

Field-Directed Self Assembly of Colloidal Suspensions

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1PM, 9 August 2021 (Online via MS Teams)

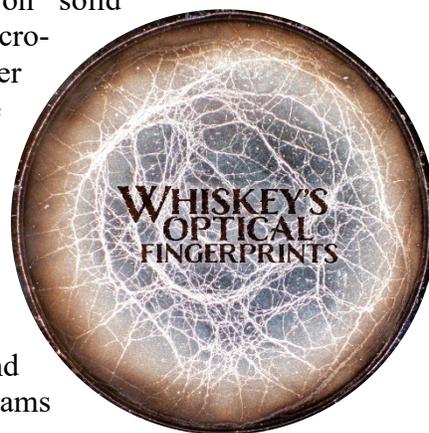
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Soft matter environments enable massively parallel control of the organization of particulate matter. Suspensions of colloids in liquids are especially sensitive to both the liquid environmental conditions and to externally applied fields, which dramatically affect interparticle interactions that can produce novel self-assemblies. My laboratory has demonstrated substantial precise control over colloidal self-organization using electric, thermal and flow fields, individually and in combination. Specific results of this from my research include precise and reversible deposition of microparticle monolayers on surfaces; electrically-induced (dielectrophoretic and electrokinetic) organization of clusters of particles in suspension, together with simultaneous sensing of their dielectric spectra; and self-assembly induced by the effects of rotational flows on interparticle forces. These methods have been used to understand the makeup and organization of the complex and widely varying biomaterial, bourbon. My laboratory is working to understand how the colloidal structures from evaporated droplets differ from brand to brand for purposes of quality control and to detect counterfeit bourbons. I would welcome any discussion on ways that colloidal manipulation might be applied to your research studies.

Stuart J. Williams, Associate Professor of Mechanical Engineering, University of Louisville, holds the Ph.D in Mechanical Engineering from Purdue University (2009). His research focuses on understanding and applying fundamental physical principles that control the organization of colloidal suspensions. Various properties controlled by external fields and particle interactions enable particle sorting, stabilization and destabilization of suspensions, and self-assembly of structures both in suspension and on solid



supports. His current studies include micro- and nanoparticle interactions under microgravity for NASA on the International Space Station, electrical characterization of phytoplankton suspensions (NSF), and understanding colloidal “fingerprints” of bourbon whiskeys. His work has been featured on the covers of *Physics Today*, *ACS Nano*, *Electrophoresis*, *Lab on a Chip*, and *Biotechnology & Bioengineering*. Williams is the Associate Director of ERINC.



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This Seminar is the third workshop seminar for the UofL Soft Matter Initiative, which is sponsored and organized by the ElectroOptics Research Institute and Nanotechnology Center (ERINC). For more information on the Soft Matter Initiative or ERINC visit <http://eri.louisville.edu/>.