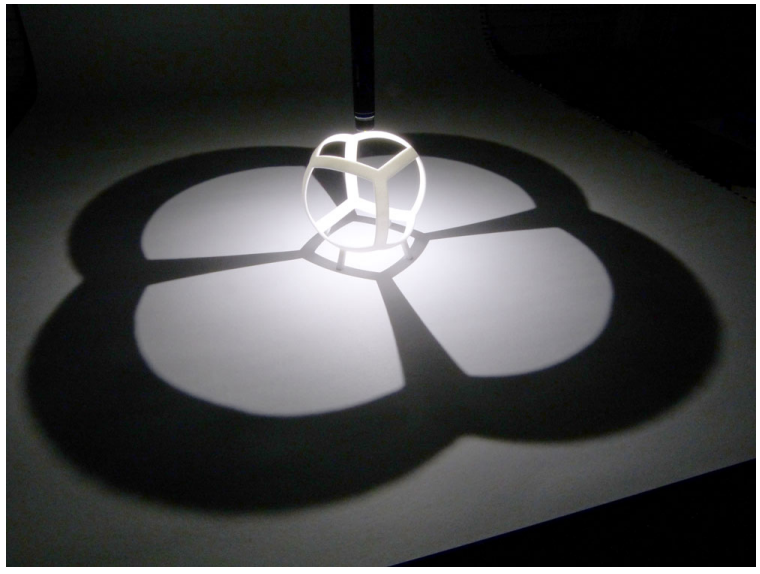
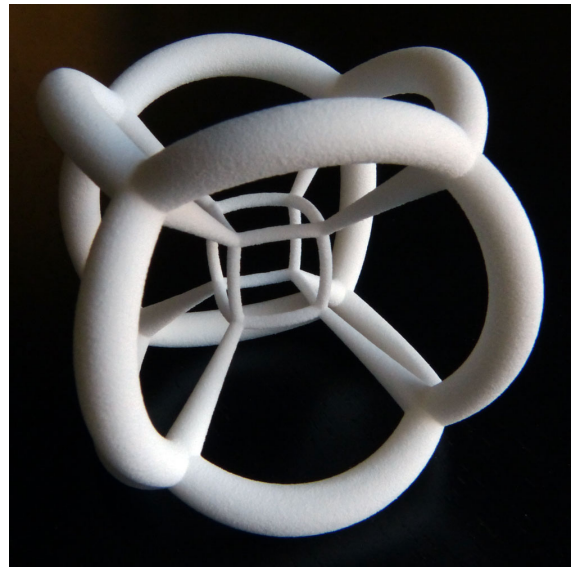
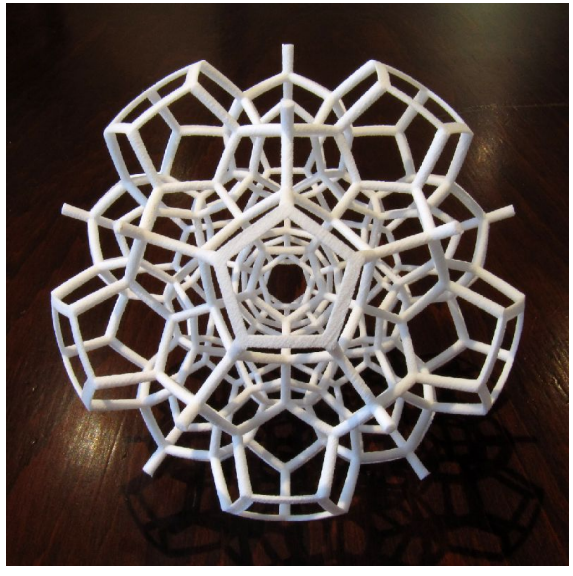
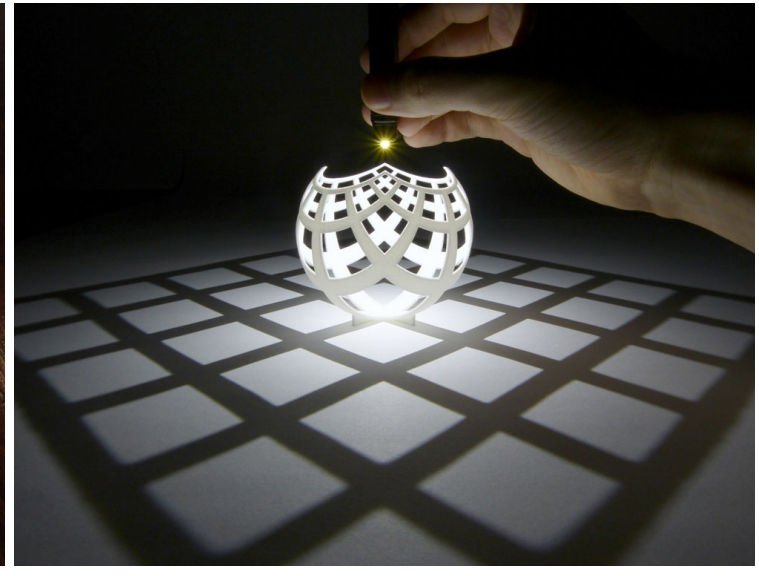



Henry Segerman
Oklahoma State University

Brilliant geometry

What is 4–dimensional space?

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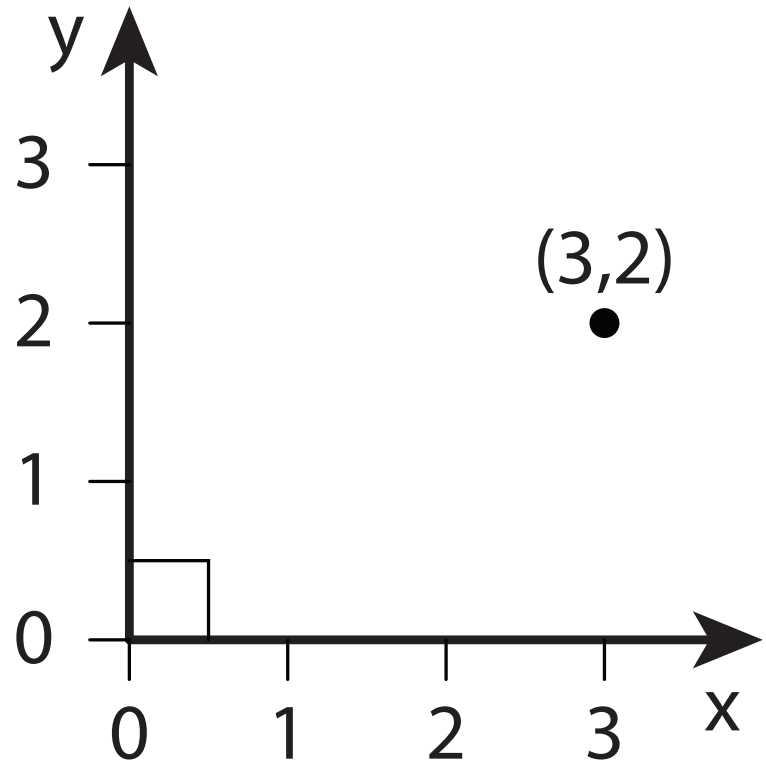
We describe a point in two-dimensional space using two numbers, say (x, y).



