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## Tiny Pumps Drive Liquid Circuits

Technology Research News March 12, 2004

Many research teams are working to make labs-on-a-chip that manipulate tiny amounts of fluids. A second major research effort is geared toward making cheap and flexible organic, or plastic, electric components. And other researchers are looking for better ways to control, or tune, compact optical devices like fibers, waveguides and photonic crystals.

Researchers from the University of Illinois at Urbana-Champaign and Lucent Technologies' Bell Laboratories have combined microfluidic some plastic electronics to make a tunable plastic transistor that could enable low-cost methods to drive, control and monitor fluids on labs-on-a-chip. The device can also use tiny amounts of fluids to adjust optical devices.

Electric transistors turn on when electricity flows from a source electrode through a central channel to a drain electrode, and off when the flow of electricity is blocked by a control electrode.

The researchers' microfluidic transistor contains channels filled with short plugs of a conducting liquid like mercury that act as source and drain electrodes; the position of the mercury adjusts the electrical response of the transistor.

An elastomeric, or rubbery, material forms the channels, and surface chemistries allow the material to instantly bond to an organic semiconductor once they come in contact.

The method opens the way to building low-cost, active power supplies and control circuitry for microfluidic pumps directly into the chip structure of a device, according to the researchers

Tunable microfluidic transistors could be used practically in three to six years. The work appeared in the September 8, 2003 issue of *Applied Physics Letters*.

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