

**520/530/580.495  
Microfabrication Laboratory**

**and**

**520/530.773  
Advanced Topics  
In Fabrication and Microengineering**

**Andreas G. Andreou**

# Fabrication and Microengineering

- Is about the physical and chemical processes that are employed to design and manufacture highly integrated structures in silicon and other materials for sensing, actuating, computing and communications

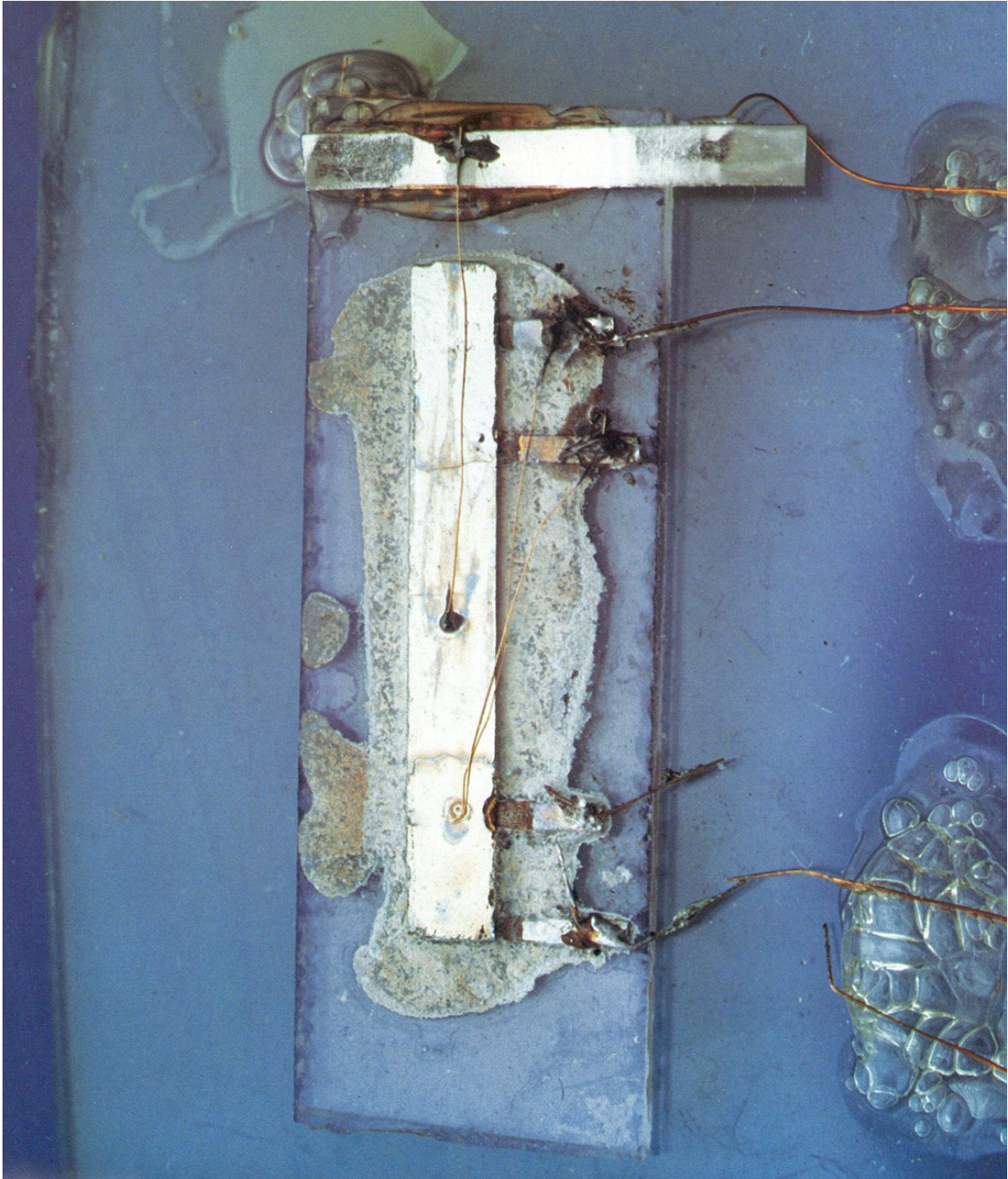
CMOS integrated circuits (analog and digital)