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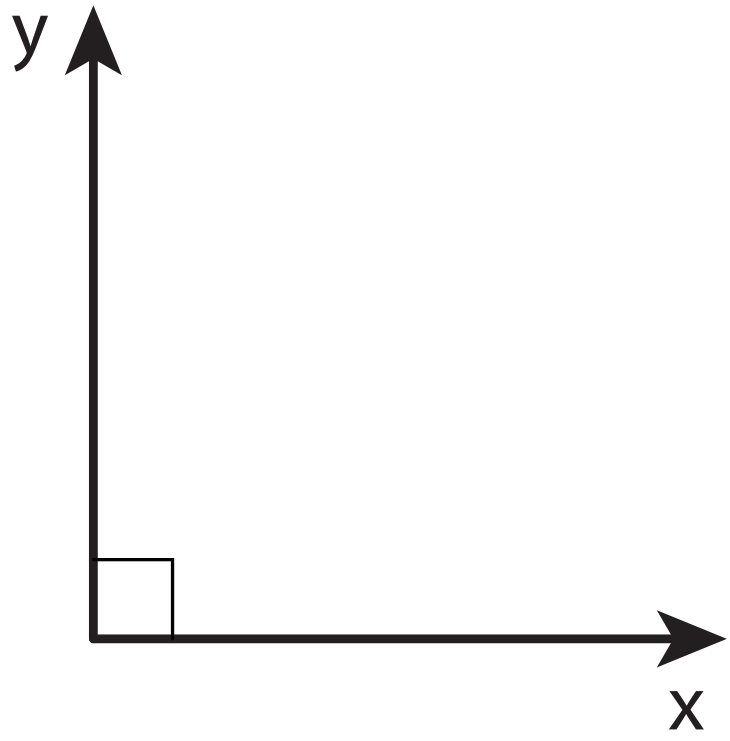

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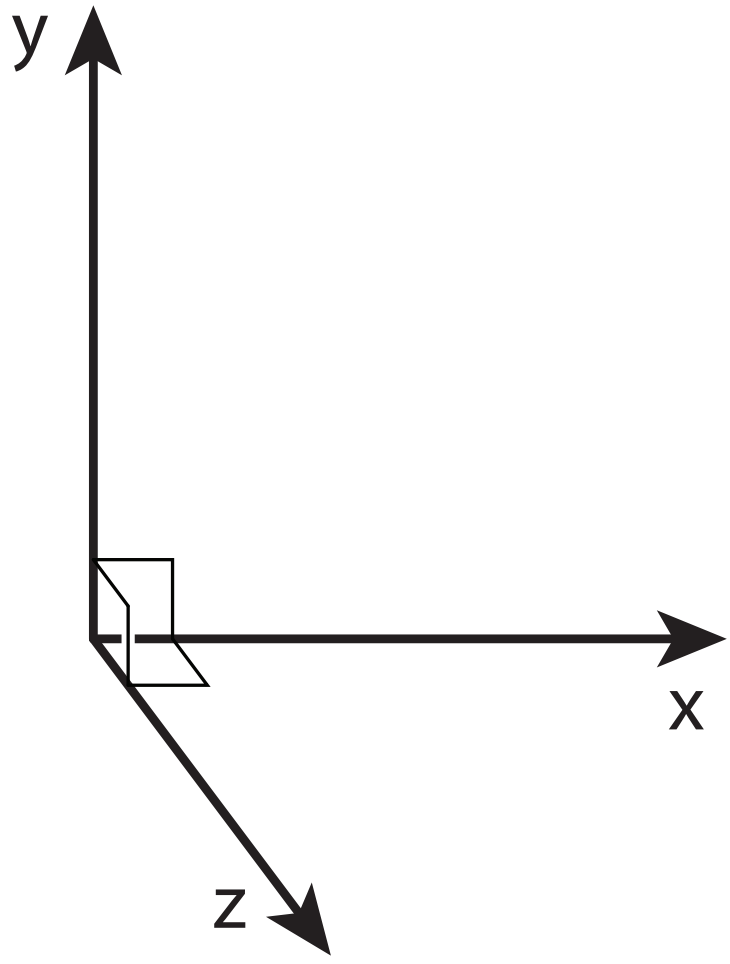
We describe a point in three-dimensional space using three numbers, say (x, y, z).

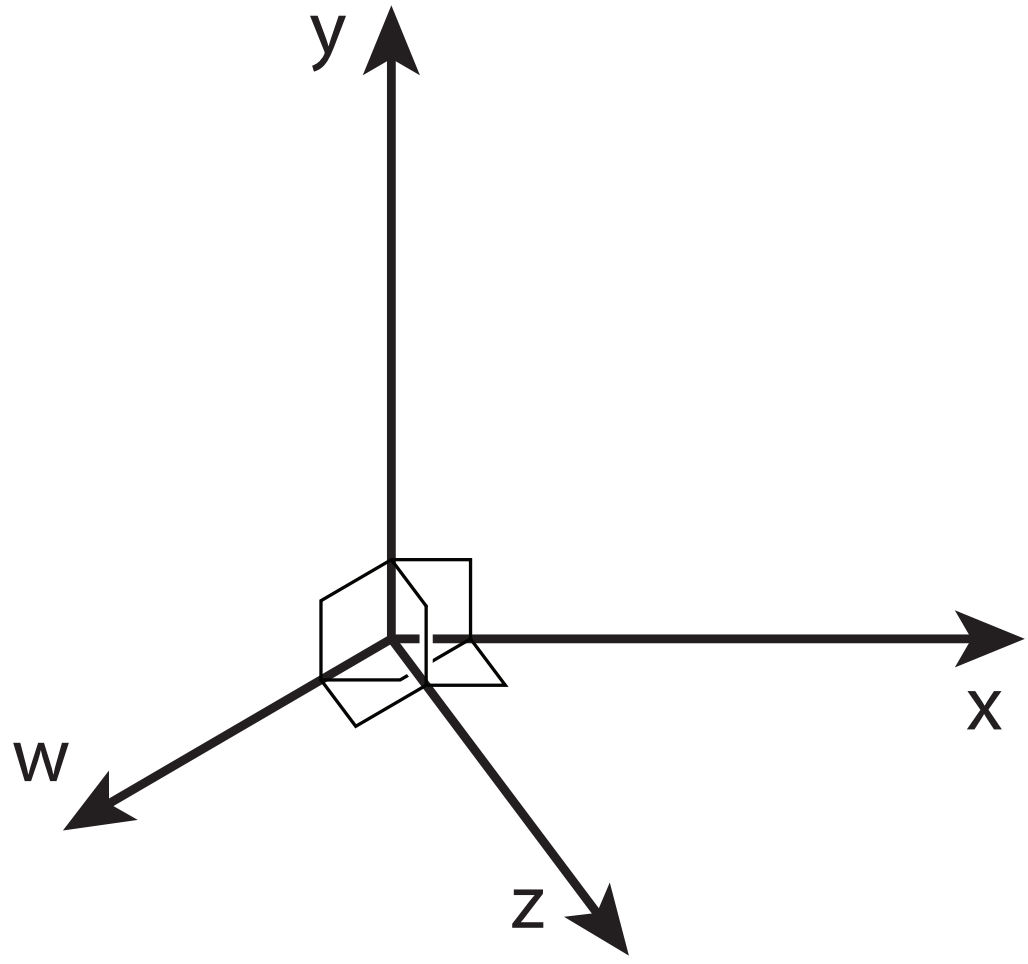


What is 4–dimensional space?

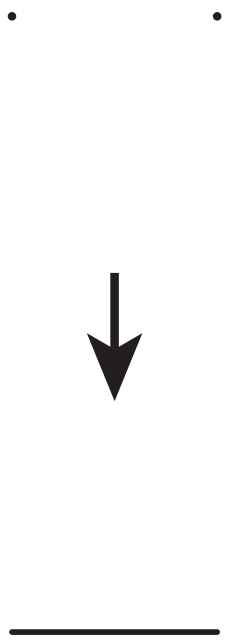
We describe a point in two-dimensional space using two numbers, say (x, y).

We describe a point in three-dimensional space using three numbers, say (x, y, z).

We describe a point in four-dimensional space using four numbers, say (w, x, y, z).



