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One-, Two-, and Three-Dimensional Physics with Films Adsorbed on Carbon Nanotube Bundles[1]

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Carbon nanotube bundles are formed by mostly parallel arrays of single-wall, closed-end carbon nanotubes of about one nanometer diameter and micrometer length, each bundle having from about 30 to over a hundred nanotubes. The nanotubes in the bundles are not of uniform diameter, which leads to bundles not being perfect stacks of nanotubes. On these bundles, one-, two-, and three-dimensional forms of matter can be formed by physisorption. In this presentation I will give a brief introduction to the changes in the solid-liquid-vapor phase diagram of simple substances brought in by dimensionality, followed by introducing carbon nanotube bundles and physisorption. I will use results from current measurements of adsorption isotherms, heat capacity, and neutron diffraction to illustrate to what extent theoretical expectations and experimental results agree (and disagree). I will conclude this presentation with comments on future experiments using a single carbon nanotube as a physisorption substrate. The work described is being carried out in collaboration with David Cobden, Subramanian Ramachandran, and Zenghui Wang.

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