Colloidal particles provide convenient building blocks for creating three-dimensional structures on the micron scale. However, for practical use we need to be able to precisely control the assembly of large numbers of individual particles. Here, I will describe how the simplest colloidal particles — smooth, hard spheres — can be guided to form perfect crystals, crystals with defects, amorphous-crystalline interfaces, and glasses by means of colloidal epitaxy onto patterned templates. Further, we go beyond assembly and use colloidal glasses formed in this way as experimental models to investigate the specific, local mechanisms of deformation in amorphous materials. These results provide critical insights into the nature and origin of shear defects in glasses.

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