breakthrough applications.



The Technology Behind the Revolution

Microfluidics technology is based on the manipulation of minute amounts of liquid in miniaturized systems. In the life sciences, the most widely used microfluidics-based device are labs-on-a-chip which allow various qualitative and quantitative biochemical analyses to be conducted quickly and efficiently with minimum handling by the user.

The inside of a lab-on-a-chip (left) consists of circuits of tiny closed channels and wells, etched onto a glass or plastic microchip. Pressure or electrokinetic forces push small volumes of fluids through selected pathways in a controlled manner. These mini-laboratories may include elements such as pumps, valves, mixing and reaction chambers and separation channels.

The technology offers an alternative to one of the most widely used techniques in the life sciences: gel electrophoresis. In gel electrophoresis, nucleic acids or proteins are loaded into a gel matrix that separates molecules by size, charge and/or shape when an electric field is applied. Lab-on-a-chip systems miniaturize and automate this process. The result is lower sample use, faster analyses and more accurate and reproducible results.

Agilent Launches the Microfluidics Arena

Agilent has been instrumental in bringing microfluidics into the life sciences laboratory. In 1999, the company introduced the first commercial lab-on-a-chip system, the Agilent 2100 bioanalyzer. The bioanalyzer (left) can analyze the purity, size and quantity of DNA, RNA and protein samples. It can also be used to count cells based on their physical or chemical characteristics (“flow cytometry”).

The bioanalyzer integrates sample handling, separation, detection and data analysis into a single platform. Depending on the application, up to 12 samples can be processed and analyzed in 30 minutes. For some protein analyses, the bioanalyzer can reduce total turnaround time 20-fold in comparison with standard gel electrophoresis, with an unprecedented level of sensitivity, even superior to silver stain.

The Agilent 2100 Bioanalyzer: The Industry Standard

The advantages of the bioanalyzer have made it a valuable tool in many industries. Agilent provides lab-on-a-chip assays (left)

for the analysis of: DNA, RNA, protein and cells. Since their introduction, more than 2,000,000 of these chips and 5,000 bioanalyzer instruments have been sold. More than 5,000 citations for the bioanalyzer have appeared in scientific journals; this number continues to grow at an exponential rate.

Bioanalyzer applications range from ensuring pharmaceutical compliance to screening genetically modified content in food to detecting bioterrorist agents.

An important application of the protein lab-on-a-chip is to check the quality and quantity of proteins and antibodies being analyzed in proteomics experiments or being developed into therapeutics during biopharmaceutical development and manufacturing.

In genomics, the bioanalyzer has quickly become the industry standard for RNA quality assessment in gene expression, polymerase chain reaction (PCR), and RNA interference experiments. To further standardize the measurement of RNA quality, Agilent introduced its RNA integrity number (RIN) software in 2004. RIN is the first tool for objectively grading and communicating the quality of RNA used in experiments. It is designed to improve the reproducibility and comparison of RNA-based research data and to facilitate the submission of data for FDA review. Both of these are critical needs in the development of advanced therapeutics for cancer, cardiovascular and other disease.

The 1200 Series HPLC-Chip/MS System
The Industry's only microfluidic chip for LC/MS - is a microfluidic chip-based technology for nanoelectrospray LC/MS. Nanoelectrospray LC/MS combines both high-resolution chromatography and high-sensitivity MS detection and is used for many ultra-trace analysis applications. The integration of all nanoelectrospray components directly on the HPLC-Chip delivers the robustness and reliability required for routine, automated, and unattended nanoelectrospray LC/MS operation. Superior sensitivity is achieved from the combination of extremely reproducible nanoflow, seamless zero dead volume connections and stable nanoelectrospray performance due to the nanopump and HPLC-Chip designs. Automation of sample loading and pre-concentration of the sample directly onto the chip enrichment column, combined with short flow paths and low delay volumes in the chip channels, enables high-throughput, fast-gradient operation.

HPLC-Chip/MS Technology puts LC columns, fittings, and ion source components onto a polyimide chip the size of a microscope slide. This eliminates 50% of valving, tubing, and connections between a nanoflow LC and MS, dramatically increasing sensitivity, reliability, and ease of use. An automated interface between the LC and MS handles all connections and chip positioning.