

## **The microbiome and evolutionary theory: the open questions of cooperation and sex**

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Evolution is the central theory with the greatest explanatory power in the life sciences. Almost all evolutionary theory models share a common prominent attribute – they focus on the individual and its genes. However, almost any organism hosts microbes, and accumulating evidence that these microbes can have a substantial impact on their host functioning and behavior. I will describe a research investigating a new and complementary assumption, supported by recent empirical evidence: that microbes can manipulate their hosts in different ways, and natural selection acted on that manipulation. We used this approach for the study of two fundamental questions in evolutionary theory: the evolution of cooperation and the evolution of sex. We used mathematical models and simulations considering hosts and their microbes, and allowing both vertical and horizontal transmission. I will discuss the range where the interests of the hosts and the microbes conflict, and where the microbes' perspective may help the evolution of cooperation and sex in cases where they are hard to explain by classical theory.