Example: how to make a hypercube



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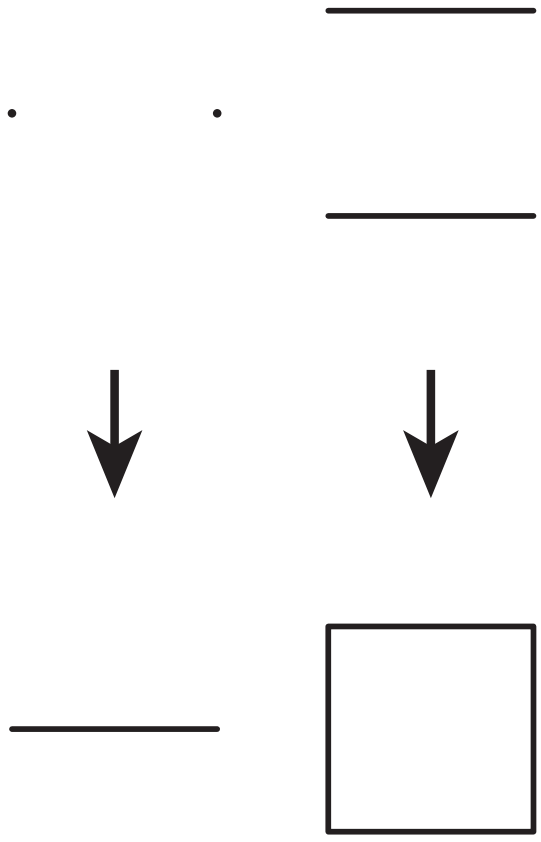

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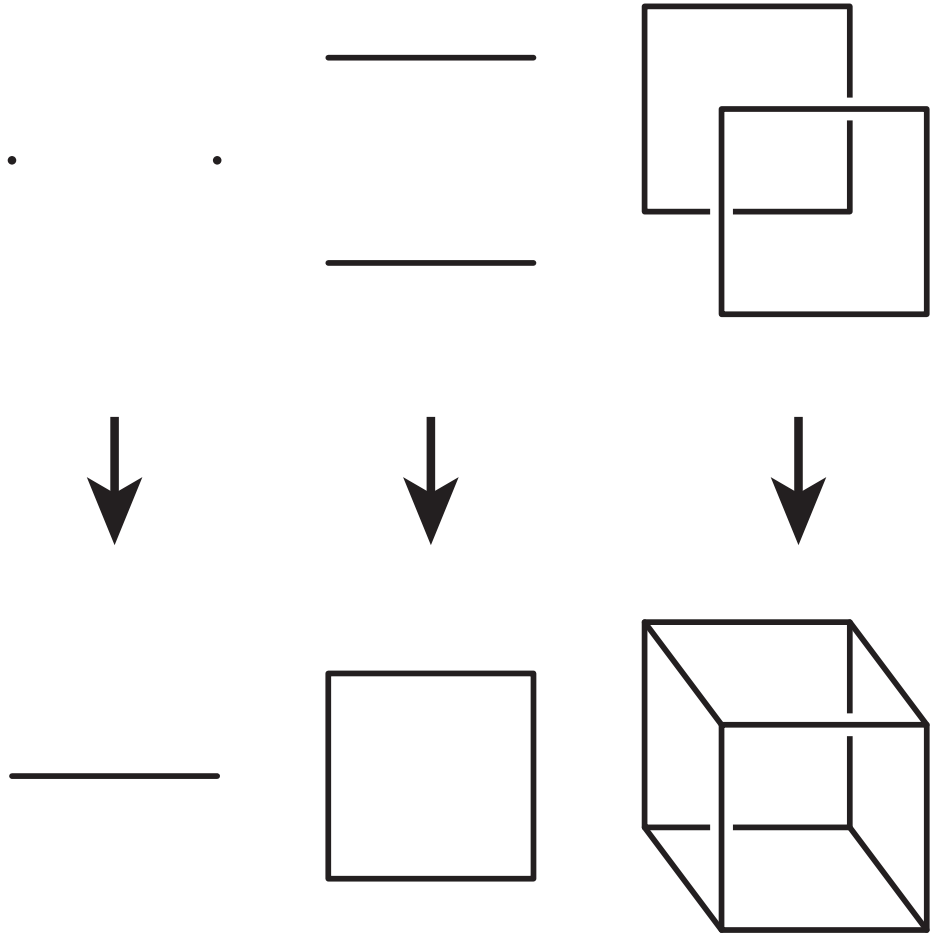
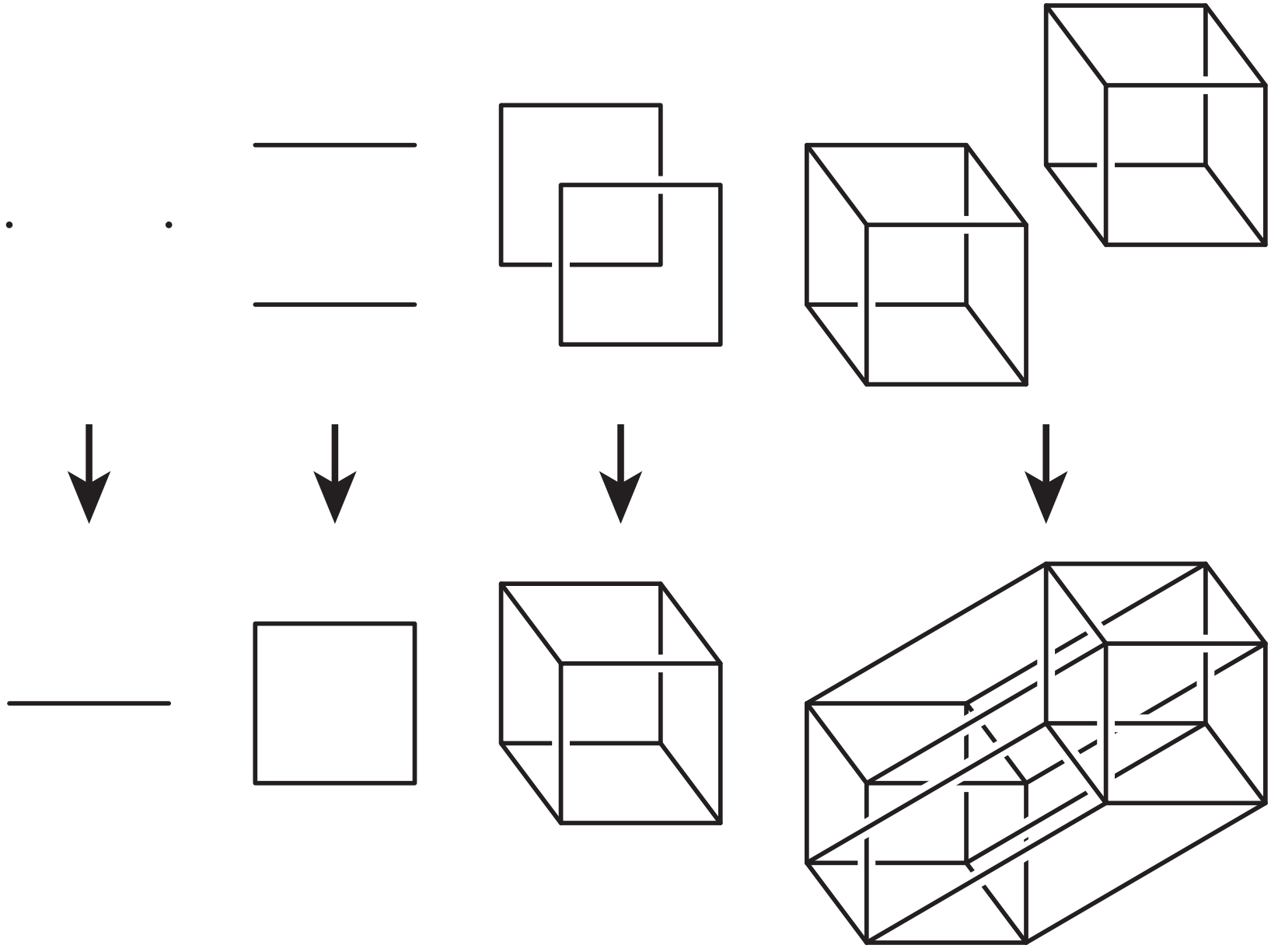
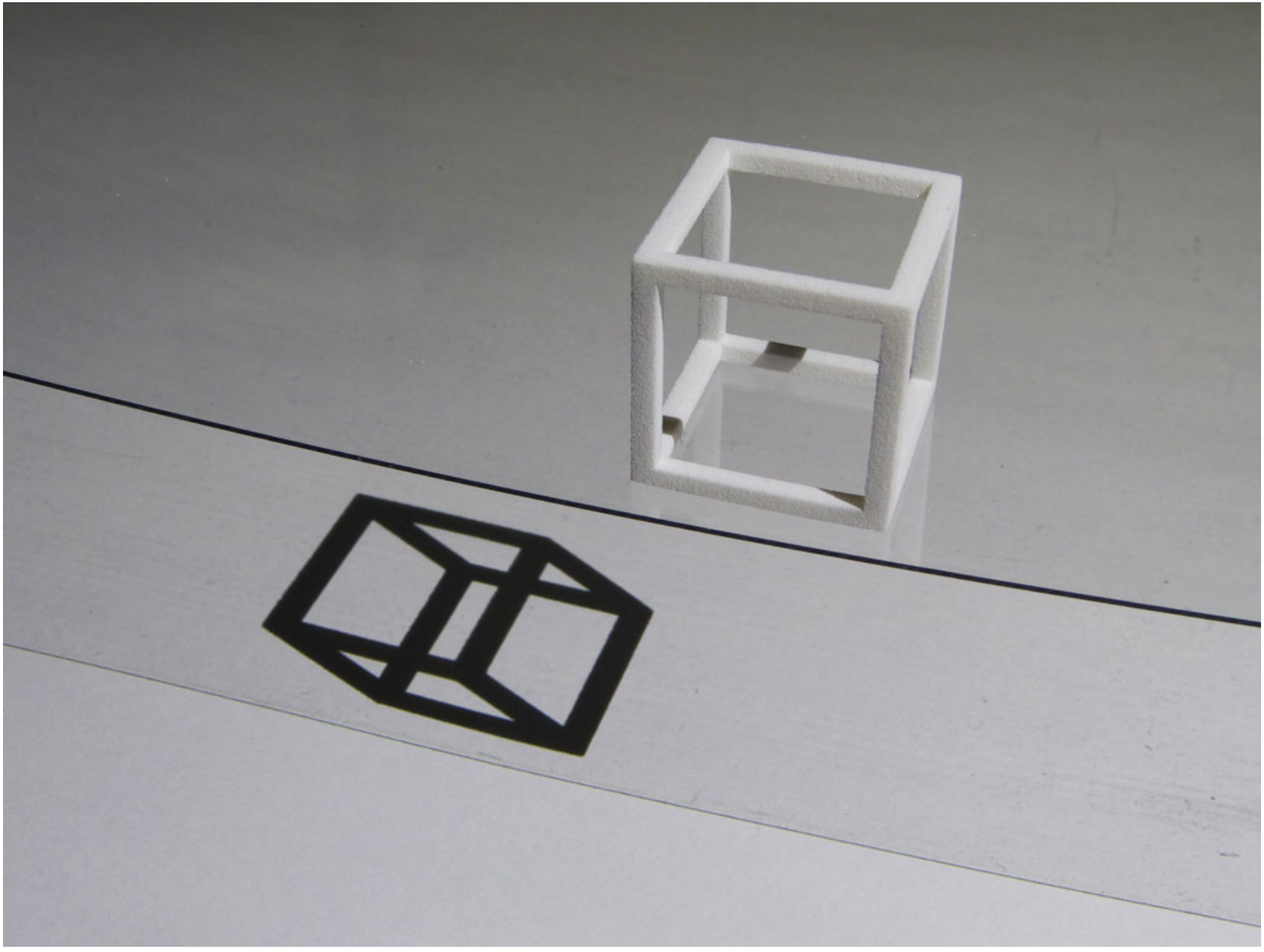


