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Interactions and transitions in biofilm formation VERNITA GORDON, University of Texas, Austin, KELLY COLVIN, University of Washington, Seattle, JACINTA CONRAD, University of Houston, MAXSIM GIBIANSKY, FAN JIN, University of California, Los Angeles, MATTHEW PARSEK, University of Washington, Seattle, GERARD WONG, University of California, Los Angeles —
Biofilms are multicellular, interacting communities of intrinsically-unicellular organisms that grow on surfaces. As such, they are fascinating model systems for multicellularity. They are also of great practical importance, since biofilms damage a variety of industrial infrastructure and are the cause of most persistent, antibiotic-resistant infections. In natural settings, most bacteria are found in biofilms. To initiate a biofilm, planktonic, free-swimming bacteria attach to a surface and then undergo a series of phenotypic changes as that adhesion becomes irreversible and the surface is populated, first by discrete bacteria, and then bacteria growing in dense clusters, "microcolonies." Both adhesion to a surface and adhesion to other cells are associated with adhesive properties of cell-produced extracellular polysaccharides (EPSs). Using laser tweezers to test cell aggregation and aggregate stability, in combination with gene expression assays and gene-knockouts, we show the importance of one EPS, pel, for early cell aggregation. We also use automated bacteria-identification and –tracking software algorithims to identify and quantify key transitions early in biofilm formation.

Vernita Gordon
University of Texas, Austin

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