Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Pattern Formation in Driven Systems[1] KATHERINE KLYMKO, Univ of California - Berkeley — Model colloidal particles of two types, driven in opposite directions, will in two dimensions segregate into lanes, a phenomenon studied extensively by Lowen and co-workers [Dzubiella et al. Phys. Rev. E 65, 021402 (2002)]. We have simulated mixtures of oppositely-driven particles using three numerical protocols. We find that laning results from enhanced diffusion, in the direction perpendicular to the drive, of particles surrounded by particles of the opposite type, consistent with the observation of Vissers et al. [Soft Matter 7, 6, 2352 (2011)]. By comparing protocols we find that enhanced diffusion follows from a simple geometrical constraint: oppositely-driven particles must, in the time taken to encounter each other in the direction of the drive, diffuse in the perpendicular direction by about one particle diameter. This constraint implies that the effective lateral diffusion constant grows linearly with drive speed and as the square root of the packing fraction, a prediction supported by our numerics. By invoking an analogy between hard particles with environment-dependent mobilities and mutually attractive particles we argue that there exists an equilibrium system whose pattern-forming properties are similar to those of the driven system.

[1]Katherine Klymko acknowledges support from the NSF Graduate Research Fellowship.

Katherine Klymko
Univ of California - Berkeley

Date submitted: 06 Nov 2015 Electronic form version 1.4