1038-76-278   **John S Lowengrub*** (`lowengrb@math.uci.edu`), 103 MSTB, Mathematics Department, UC Irvine, Irvine, CA 92697. *Controlling the morphology of viscous fingering patterns: A surprising discovery.*

A variety of pattern forming phenomena, ranging from the growth of bacterial colonies to snowflake formation, share similar underlying physical mechanisms and mathematical structure. Viscous fingering, considered here, is a paradigm for such phenomena. Prediction and control of the shape of emergent patterns is difficult due to the non-locality and nonlinearity of the system. Here, we report the discovery of a remarkable strategy to precisely control the pattern shape and the evolving interfacial instabilities over some ten orders of magnitude in length. There exist denumerable attracting, self-similarly evolving symmetric, universal patterns. Experiments confirm the feasibility of the strategy, which is summarized in a morphology diagram. (Received February 11, 2008)