Microelectromechanical Systems (MEMS)

DNA Microarrays and Micro Total Analysis Systems

Synthetic Microstructures for Biological and Medical Research

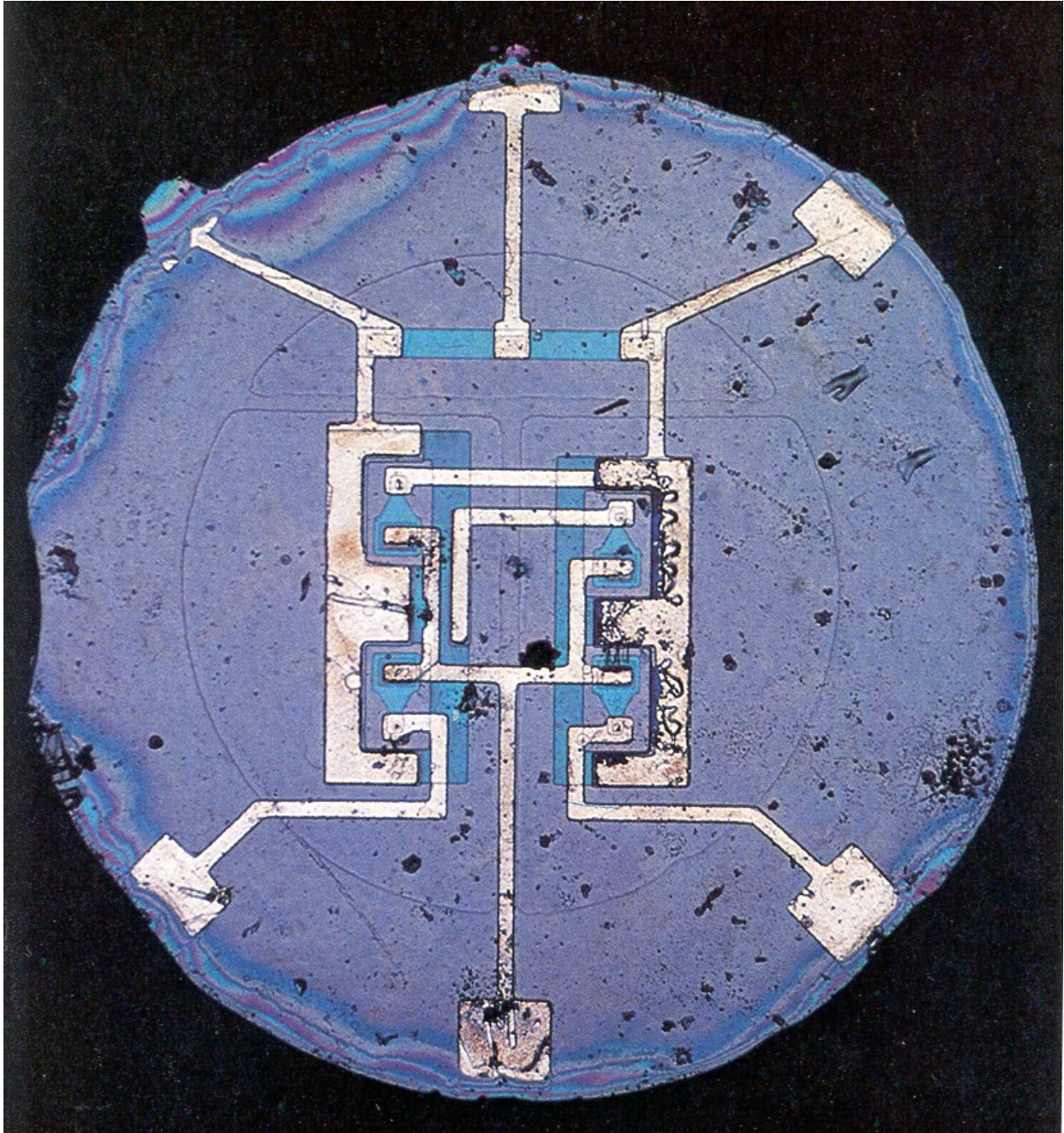
# Integrated Circuits (1958)



