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Decoupled MRI Setup Images at Microscopic Level

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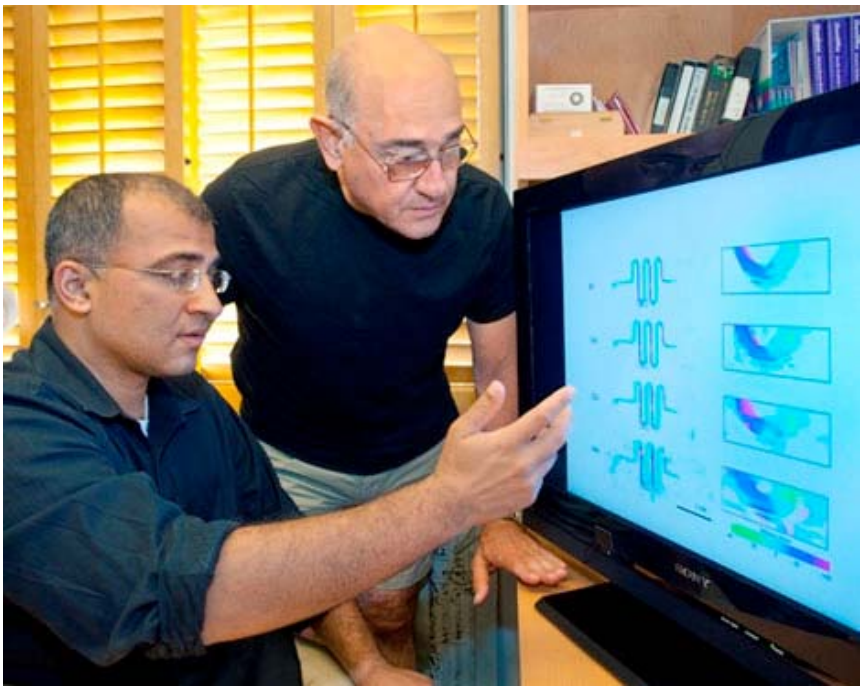

Researchers from Lawrence Berkeley National Laboratory and UC Berkeley are reporting an important advancement in MRI technology (so far on a relatively small scale) that allows for considerably greater resolution and a 10^6 increase in imaging speeds. The basic idea is to separate the signal-encoding phase from the signal-detection phase, thereby overcoming limitations caused by having to have a huge magnet and the detection system in close proximity.

The abstract in *Science* sums up the advancement succinctly:

> Magnetic Resonance Imaging (MRI) can elucidate the interior structure of an

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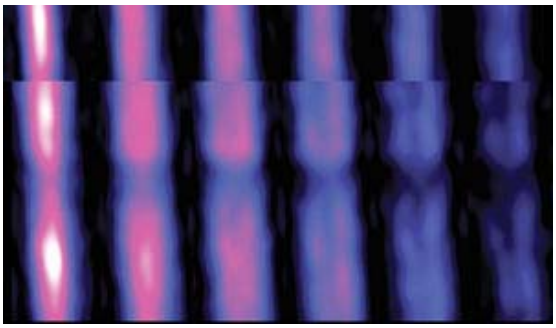

optically opaque object in unparalleled detail but is ultimately limited by the need to enclose the object within a detection coil; acquiring the image with increasingly smaller pixels reduces the sensitivity because each pixel occupies a proportionately smaller fraction of the detector's volume. Here, we overcome this limitation using remotely detected MRI: Images of fluids flowing in channel assemblies are encoded into the phase and intensity of the constituent molecules' nuclear magnetic resonance signals and then decoded by a volume-matched detector after the fluids flow out of the sample. We thus accelerate zoomed in MRI acquisition in microfluidic devices by 106, obtaining microscopic images of flow and velocity distributions. Our results illustrate the facile integration of MRI with microfluidic assays and suggest generalizations to other systems involving microscopic flow.