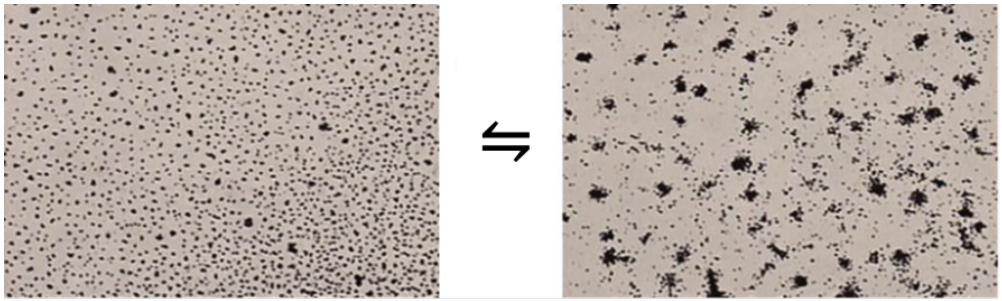
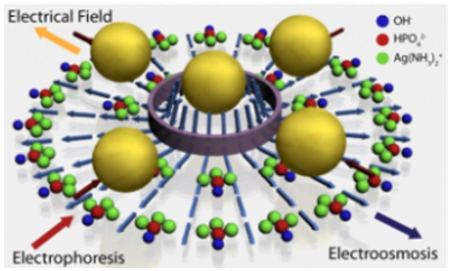
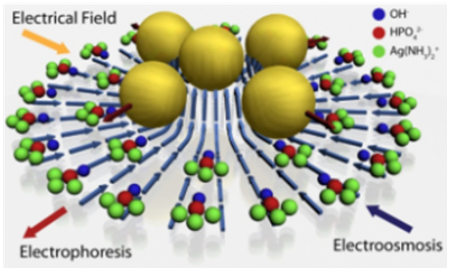
Transition between Collective Behaviors of Micromotors in Response to Different Stimuli

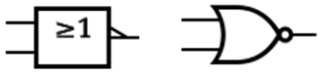
Penn State MRSEC DMR-0820404: Wentao Duan, Ran Liu, Ayusman Sen (*JACS, 2013*)

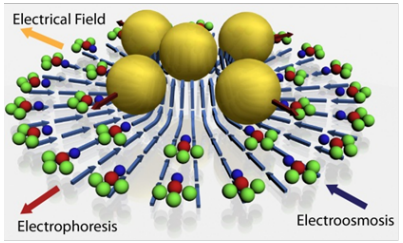


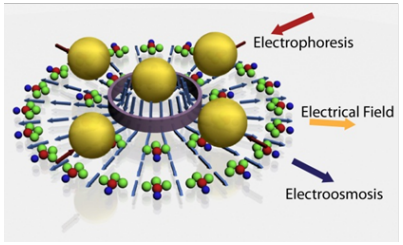




NOR Gate







A=UV B=NH_3

	INPUT		OUTPUT
	A	B	A NOR B
1	0	0	1
0	1	0	0
	1	0	0
	1	1	0

Silver phosphate micromotors exhibit reversible transition between two collective behaviors: repulsive dispersion-like “exclusion” and attractive clustering-like “schooling” by the addition and removal of NH_3. Hierarchical particle clustering is observed when other inert particles are also present. Upon the addition of NH_3, large Ag_3PO_4 microparticles function as pumps, pushing away inert particles from their vicinity. We also find that the transition from dispersion to clustering can be halted with UV light. By combining the two external stimuli, we demonstrate that micromotor systems can be used as logic gates, with stimuli (UV and NH_3 in our system) as inputs and collective behaviors as outputs: “schooling” and “exclusion” behaviors as 1 and 0, respectively which suggests their potential for applications in computations.