



## Felix Hol

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### **“Antibiotic-mediated Competition and Bacterial Biodiversity in Synthetic Ecosystems”**

**Thursday, August 21**  
220 Shillman Hall  
11:45 a.m. – 1:00 p.m.

*Refreshments will be  
served*

**ABSTRACT** Natural bacterial habitats are complex environments that are spatially structured and heterogenous at the micro-scale. Microfluidics and nanofabrication are ideally suited to manipulate the environment at those scales, and have emerged as powerful tools to study bacterial communities. My work ranges from the role of ecosystem properties in maintaining biodiversity, to the influence of antibiotic gradients on the population dynamics of bacteria. In this talk, I will discuss how antagonistic interactions mediated by antibiotics shape bacterial communities. Colicin production by *Escherichia coli* is such an interaction that governs intraspecific competition and is involved in promoting biodiversity. It is unknown how environmental cues affect regulation of the colicin operon and thus influence antibiotic-mediated community dynamics. We investigate the community dynamics of colicin-producing, -sensitive, and -resistant/non-producer *E. coli* strains that colonize a habitat spatially structured by microfabrication. Nutrients are found to strongly influence community dynamics: when growing on amino acids and peptides, colicin-mediated competition is intense and the three strains do not coexist unless spatially separated at large scales (millimeters). Surprisingly, when growing on sugars, colicin-mediated competition is minimal and the three strains coexist at the

micrometer scale. Carbon storage regulator A (CsrA) is found to play a key role in translating the type of nutrients into the observed community dynamics by controlling colicin release. Our results highlight how molecular-level regulatory mechanisms that govern interference competition give rise to community-level biodiversity patterns.

**BIOGRAPHY** Dr. Felix Hol is currently a postdoctoral fellow working in the lab of Prof. Cees Dekker at Delft University of Technology (the Netherlands) and the lab of Prof. George Whitesides at Harvard University. His research interests range from the eco-evolutionary processes that shape microbial communities, to the development of novel tools to address problems in global health. Felix received his Masters degree in ‘Physics of Life’ from VU University Amsterdam studying chromatin structure at the single molecule level. In 2014, he obtained his PhD in Biophysics from Delft University of Technology where he used microfabricated ecosystems to study cooperation and competition in bacterial societies, and the mechanisms underlying adaptive resistance to antibiotics.