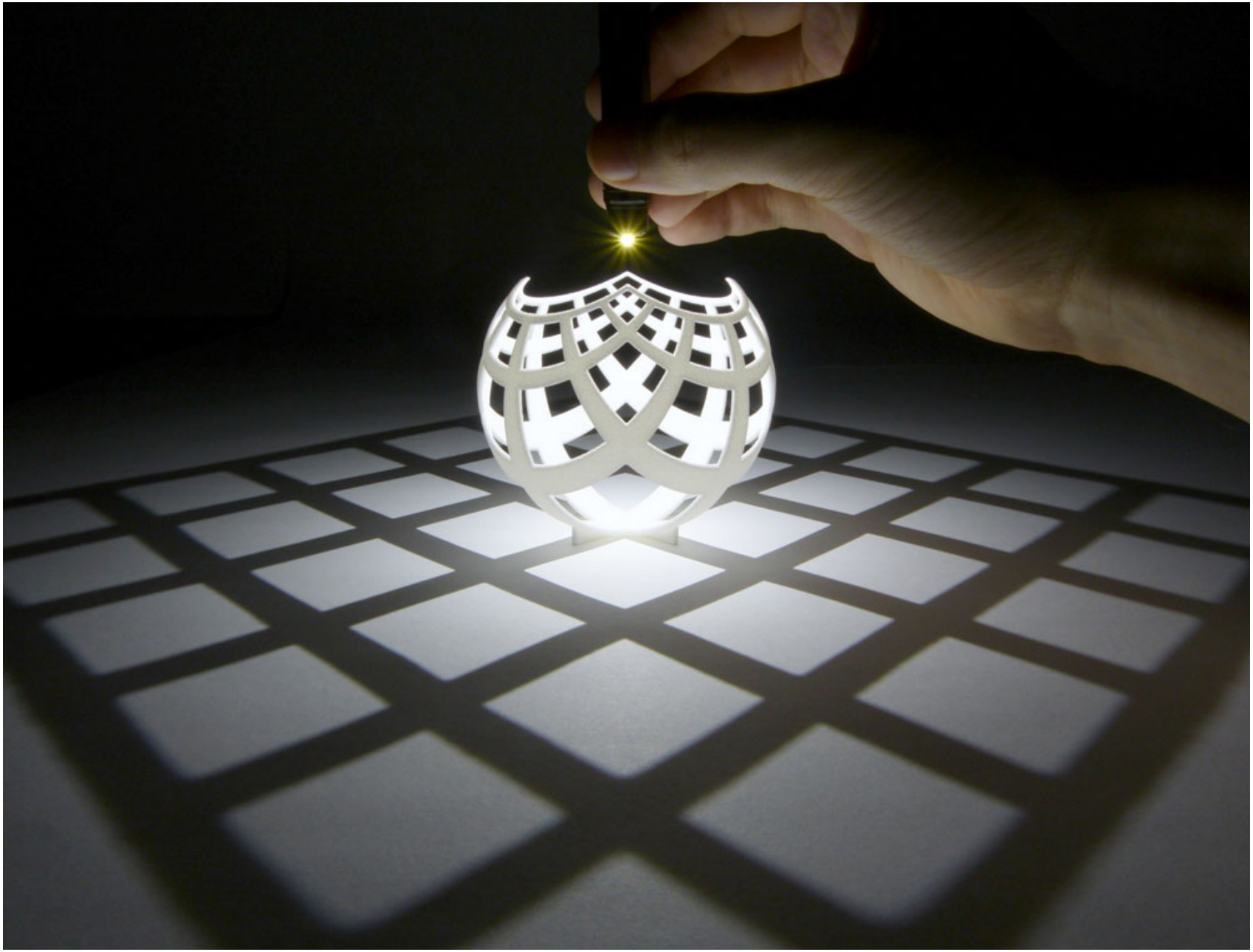
Example: how to make a hypercube



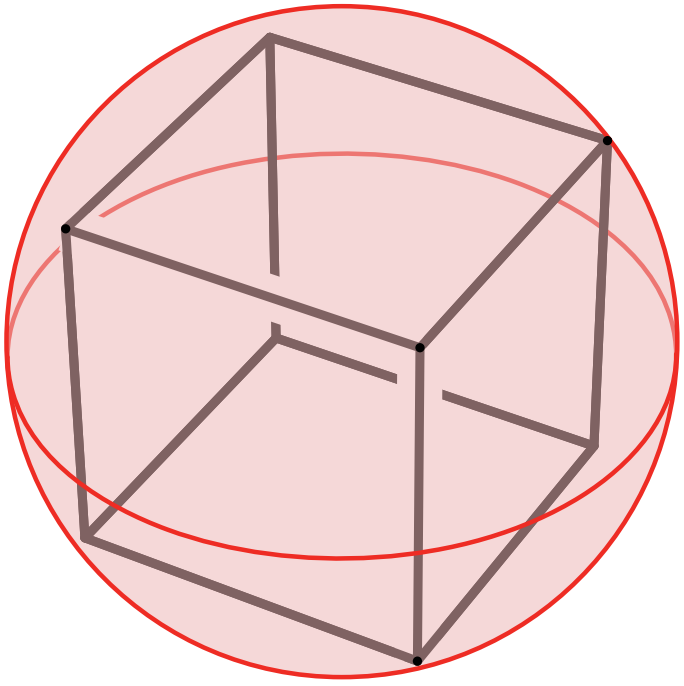
How can we see 4-dimensional things?

