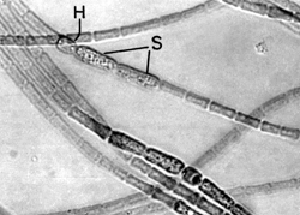
https://prl.natsci.msu.edu/people/faculty/peter-wolk/ TO BE REVISED

**Developmental Mechanisms in Filamentous Cyanobacteria**

The filamentous cyanobacterium *Anabaena* provides models of the short-range intercellular interactions that control development in many organisms. When *Anabaena* grows in the presence of abundant fixed nitrogen, all of its cells appear to be of the same type, referred to as a vegetative cell. When nitrogen becomes limiting, 5 to 10% of the cells differentiate, at semi-regular intervals along the filaments, into nitrogen-fixing cells called heterocysts. In some species, yet a third type of cell, the akinete (or spore), can differentiate from vegetative cells positioned adjacent to heterocysts. Pre-existing heterocysts inhibit nearby cells from differentiating into heterocysts and (in some species) induce nearby cells to become akinetes. We wish to know how they do so.  
  
**Figure 1.** Filaments of *Anabaena cylindrica*. Heterocysts (H) are nitrogen-fixing cells. Enlarged spores (S), a.k.a. akinetes, here still immature, form by differentiation of vegetative cells adjacent to heterocysts, and can germinate after exposure to harsh conditions. The remaining vegetative cells of the filaments photosynthesize and grow.

We devised genetic methodology to facilitate molecular analysis of the development of *Anabaena*. If restriction by cyanobacterial endonucleases is avoided, DNA can be transferred with high efficiency from *Escherichia coli* to *Anabaena* by conjugation of bacterial plasmids. Mutations can thereupon be generated and complemented, and reporter genes can be used to visualize the cells in which promoters are active and, within cells, where particular proteins are localized. The genomes of numerous strains have been sequenced and transposons active in *Anabaena* are available.

Now emeritus, I pursue the genetics of *Anabaena* development in collaboration with others, with an emphasis on novel roles of transposons that may enhance understanding of regulation of photosynthesis and of akinete formation. I continue to seek an understanding of why it is that *Anabaena* PCC 7120, a model for study of heterocyst formation, lacks akinete formation, motility, and synthesis of gas vacuoles.