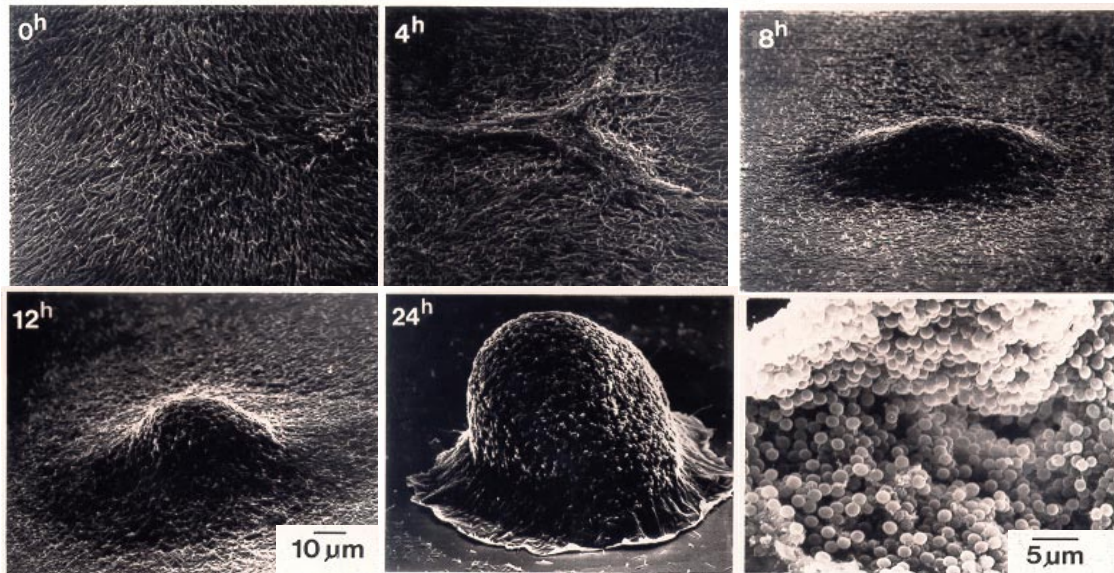


## Design Principles of Microbial Cooperation

Recent advances in experimental methods have revolutionized the way scientists think about microbes. It is now clear that most bacteria spend at least parts of their lifecycles in cooperative communities such as biofilms. Moreover, populations of genetically identical microorganisms often differentiate into different cell types to obtain group-specific fitness advantages. Many examples of biofilms are of utmost importance from industrial and public health perspectives, and are a major scourge of hospital surgeries, water quality, and daily life. *Myxococcus xanthus* is one of the most intriguing microbes known for its multicellular lifestyle: under appropriate conditions, bacterial cells will begin to aggregate and form complex fruiting body structures, which contain environmentally resistant spores. This developmental process requires a complex and tightly controlled regulatory network. In addition to traditional experimental research, computational and engineering approaches have been used to understand the mechanism involved in multicellular differentiation.



**Multicellular differentiation of *M. xanthus*. Micrographs by Jerry Kuner**

The groups of Dr. Oleg Igoshin (Bioengineering Dept., Rice) and Heidi Kaplan (Dept. of Microbiology and Molecular Genetics, UT Medical School) have launched a collaborative project which seeks to quantitatively characterize and mechanistically understand cooperative phenomena *M. xanthus*. A student participating in this research will design and construct fluorescent strains containing transcriptional reporters that are activated during different stages of *M. xanthus* development. These genetic constructs will be used to investigate noise, asynchrony and population heterogeneity in *M. xanthus* biofilms. Moreover, changes in fluorescently labeled biofilms will be quantitatively measured using time-lapse microscopy and statistically analyzed.

The student participating in research during the semester can get BIOE 400 credit. Summer support may be available for students willing to continue the project. Interested students are invited to contact Dr. Oleg Igoshin at [oi1@rice.edu](mailto:oi1@rice.edu)