Phillip Geissler, the Aldo De Benedictis Distinguished Professor of Chemistry at the University of California, Berkeley, passed away on July 17, 2022, while hiking in Utah. Geissler was a remarkable scholar, a beloved colleague, a charismatic teacher, and a dear friend to many in the chemical community. He made major contributions to statistical mechanics, pioneering techniques for the computer simulation of rare events in condensed phases, the study of water and aqueous solvation effects, and the biophysics of cell membranes. While the focus of his work in theoretical statistical mechanics spanned a broad range of topics, Geissler also made substantial and lasting contributions to nanoscience, particularly to our understanding of nanoscale self-assembly processes.

Geissler’s first foray in this area was aimed at understanding the nonequilibrium evaporation-mediated self-assembly of nanoparticles studied in Brus’ laboratory. The experiments were remarkably rich, exhibiting a plethora of large-scale morphological features. This complexity inspired many explanations for the phenomena, ranging from microscopic segregation induced by competing short- and long-ranged interactions to a hydrodynamically driven Marangoni phenomena. Geissler and collaborators instead appealed to a simple picture based on a lattice model that coupled the fluctuations of the evaporating solvent to the motion and short-ranged interactions of the nanoparticles themselves. Despite the simplicity of the approach, this work was remarkably successful in predicting the assembly behavior and was quickly accepted as the canonical theory of evaporation-mediated self-assembly at the mesoscale and beyond.

This style, the creation of simplified models based on a deep understanding of the essential physical ingredients underlying seemingly complex dynamical phenomena, was at the heart of Geissler’s research program. He continued to work in close collaboration with experimentalists in the field of nanoscience, producing highly impactful work, often published in the pages of this journal, which greatly enhanced our understanding of the possible ways in which nanoscale objects can assemble in- and out-of-equilibrium into surprisingly beautiful and useful large-scale structures. Some prominent examples of this may be found in his work with Yang’s group on the formation of superlattices from silver polyhedral nanocrystals, and his work with Alivisatos’ group on the mechanism of alignment of colloidal nanorods and on nonequilibrium nanocrystal transformations. In the last talk Geissler gave in Telluride Colorado, 3 days before his untimely death, he outlined a beautiful and compelling theory rationalizing how lattice strain drives cation exchange in nanostructures.

The loss of Phillip Geissler leaves a large void in the theoretical chemistry community, as well as in the larger materials science community that encompasses nanoscience. Geissler had recently joined the editorial advisory board of Nano Letters, providing characteristically insightful scientific suggestions. His legacy lives on through his scientific work and in those who learned from him through his papers and his teaching. He will be sorely missed.

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REFERENCES


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