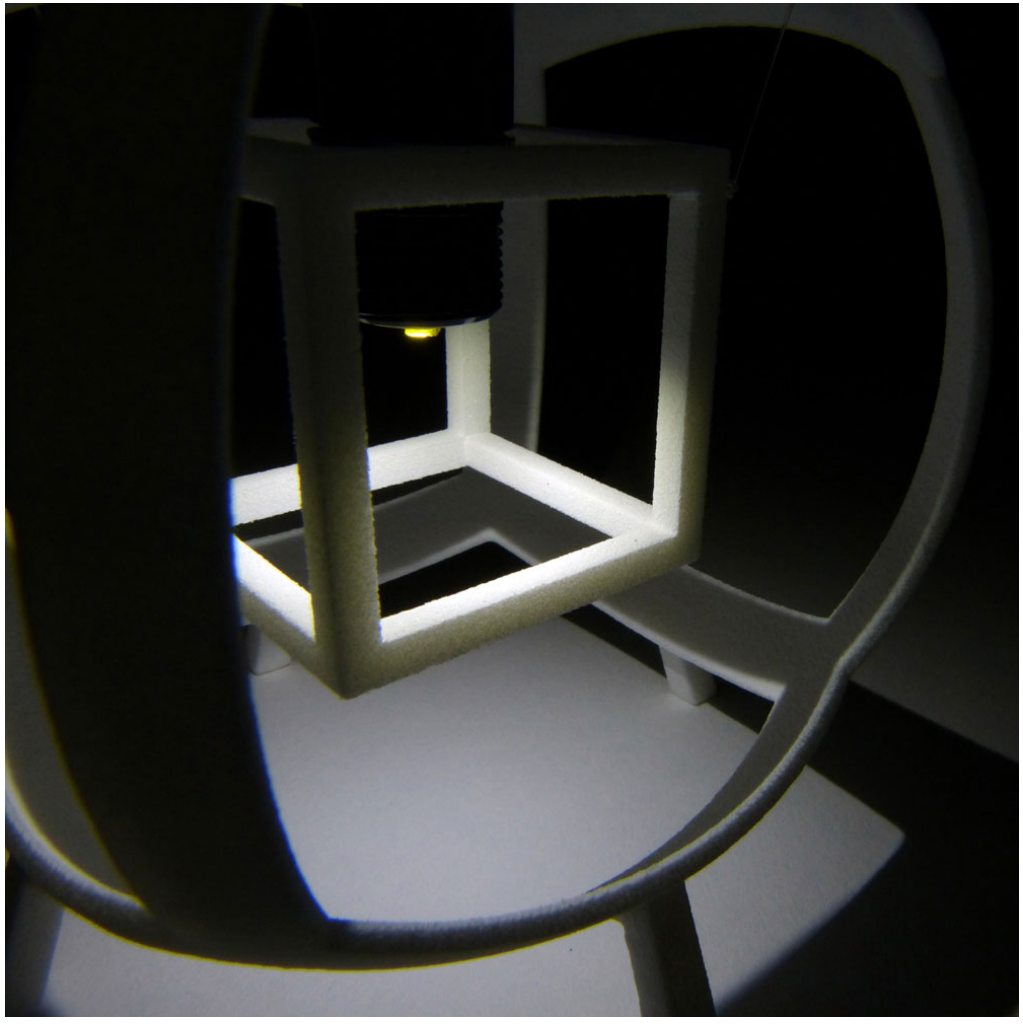


Stereographic projection



First radially project the cube to the sphere...