Jack Kilby Texas Instruments,  
Phase Shift Oscillator



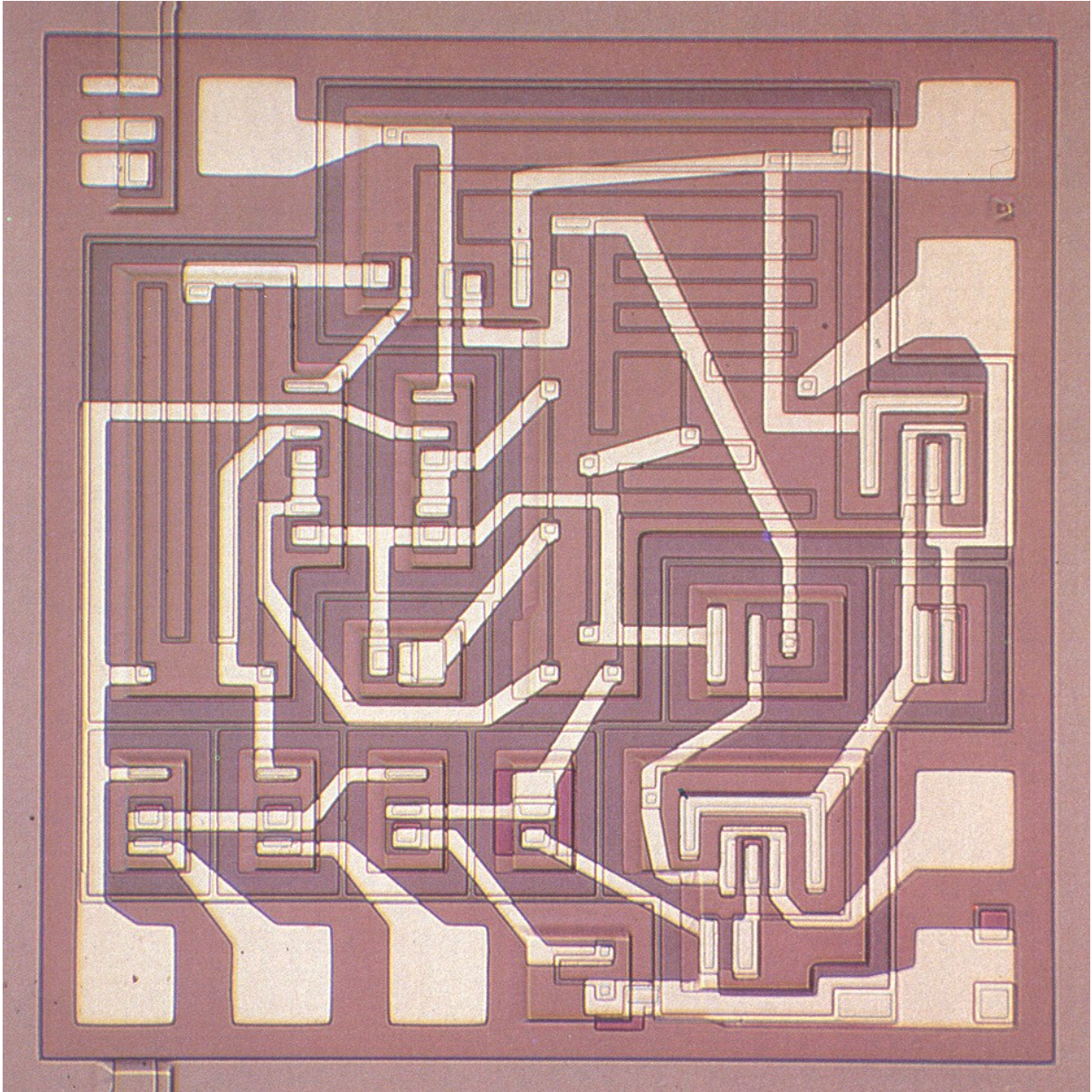
# Planar Process (1962)



