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Paper-Based Detection Using Synthetic Gene Circuits

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Abstract : Paper-based synthetic gene circuits offer a new paradigm for programmable, fieldable biodetection. We demonstrate that by freeze-drying gene circuits with in vitro expression machinery, we can use complimentary RNA sequences to trigger colorimetric changes upon rehydration. We have successfully utilized both green fluorescent protein and luciferase-based reporters for easy visualization purposes in solution. Through several efforts, we are aiming to use this new platform technology to address a variety of needs in portable detection by demonstrating several more expression and reporter systems for detection functions on paper. In addition to RNA-based biodetection, we are exploring the use of various mechanisms that cells use to respond to environmental conditions to move towards all-hazards detection. Examples include explosives, heavy metals for water quality, and toxic chemicals.

Keywords : cell-free lysates, detection, gene circuits, in vitro
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