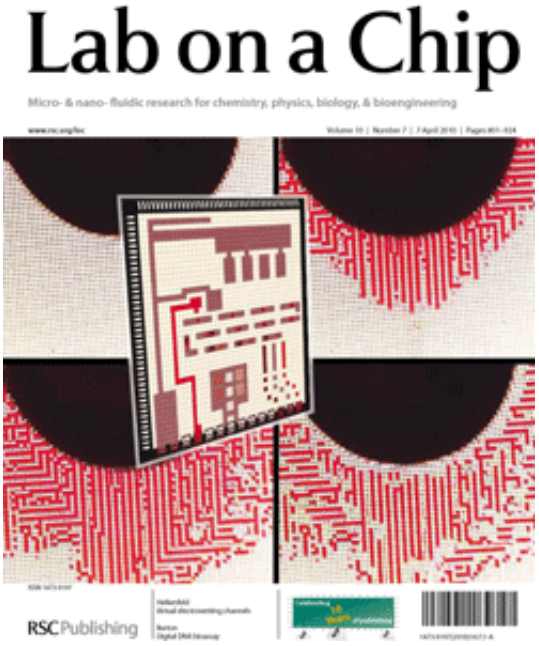
A Lab-on-a-Chip With Moveable Channels

March 22 2010, By Wendy Beckman



"Virtual Electrowetting Channels" is the cover story for March.

(PhysOrg.com) -- UC engineering researchers create tiny pools without walls with programmable microfluidic systems.

Microfluidic devices typically depend upon electrokinetic or traditional pressure methods to move microscopic amounts of fluid around a fixed microchip.

As just published as the cover story in "*Lab on a Chip*," in "Virtual

electrowetting channels: electronic liquid transport with continuous channel functionality," engineering researchers at the University of Cincinnati have created a paradigm shift — and moved some tiny channels in the process.

"'Lab on a Chip' is the top journal in the microfluidics community, with an acceptance rate of less than one out of three," says Ian Papautsky, one of the paper's authors.

The field of microfluidics has been intensely investigated for nearly two decades, being traditionally explored within fixed geometries of continuous polymer or glass microchannels. None of the prior approaches was capable of creating any desired channel geometry and being able to keep that channel configuration intact without external stimulus.

With that capability, electrically induced channel functions could bridge the gap between the worlds of programmable droplet and continuous flow microfluidics.

Someone just bridged that "micromoat."

"So here we are working on displays, and creating cutting-edge techniques at moving colored fluids around, and we nearly overlooked the possibilities in lab-on-a-chip or biomedical areas," says Jason Heikenfeld, director of UC's Novel Devices Laboratory and an associate professor of electrical engineering in UC's College of Engineering and Applied Science. Heikenfeld has been making a name for himself — and UC — in the fields of photonics and electrofluidic display technology.

"This is where collaboration comes into play," Heikenfeld continues. "Here at UC we have several internationally known experts in

microfluidics and lab-on-a-chip devices. We started collaborating with one of them, Ian Papautsky, and now we find ourselves in the middle of an exciting new application space."

“In microfluidics, we typically work with either continuous flows which give us high throughputs or droplets (digital flows) that can be manipulated electrically,” says Papautsky, associate professor of electrical engineering. Papautsky is also director of UC’s BioMicroSystems Lab and director of the Micro/Nano Fabrication Engineering Research Center. “In our new collaboration with Jason Heikenfeld, we are merging these two paradigms into a programmable microfluidic system. This is especially exciting because traditionally all lab-on-a-chip devices are limited by the predefined microchannel structure. A programmable microfluidics platform would offer an ability to reconfigure microchannel structure as needed for performing a wide range of biomedical assays, from DNA analysis to immunoassays, on the same chip.”

“I am excited to see our work so well received,” Papautsky adds.

More information: “Virtual electrowetting channels: electronic liquid transport with continuous channel functionality,” *Lab on a Chip*, by Manjeet Dhindsa, Jason Heikenfeld, Seyeoul Kwon, Jungwon Park, Philip D. Rack and Ian Papautsky

Provided by University of Cincinnati

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