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TeCSBi Seminar*

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De novo engineered living materials from bacteria

Engineered living materials (ELMs) are composites of living cells incorporated into a biopolymer matrix. They are inspired by natural living materials but use synthetic biology to introduce non-natural properties. While cells confer functionality to ELMs, the matrix defines its mechanical and physical. For this reason, engineering the collective self-organization of cells through a genetically encoded synthetic matrix has been a longstanding challenge in the ELM field. Prior to my work, most macroscopic ELMs either required significant processing to be assembled or were based on natural biomaterials and hence minimally tunable. Here, I present the first macroscopic de novo ELM, which grows from genetically-engineered bacteria. To achieve this goal, I engineered *Caulobacter crescentus* to display self-interacting proteins. In this way, I created a synthetic extracellular matrix that mediates the hierarchical organization of cells over four orders of magnitude, resulting in the growth of centimeter-scale living materials. Remarkably, the mechanical properties of de novo ELMs can be controlled through genetic modifications of the matrix protein. This study lays the foundation for growing ELMs with defined physical and mechanical properties, thus paving the way toward growing multifunctional, self-regenerating materials

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