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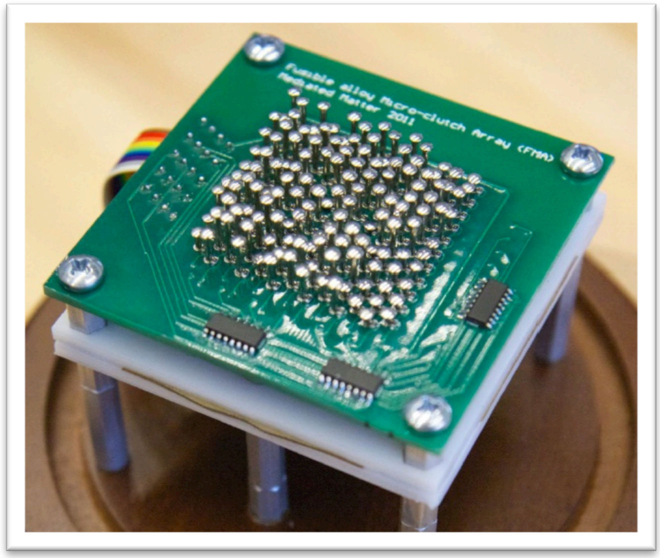

Benjamin Peters, MIT (Cambridge, MA)
$15,000 Lemelson-MIT "Use it!" Graduate Winner
Reconfigurable Forming Tools – Looking Beyond 3D Printing

The Challenge: The past five years has seen an incredible surge of interest in small, consumer-scale digital fabrication tools, typified by the wide array of 3D printer kits available.
3D printing is a serial process—adding one layer at a time. Historically, this process works most consistently for smaller parts—around the size of a coffee cup or salt shaker. Most challenging are larger volume, high resolution prints; they require a huge number of detailed layers, often taking many hours or even days to print a single part. It's often true that the longer the print time, the higher the likelihood that an interruption or error will occur and ruin the subsequent layers.

The Solution: Ben Peters proposes a new approach to 3D fabrication for these larger volume parts. Peters is developing technology that can be used for the direct parallel creation of physical shapes from digital files. A type of reconfigurable pin tool, his device creates a detailed, contoured surface for 3D visualization as well as for forming or casting operations. The reconfigurable surface is composed of a dense array of tiny moving pins—similar to a pin-impression toy—but instead of using thousands of tiny motors, Peters' device uses very few mechanical actuators, only a single set on each of the four sides of the array.

In the most recent embodiment of Peters' invention, the "pins" are threaded rods bundled together inside a spring loaded retaining frame. Peters discovered a means of using a converging pattern of mechanical vibrations to cause a targeted screw in the array to rotate, screwing itself up or down. This actuation technique can then be varied to reconfigure the positions of the entire array of threaded screws, generating a full projected 3D shape made by the tops of the screws. The method allows for very small diameter screws to be used in generating high-resolution surfaces of many thousands of moving rods.

Application and Commercialization: Formative processes, like molding or stamping, offer some of the fastest production rates possible. Combining the inherent speed of forming with the shape reconfigurability this "digital molding" technology provides, companies could improve the flexibility of production lines and well as reduce the lead time on development and prototyping. Peters' intention was also to market this device to those who currently do not have access to such tools and empower these individuals to take the first steps toward designing, creating and sharing.