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In comparison with the much larger eukaryotic cell, relatively little is known about the structure and spatial organization of the components of bacterial cells. However, as Sriram Subramaniam and Jacqueline Milne discuss on page 666, recent advances in three-dimensional electron tomography are allowing microbiologists to view the surfaces and interiors of bacterial cells with ever increasing clarity. Visualization of large structures such as cytoplasmic filaments, receptor arrays and ribosomes has become possible, and with new image averaging techniques we can now even follow the conformational changes of specific membrane proteins in the context of the native cell membrane.

One example of a structure for which electron tomography could help to extend our current understanding is the bacterial Z ring. During cell division, cytokinesis is achieved by the multicomponent divisome machine, the assembly of which is initiated by polymerization of the protein FtsZ into the annular Z ring. In rod-shaped bacteria, this structure forms at the midpoint of the cell and then becomes constricted, eventually giving rise to two identical daughter cells. On page 642, David Adams and Jeff Errington describe the diverse repertoire of accessory proteins that regulate the assembly of FtsZ into the Z ring and integrate information on cell cycle status and the environment.

Another structure ripe for analysis by tomography is the needle-like complex of the type III secretion apparatus used by *Pseudomonas aeruginosa*, a major cause of health care-associated infections, to inject effector proteins into host cells. On page 654, Alan Hauser describes our current understanding of the type III secretion system components, including the effector proteins that are secreted by the bacterium to manipulate host cell function.



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