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Devices for the production and sorting of microfluidic droplets DONALD AUBRECHT, Harvard University, JOHN HEYMAN, HabSel, Inc., JEREMY AGRESTI, Fluid Discovery, Inc., SARAH KÖSTER, Universität Göttingen, DAVID WEITZ, Harvard University — Droplets produced in microfluidic devices are a great set of tools for studying large cell populations and permutations of reactions. Sample populations of 10^6 - 10^7 can be studied with relative ease, as encapsulation and screening rates in the kHz range are accessible. Previous droplet work has shown encapsulation of cells in droplets allows individual cells and their products to be studied. Advantages include correlation between detected products and initial drop contents, as well as minimized sample cross-contamination. Most microfluidic-based biological assays rely on fluorescent labeling of cells or use of cellular products to initiate a fluorescence-producing reaction. Detection of the fluorescence provides a trigger for sorting those cells or cell-containing droplets away from the general population. Though this allows some cellular processes to be studied, detection and quantification of all products, not just those expressed to the cell surface or those that catalyze reactions, would impact development of better therapeutics. We are currently working to adapt benchtop biological assays that label and detect cellular products for use in a droplet-based system. The work presented here details the chain of modular microfluidic devices we use to encapsulate, incubate, interrogate, and sort a population of droplets containing a model system.

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