Realizing the full potential of nanodevices will require the ability to place individual elements that are much smaller than the width of a human hair in precise, 3-D configurations. We have developed new materials that allow us to use light and/or electric fields to position individual micro- or nanostructures in precise locations in three dimensions and then to lock them into place using short pulses of light from a laser. This “trap-and-zap” scheme is being used to create new types of optical, electronic and mechanical devices based on nanotechnology. Shown here are 2D pattern (left), a 3D cube (middle), and a “needle and thread” (right) created with this technique.