RTL Logic (Noyce and Hoerni)



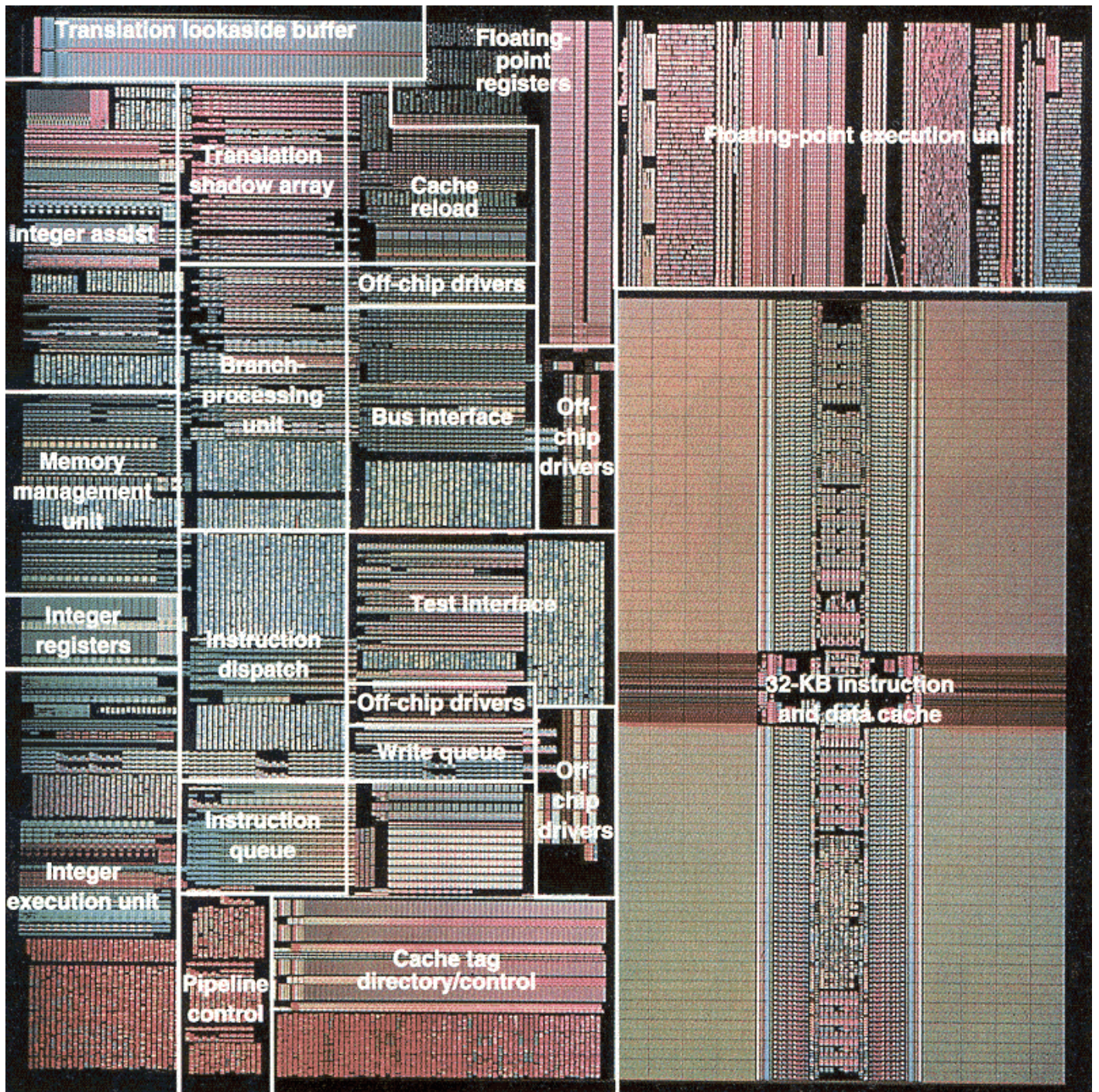
# Operational Amplifier (1965)



