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Gaussian morphing at constant area by sliding in metasurfaces inspired by Euglena cells

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A number of strategies have been proposed to overcome the constraint imposed by Gauss Egregium theorem regarding morphing of a thin sheet. These strategies often boil down to devising a metasurface whose subunits can accommodate non-uniform in-plane stretch, e.g. pneumatic channels, swellable materials, kirigami or origami patterns. I will discuss a different approach inspired in the way Euglena cells actively change their shape to crawl in confined environments, and the realization of this idea at macroscopic scales. I will also discuss a mathematical modeling of this morphing mechanism, and how it can be used to realize a broad range of surfaces with a single metasurface. Finally, I will discuss the mechanical properties of this class of metamaterial.

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