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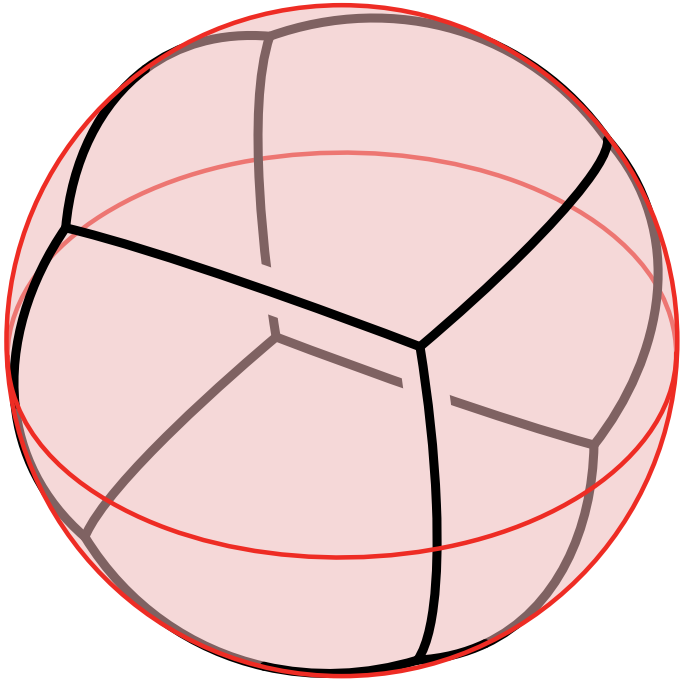
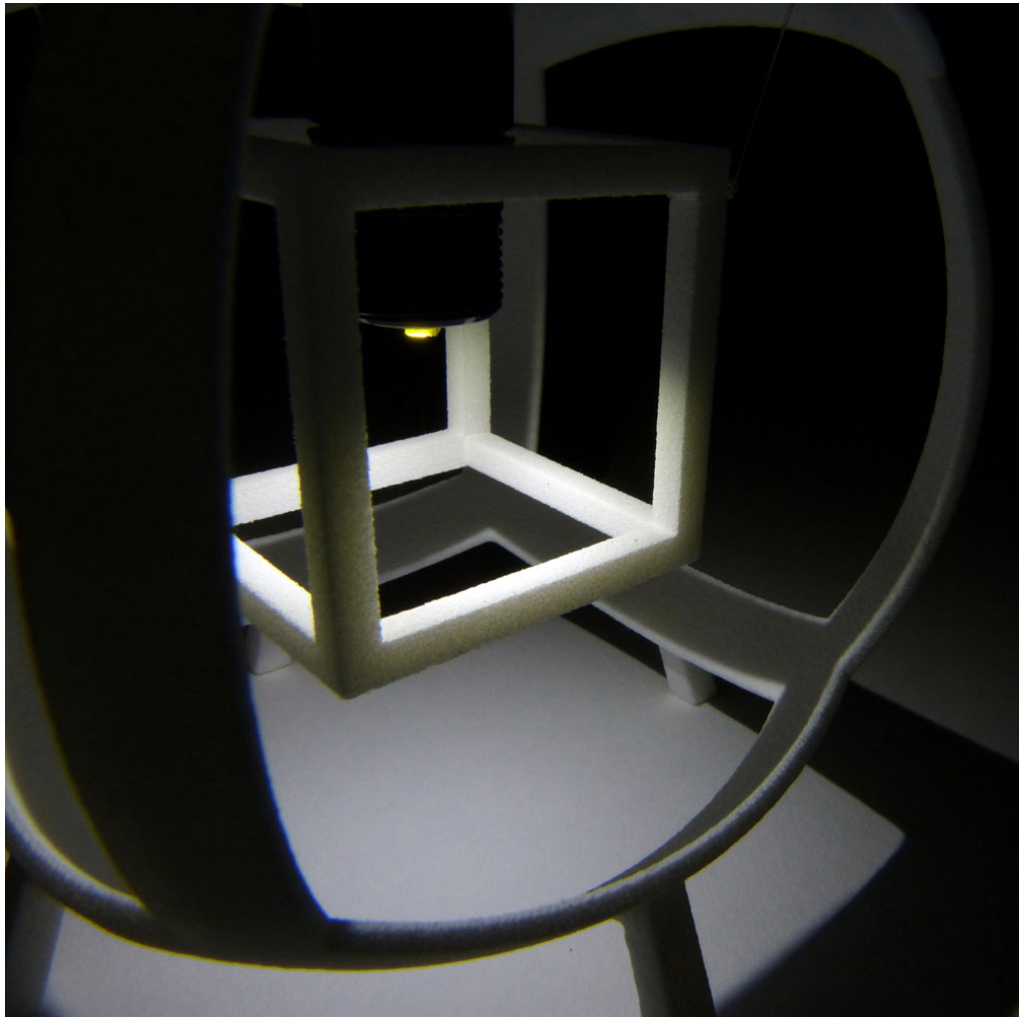
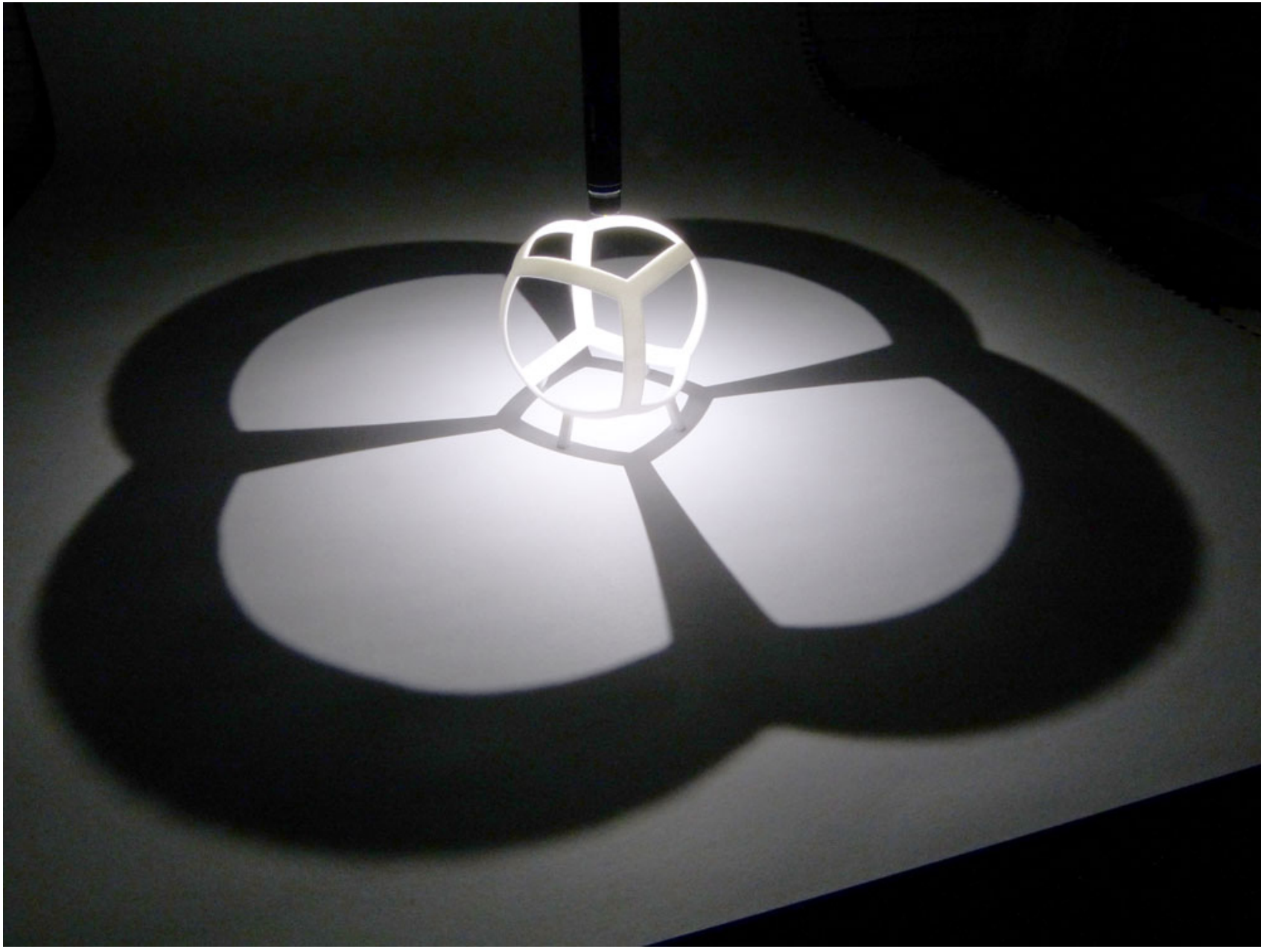




