Applying the principles of soft matter formulation to aid the search for new antibiotics

*Prof. Rosalind Allen & Dr Simon Titmuss (both University of Edinburgh, School of Physics & Astronomy*)

Aims

Multicomponent systems of interacting particles are central to innovation in industry and healthcare, from consumer products like shampoo or toothpaste to biological systems like bacterial communities in soil or wastewater treatment plants. Formulation scientists have developed strategies, underpinned by soft matter physics, to understand the interparticle interactions in such formulations, yet for soil bacterial communities we know little of the nature of the relevant interactions. This lack of understanding contributes to the difficulty in culturing soil bacteria under laboratory or biotech industrial conditions, hampering the search for new antibiotics. This project will build on the progress made during two SOFI PhDs (Dan Taylor – C1, Nia Verdon – C3)1 and bring in the James Hutton Institute as a new partner to develop a methodology tailored to optimizing the culturability of communities of soil bacteria. The methodology will combine elements of formulation science, soft matter physics, machine learning and microbiology and so sits squarely within the scope of the SOFI2 CDT.

Skills/training

The student will work within an Institute that combines expertise in soft matter physics, and its application to formulation science, with statistical physics and its application to understanding the growth dynamics of bacterial communities. We have the best developed microbiology lab facilities within a Physics Lab in the UK, and a dedicated (PhD-level) Biology Lab manager who is experienced in teaching physical science students the necessary microbiology for this project. The student will develop expertise in imaging/tracking bacteria and microfluidics, and there will be scope to further develop the analysis software and develop simple numerical/analytic models if that matches the student’s interest.

References

1. *Counting individual bacteria during high-throughput growth in microfluidic droplets*

Daniel Taylor, Nia Verdon, Rosalind J. Allen & Simon Titmuss, to be submitted (will be on arXiv w/c 7 December 2020).