**Fairchild ua 709**



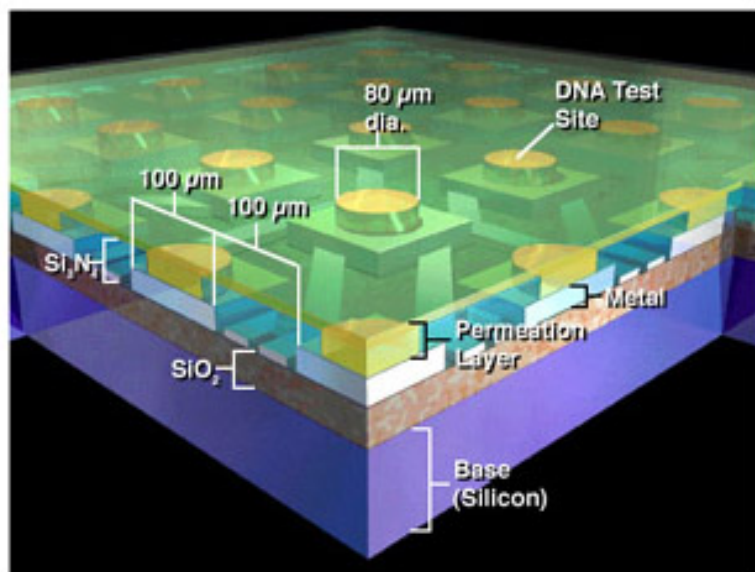
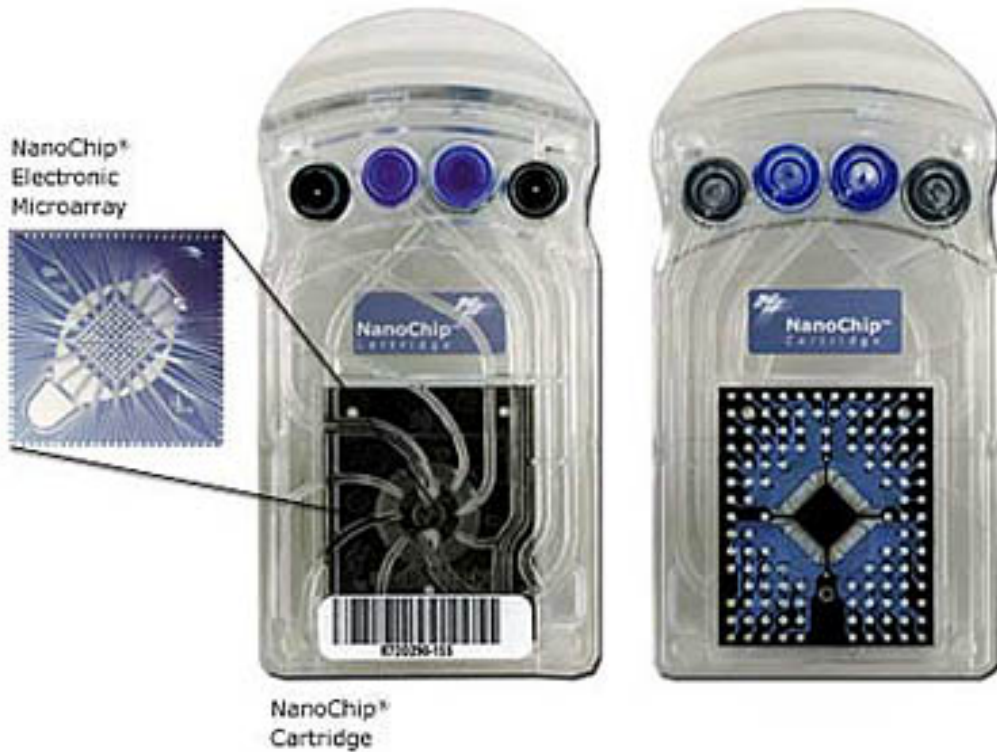
# PowerPC





