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## **Organelles without borders: How phase transitions functionally organize living cells (I)**

*Sunday 10 June 2018 11:30 (30 minutes)*

Living cells are composed of a complex mixture of macromolecules. To regulate their activity, cells partition these molecules into specialized compartments called organelles. Typically, membranes form a selective barrier between organelles and the cytoplasm, allowing each compartment to maintain a distinct biochemical composition that is tailored to its function. However, cells also contain a variety of organelles that are not enclosed by membranes. For example, germ granules, stress granules and the nucleolus consist of local concentrations of protein and nucleic acid that rapidly exchange with the surrounding cytoplasm or nucleoplasm. Recent progress suggests that these membraneless organelles assemble through phase separation, whereby soluble components condense from the cytoplasm to form dynamic droplets. Intracellular phase transitions appear to be widespread in eukaryotes and we hypothesize that they may contribute to spatiotemporal organization in bacteria as well. Nevertheless, the molecular forces that drive such phase transitions, and how they are regulated in response to environmental and/or developmental conditions, remain poorly understood. Here, I describe our efforts to answer these questions using quantitative live-cell imaging and physical modeling.

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