How do antibiotic-producing bacteria cells grow and branch?

80% of all antibiotics currently used in clinic are produced by filamentous, sporulating soil bacteria called *Streptomyces*. A single *Streptomyces* spore is distributed to the soil via air, water or insects. The spore can then germinate and grow by the addition of the new cell material to the tip. Additionally, it forms new branches on the lateral cell wall. This creates a branched network, also called mycelium that penetrates deeply into the soil to allow the organism to find nutrients. Once the nutrients are expired, the organism produces secondary metabolites (including antibiotics) to kill other competing microbes. Simultaneously, the hyphae grow upwards and forms an aerial mycelium. This vertical mycelium is then finally converted into spores that get distributed once more. Surprisingly the formation of the complicated branched mycelium is not well understood on a molecular level.

This project focus is to understand fundamental details and mechanism of how the cell orchestras the creation of the mycelium structure. Particular emphasis is on revealing the organisation of the main proteins responsible for tip growth and branching. We aim to identify proteins involved in the tip growth and to understand their role on the molecular level. One of the methods to exploit it will be time lapse fluorescent microscopy. We will utilize it to characterise in detail the organisation and the interactions of these proteins at the tip. To study further their function and role in tip growth, we will create mutant strains, which lack the genes encoding these proteins and to study their impact on cell shape. Building on that we will further introduce small changes in one of the key proteins involved in the tip growth to study if and how it interacts with other binding partners.

Our studies will give as an unprecedented insight into the formation of the mycelium structure in filamentous bacteria. As the life cycle of these bacteria and antibiotic production are fundamentally linked it will give us a valuable information with potential applications in antibiotic and other medicine production.