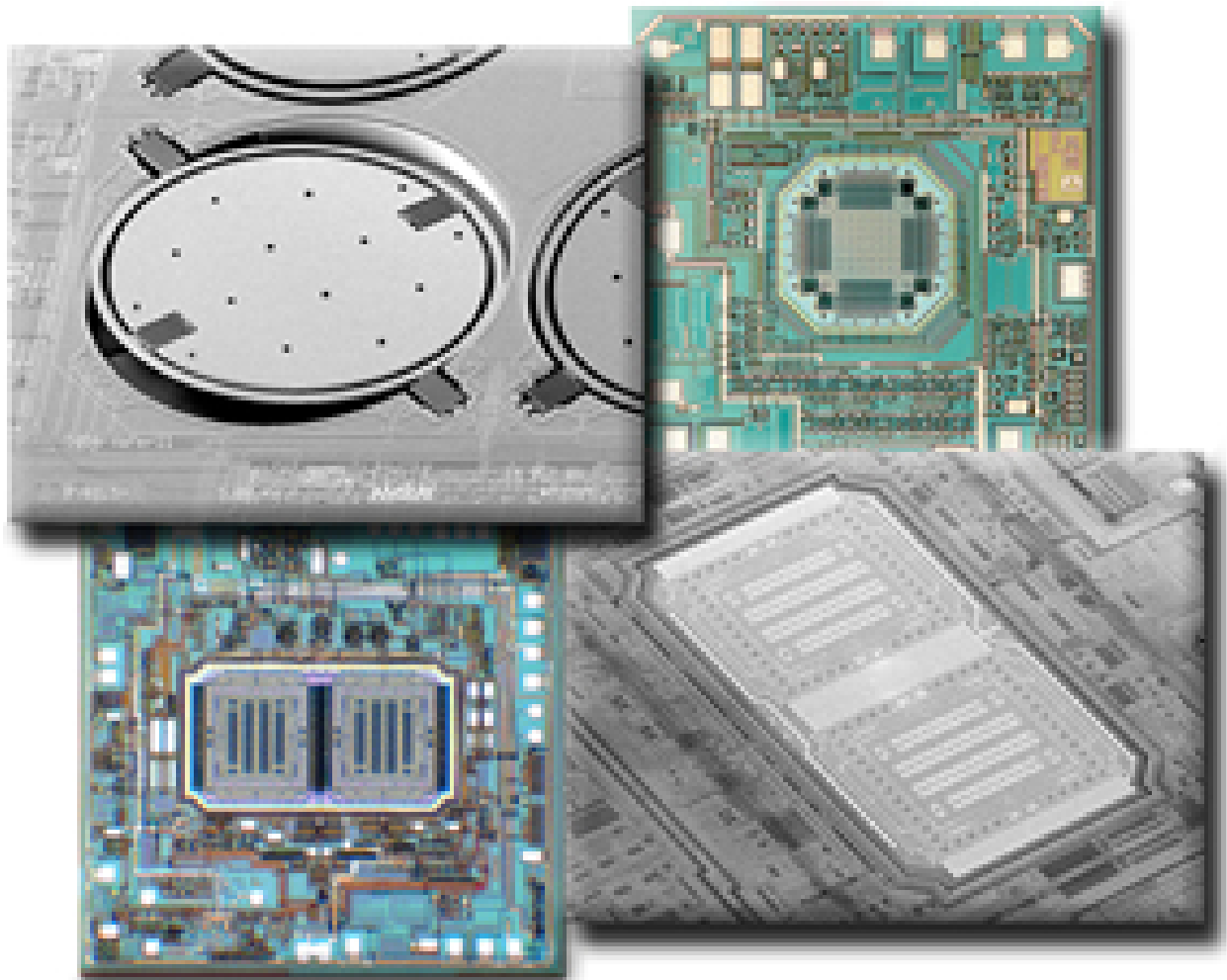
# DNA MICROCHIPS

[http://www.nanogen.com/products/nanochip\\_micro.htm](http://www.nanogen.com/products/nanochip_micro.htm)



