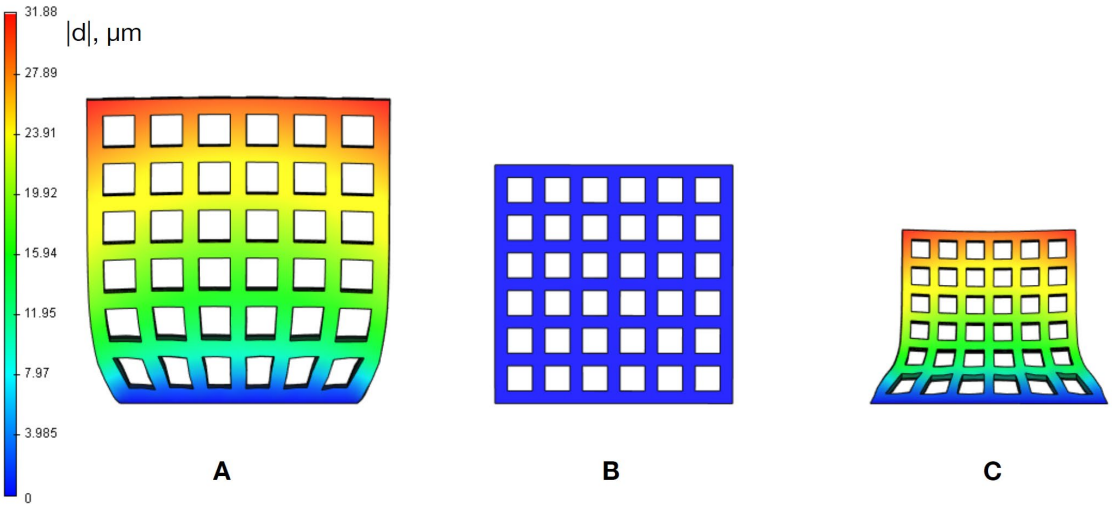
Compensating shrinking deformation by smart design

Most schools and companies' research and development departments have a 3D-printer used for fast prototyping, tailored manufacturing and research in new materials. The structures that they produce are becoming more and more competitive with the commercially available parts and device manufacturing. Unlike the established industry though, not all the intricate aspects of the available materials and techniques are optimized yet. As the suppliers of the 3D-printers aim to extract profit from selling tools and materials, they have a mission to optimize the performance of the additive-manufactured structures only in the specific areas of application and specific tasks they must fulfill, but not in extreme applications. Hence the users of the equipment are often restricted to a few standard recipes and uses of these structures. To create more of these opportunities, the researchers develop their own formulas, algorithms and process flows.

For instance, often the structures produced by means of multiphoton stereolithography, including in the Nanoscribe Photonic Professional GT in the Cleanroom of MESA+, only remotely resemble the expected shape. On top of that, if one wants to process them further on, the miniature polymer structures suffer from shrinkage and deformation. One may regard this as a hindrance to the process flow, for example, if further material deposition or chemical treatment is required and the geometry of the structures fails to comply. On the other hand, it opens the gate for shape and size-manipulation in post-processing, like producing a structure and thermally shrinking it several times to surpass the resolution limit, or printing a semi-stable structure that will somehow react to external stimuli.

This project will give you an opportunity to create your own additive fabrication process to extend the capabilities of the Nanoscribe. We will use the phenomenon of thermal deformation to improve the fidelity of stereolithography and work on the theoretical model to expand the opportunities to apply these structures. You will be able to choose your own ratio of theoretical and practical research to fit your interest, and get the expert support of the Optical Sciences research group and MESA+ institute for nanotechnology to produce impactful research.



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