Then stereographically project to the plane



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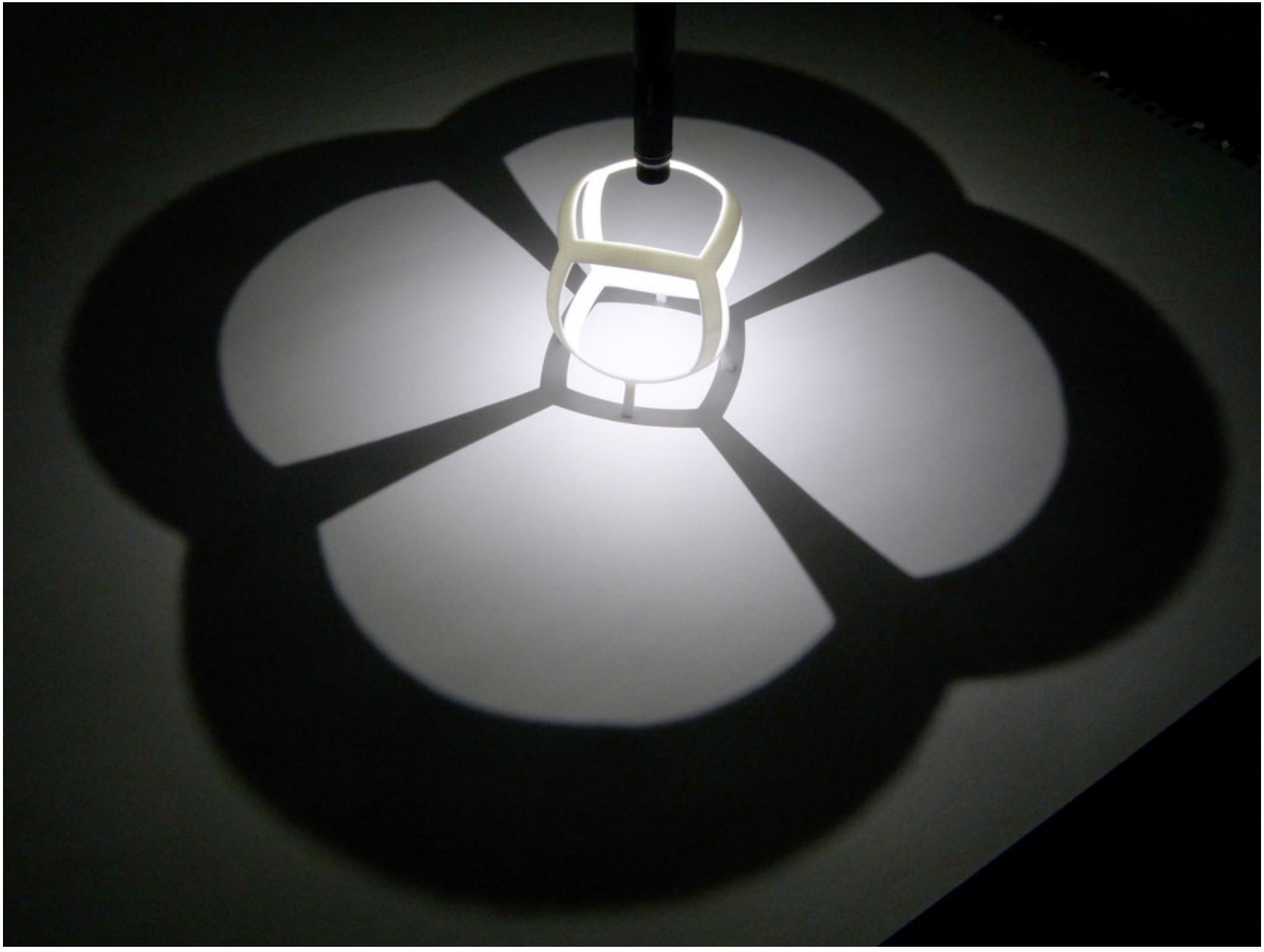
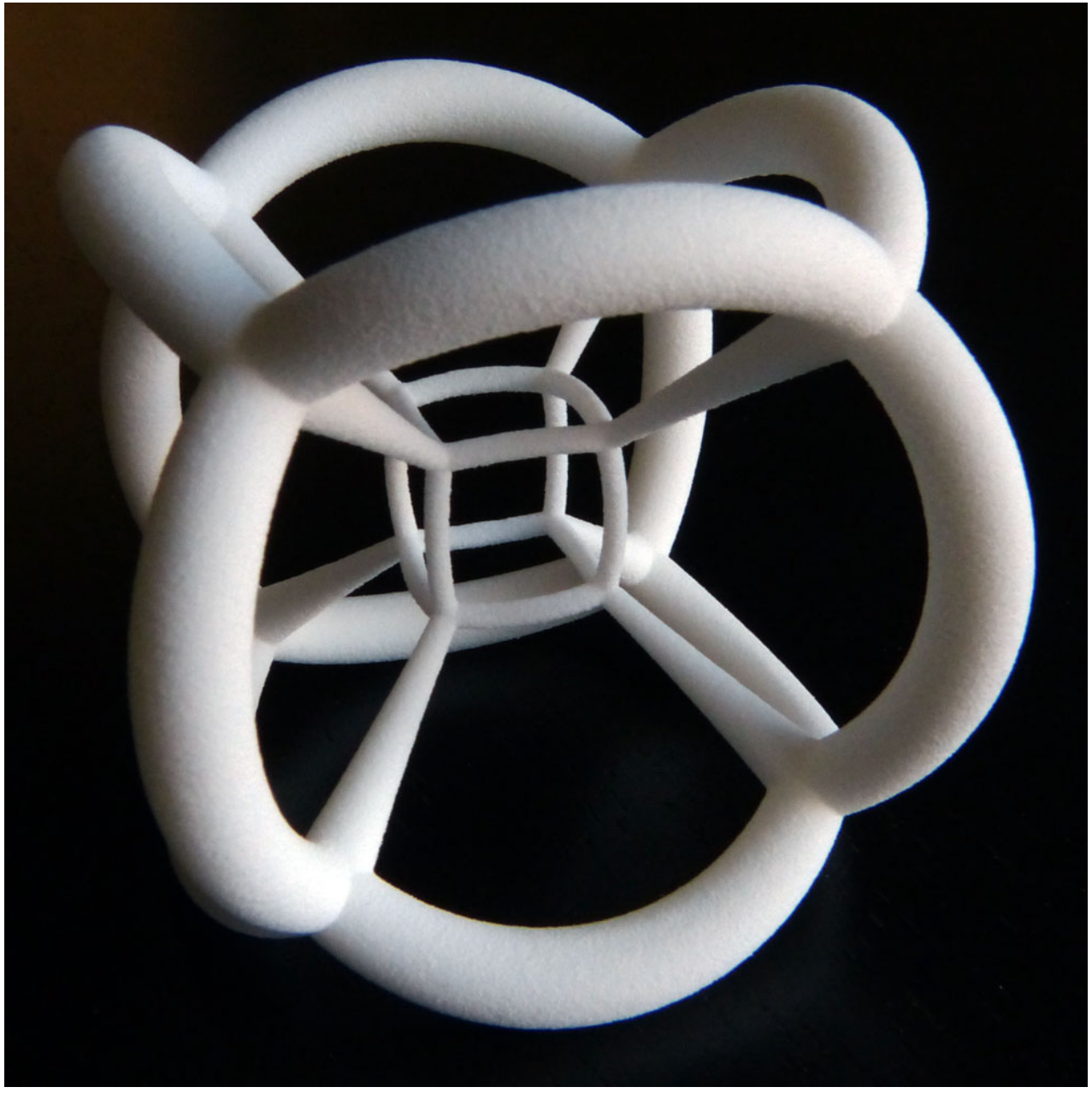


