



universität
wien

Fakultät für Mathematik

EINLADUNG
**Mathematisches Kolloquium
und
Junior Kolloquium**

Prof. Dr. Vincent Jansen (*University of London*)
Mittwoch, 27. April 2016

15.00 Uhr – Junior Kolloquium:
"The evolution of sex-specific virulence"

15.45 Uhr – Kaffeepause

16.15 – Vortrag:
"Siderophore production and the evolution of investment in a public good: An adaptive dynamics approach to kin selection"

Anschließend vinum cum pane

Ort: Fakultät für Mathematik, Oskar Morgenstern-Platz 1, Sky Lounge

Reinhard Bürger, Karl Sigmund, Joachim Hermisson, Josef Hofbauer

Junior Kolloquium: "The evolution of sex-specific virulence"

Abstract: Many diseases affect males and females differently. There are often differences between sexes in the infection rates of parasites and pathogens, in the disease prevalence as well as in the rates with which infection progresses to disease and in the mortality caused by disease. Some pathogens even manifest themselves in entirely different ways in the different sexes. These differences are often attributed to physiological, behavioural or social differences between the sexes. However, from an evolutionary ecology perspective it seems plausible that pathogens and parasites will adapt to differences between the genders and that therefore the parasites themselves might have adapted to act differently in males and females. I will present a general model for the evolution of virulence, based on an extension of the well-known SIR model, in a population with two genders to find out how parasites are likely to adapt. This allows us to study how differences between the sexes can drive the evolution of sex-specific virulence. The model can explain patterns of differences between genders in the epidemiology of infectious disease that have hitherto remained unexplained.

Vortrag: "Siderophore production and the evolution of investment in a public good: An adaptive dynamics approach to kin selection"

Abstract: The bacterium *Pseudomonas aeruginosa* sequesters iron from the environment through the secretion, and subsequent uptake, of iron-binding molecules. As these molecules can be taken up by other bacteria in the population than those who secreted them, this is a form of cooperation through a public good. Traditionally, this problem has been studied by comparing the relative fitnesses of siderophore-producing and non-producing strains, but this gives no information about the fate of strains that do produce intermediate amounts of siderophores. Here, we investigate theoretically how the amount invested in this form of cooperation evolves using assumptions for a simple ecological setting. We formulate a differential equation model for the local dynamics which describes the competition and cooperation of the bacteria. From this dynamical model we derive the fitness from one generation to the next generation following the adaptive dynamics method, and retrieve a representation in terms of inclusive fitness (Hamilton's rule) from the fitness expression that we derive. The results show how selection is driven by local siderophore production and local competition. Because siderophore production reduces the growth rate, local competition decreases with the degree of relatedness (which is a dynamical variable in our model). The adaptive dynamics approach allows us to assess evolutionary stability, and we found that selection can lead to an intermediate strategy which in our model is always evolutionarily stable yet can allow invasion of strategies that are much more cooperative. Our model describes the evolution of a public good in the context of the ecology of the microorganism, which allows us to relate the extent of production of the public goods to the details of the interactions.