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Rapidly evolving microorganisms with high biofuel tolerance[1] SAURABH VYAWAHARE, QIUCEN ZHANG, WENDY LANG, ROBERT AUSTIN, Department of Physics, Princeton University, Princeton NJ 08544 — Replacing non-renewable energy sources is one of the biggest and most exciting challenges of our generation. Algae and bacteria are poised to become major renewable biofuels if strains can be developed that provide a high,consistent and robust yield of oil. One major stumbling block towards this goal is the lack of tolerance to high concentrations of biofuels like isobutanol. Using traditional bioengineering techniques to remedy this face the hurdle of identifying the correct pathway or gene to modify. But the multiplicity of interactions inside a cell makes it very hard to determine what to modify a priori. Instead, we propose a technology that does not require prior knowledge of the genes or pathways to modify. In our approach that marries microfabrication and ecology, spatial heterogeneity is used as a knob to speed up evolution in the desired direction. Recently, we have successfully used this approach to demonstrate the rapid emergence of bacterial antibiotic resistance in as little as ten hours. Here, we describe our experimental results in developing new strains of micro-organisms with high oil tolerance. Besides biofuel production, our work is also relevant to oil spill clean-ups.

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Saurabh Vyawahare
Department of Physics, Princeton University, Princeton NJ 08544

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