**Designing living materials from bacteria and vesicles**

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The emerging field of Engineered Living Materials aims to create highly advanced functional materials using the sensory and synthetic activities of microorganisms. Most of the scientific and industrial efforts up to date are focused on synthetic biology and engineering cells for biotechnology purposes. In this project we test a new methodology, whereby we scaffold metabolically active microorganisms using expertise and techniques from soft matter. We will 1) encapsulate cellulose-producing bacteria, Komagataeibacter xylinus (Kx), in lipid vesicles to explore the living production of cellulose beads and capsules, needed for cosmetics and pharma applications; 2) embed lipid vesicles in Kx culture to create foam-like cellulose films for scaffolds and insulation. Towards the end of the project we will attempt to create multispecies materials, where we will embed lipid vesicles with pigment producing E. coli bacteria, into a Kx produced cellulose matrix. The lipid membranes would allow the coexistence of different bacteria species and the co-production of the various material components. For more information about our vision see our Royal Society video [Would You Wear A Living Shoe](https://www.youtube.com/watch?v=sK32DnuMnOU)?

The project combines knowledge from soft matter, microfluidics, quantitative microscopy, microbiology and material design. The student will spend time in the HBBE in Newcastle, where they will have interact with architects and designers from the Newcastle school of Architecture, and with microbiologists and molecular biologists from Northumbria university.