OVERVIEW
In this lecture I will present an overview of the bacterial cell division machinery with an emphasis on how the components were discovered and the approaches used to figure out their functions. We will also discuss two classic papers on the Min system and the spatial regulation of cell division in *E. coli*. A recent paper identifying a new spatial regulator of cell division in the pathogen *Streptococcus pneumoniae* will provide a nice (current) example of division regulation in non-model systems.

Some questions to ponder for discussion during the introductory lecture:

1) If you were a researcher back in the early days of the field, how would you go about identifying components of the division machinery? Where do you start? Assume you can use any technique modern or classical.

2) How would you learn the functions of the factors once you identified them? What approaches would you take? What might give you some clues?

3) What about spatial regulators of cell division - how would you identify them?

PAPERS FOR DISCUSSION


This paper describes the identification and characterization of the *min* genes responsible for promoting cell division at midcell in *E. coli*. Be prepared to discuss the results. How many of the *min* genes are needed to properly direct midcell division? What are the functions of the individual components? How was this determined? How is topological specificity conferred to the division inhibitor? What potential models are proposed to explain this (see Discussion)? Be prepared to draw models on the board. How would you experimentally determine which model is correct? What are maxicells? Why were they used? Why don’t we use them anymore?


A clear example of the power of GFP fusions and time-lapse microscopy when it comes to figuring things out. In this case, Raskin and de Boer study the subcellular localization of the MinD protein. What they found is remarkable even by today’s standards.

Things to ponder: What makes them confident that the GFP fusion is reporting on the normal localization of untagged MinD? What other components of the Min system are required for the oscillation? What determines the speed of oscillation? Why does this appear to be important?
Is new protein synthesis required for oscillation? How do they know? What was the motivation for the experiments in Figure 2? What question were they asking?


**General Reviews:**
