

**Movie S1.** Tomogram of a *Synechococcus* sp. PCC 7942 cell.

**Movie S2.** Tomogram of a *Microcoleus* sp. cell.

**Movie S3.** Tomogram of a *Microcoleus* sp. cell showing one large vesicle in the center of the cell and another in the periphery.

**Movie S4.** Tomogram of a *Microcoleus* sp. cell showing vesicles fused to the thylakoid membranes and connected to each other by thylakoid membranes.

**Movie S5.** An artistic model of cyanobacterial thylakoid membranes.