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The Effect of Contact Angle on the Orientation, Stability and Assembly of Dense Floating Cubes JONATHAN ROTHSTEIN, MICHAEL DONNELL, ROBERT DANIELLO, University of Massachusetts - Amherst — In this talk, the effect of contact angle, density and size on the orientation, stability and assembly of floating cubes will be presented. All the cubes tested were denser than water. Floatation occurred as a result of capillary stresses induced by deformation of the air water interface. The cubes were observed to float in one of three primary orientations depending on contact angle: edge up, vertex up and face up. Measurements net force on the cubes showed that the maximum capillary forces were always experienced for the face up orientation. However, when floatation was possible in the vertex up orientation, it was found to be the most stable cube orientation because it had the lowest center of gravity. A series of theoretical predictions were performed for the cubes floating in each of the three primary orientations to calculate the net force on the cube. The theoretical predictions were found to match the experimental measurements well. The assembly of cubes floating face up and vertex up were also studied for assemblies of two, three and many cubes. Cubes floating face up were found to assemble face to face and form regular checkerboard arrays with no free interface between cubes. Cubes floating vertex up cubes were found to assemble in a variety of different arrangements including edge to edge, vertex to vertex, face to face and vertex to face with the most probably assembly being edge to edge. Large numbers of vertex up cubes were found to pack with a distribution of orientations and alignment.

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