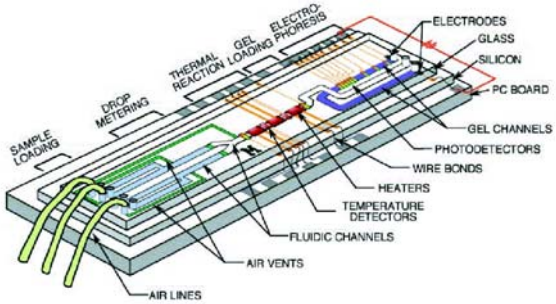
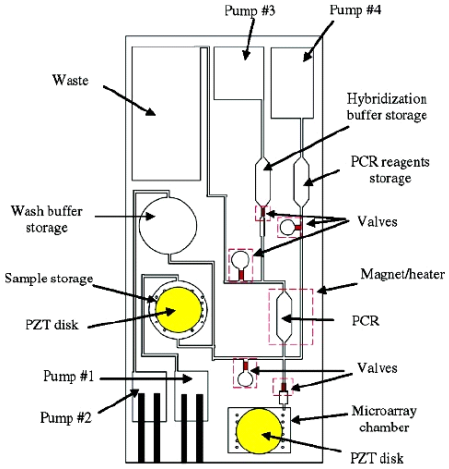
Homework Micro-scale Engineering #3, Due Date September 23, 2008

Integrated Nanoliter DNA Analysis Device (Michigan Device) and *Self-sustained, fully integrated biochip* (Motorola Device) were discussed in the class. Their papers are posted on the "Supplementary" page in our Web site at http://www.colorado.edu/engineering/MCEN/micronanobio/. 1) List four components/functions used in the Michigan device that were not used in the Motorola device. 2) List five components/functions used in the Motorola device that were not used in the Michigan device. 3) Propose two new components/functions that were not used in both devices. Turn in your answers by September 23, 2008. (10 points)





1) 1. The hydrophobic coating used to hold liquid sample. Air pressure is applied to push the liquid over the stop for mixing.
   2. Intercalating dyes and gel loading used for the detection of DNA fragments.
   3. Loading of DNA samples and reagents into the chip.
   4. The air vent used to relieve pressure and control the movement of the sample.

2) 1. Sample storage unit used to take the blood sample.
   2. PZT disk used to enhance mixing of target cells and the magnetic beads.
   3. Thermally actuated paraffin-based micro-valves used to regulate flows.
   4. Electrochemical and thermo-pneumatic pumps used to move liquid solutions.
   5. The Motorola eSensor with gold electrodes on which thiol-terminated DNA oligonucleotides are immobilized to detect electrochemical signals of hybridized target DNAs.

3) Dielectrophoresis can be used to collect target cells by using spiral electrodes. Electro-osmosis can be used to pump liquid samples.