# Analog Devices

## Accelerometers and Gyroscopes





# Industrial Success

- Analog Integrated Circuits

**Key:** Fabrication process improvements in bipolar or MOS/bipolar technologies

- Good parametric yield
- Reliability

- Very Large Scale Integrated Circuits

**Key:** Manage complexity in the number and connectivity of switches (MOS transistors)

- Integrated Micro-electromechanical Systems

**Key:** Fabrication process augmentation to incorporate moving structures

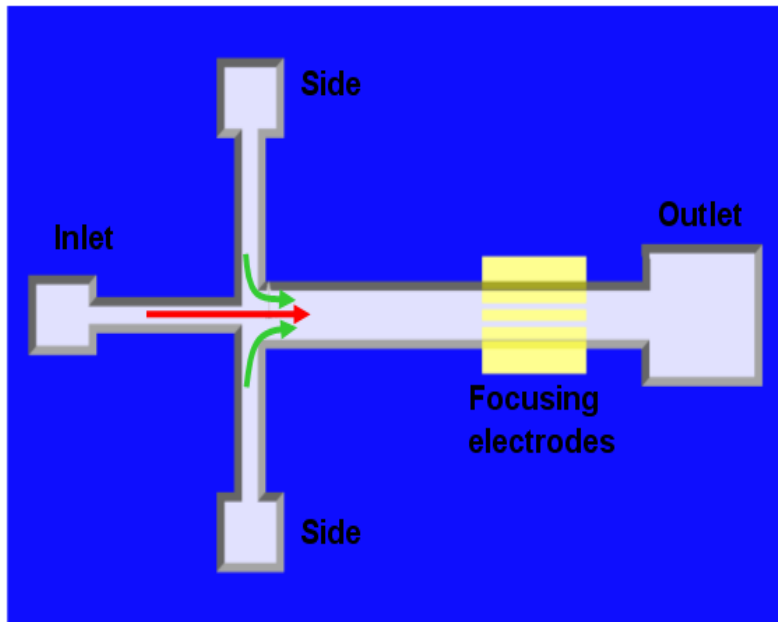
# Course Outline

- Process Architecture
- Mask Design
- Photolithography
- Silicon Oxidation
- Etching
- Thin Film Deposition
- Photoresist and Photoepoxy (SU-8) processing
- Packaging
- Testing

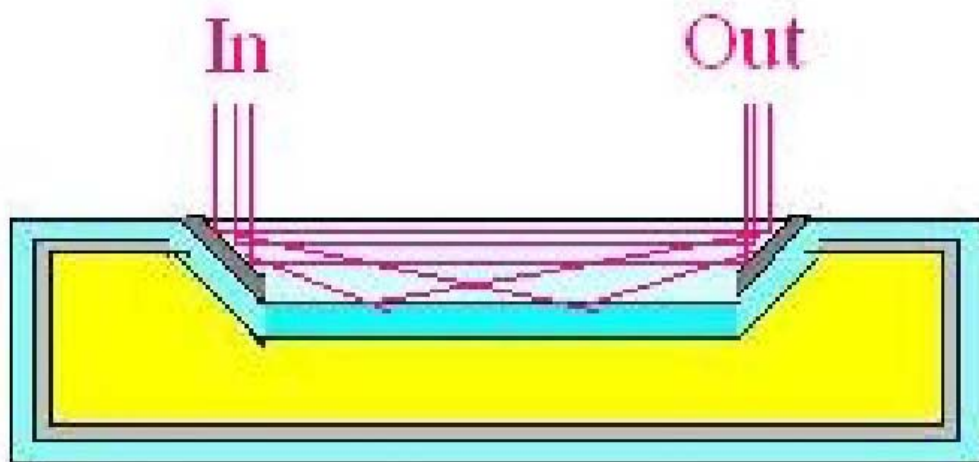


# Lab Work

## 1. Microflow Cytometer for Cell Sorting



## 2. Micromachined Optical Waveguides



# Microfabrication Laboratory and Her Friends

