Evolutionary ecology of \textit{E. coli} metapopulations in patchy landscapes\textsuperscript{1}

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Spatial ecology and metapopulation biology are essential features of natural populations. Extinction of local populations, the colonization of new suitable habitat patches (metapopulation dynamics) as well as the creation and destruction of local habitats (patch dynamics) are basic components of the evolutionary process shaping life-history strategies. As Darwin liked to put it “the zoology of archipelagoes”. The role of spatial structure have been shown to be important for both, persistence and coexistence. However, the spatial ecology of microbial metapopulations have rarely been observed nor exploited technologically. We use nano and micro fabrication technology to build a spatially explicit (dynamic) landscape of habitat patches (the metapopulation chip) and a (UV) laser-based disturbance regime (patch dynamics). By building upon the theory of metapopulations in dynamic landscapes, we build fitness landscapes by linking patch dynamics to fluorescent patterns coming from molecular markers in the cell culture. We use landscape ecology and metapopulation biology to generate selective forces that can be used for evolutionary design of microorganisms.

\textsuperscript{1}Thanks to Peter Galajda & Robert Austin