Do the same thing one dimension up to see a hypercube



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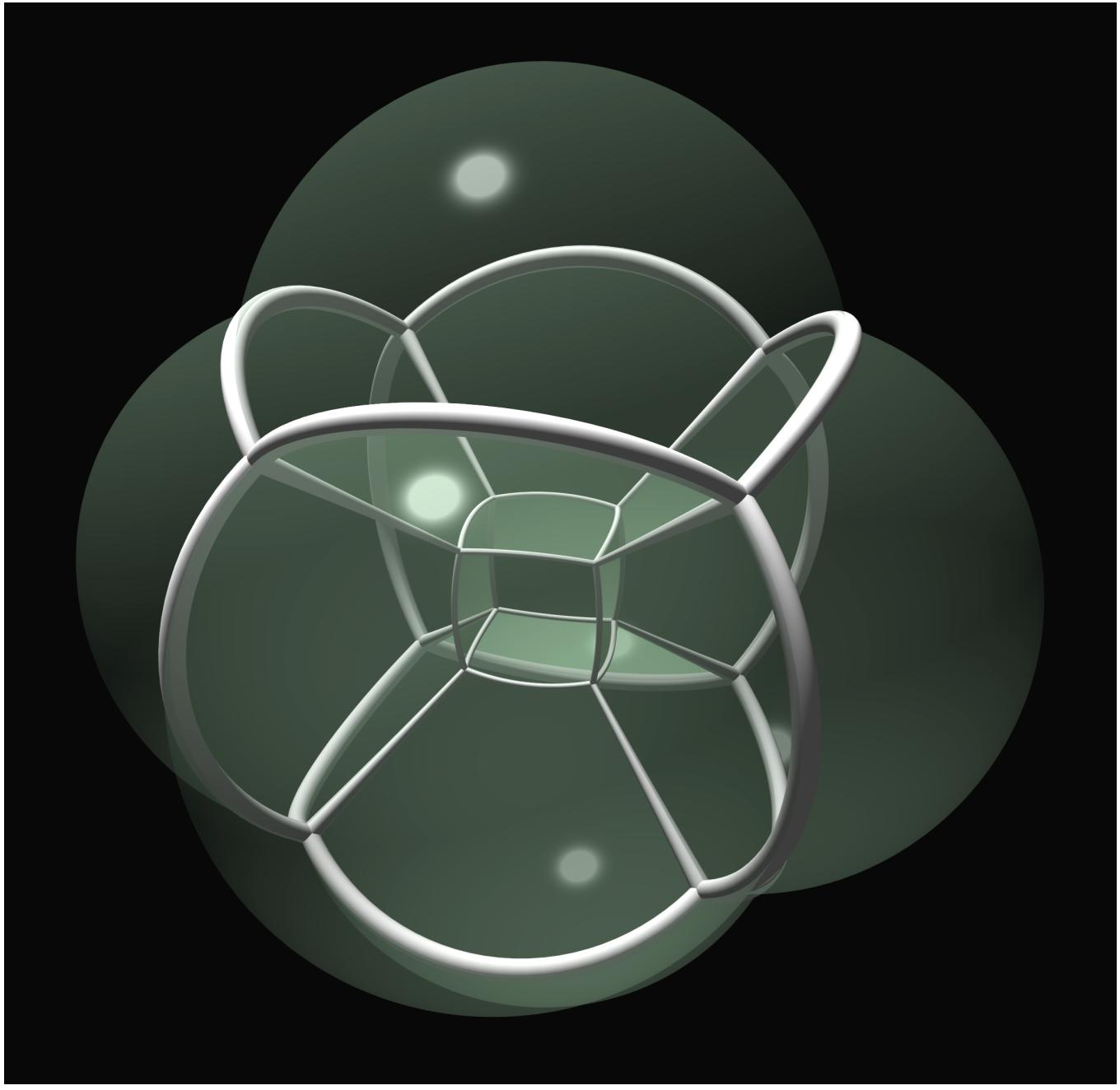
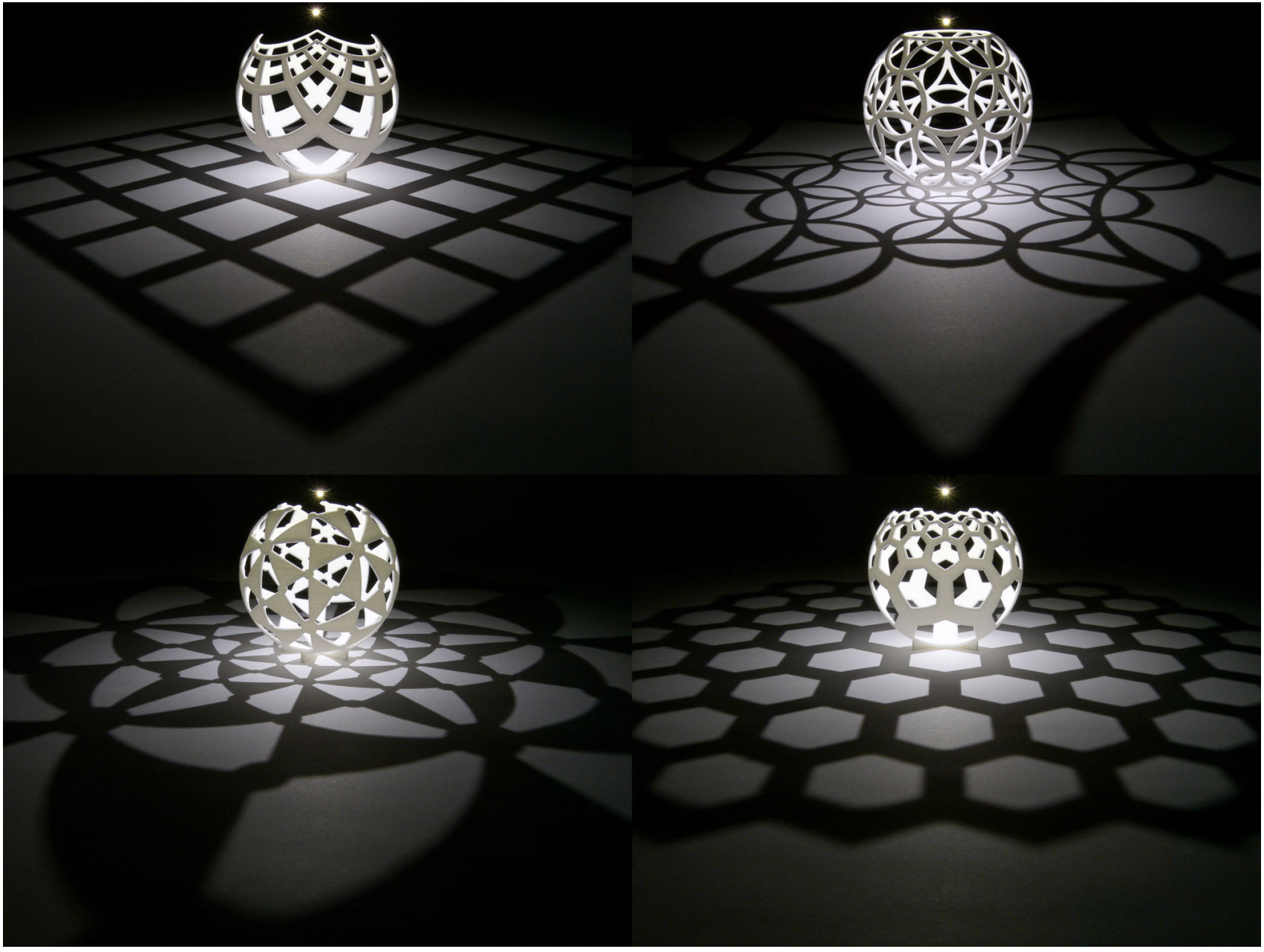
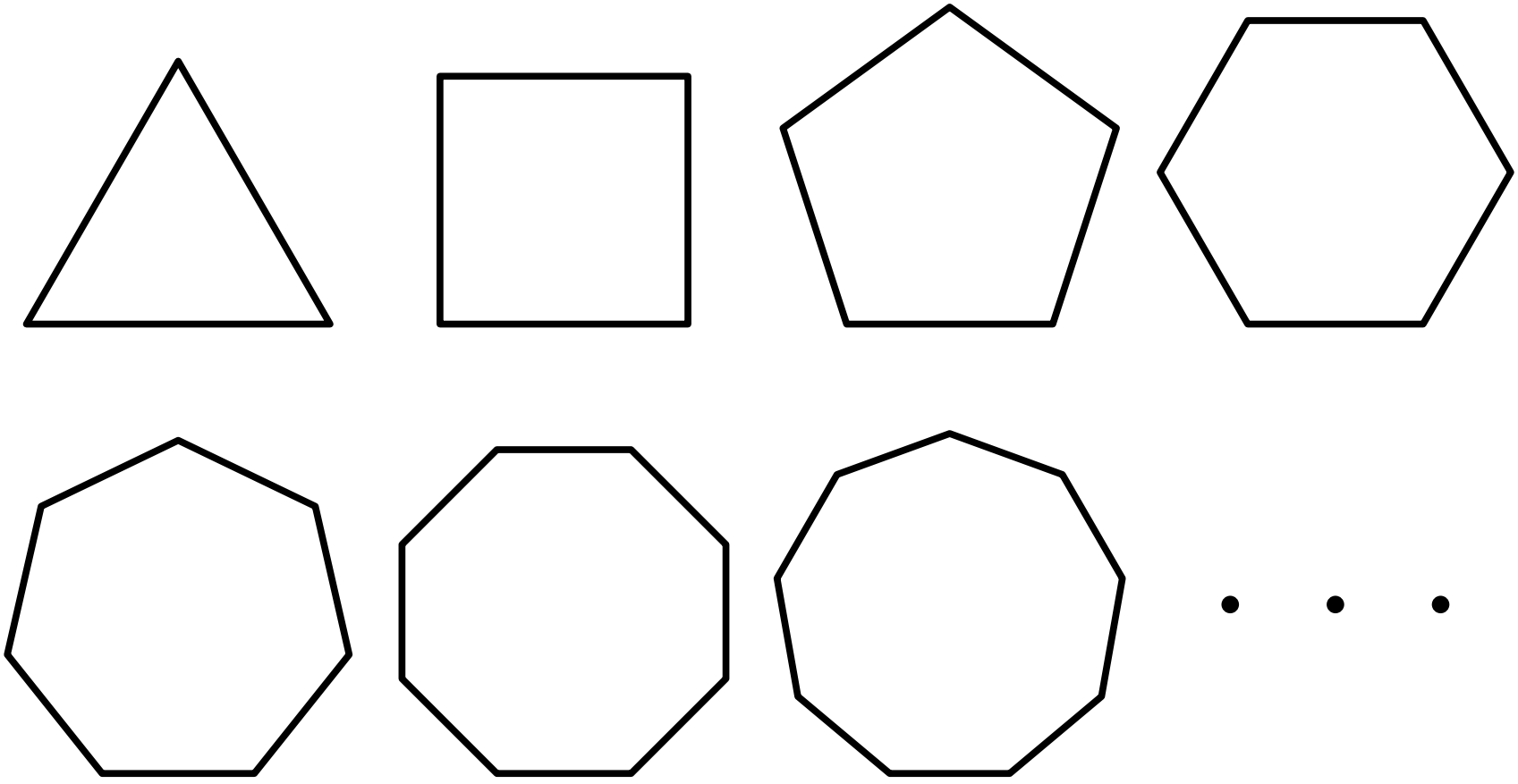


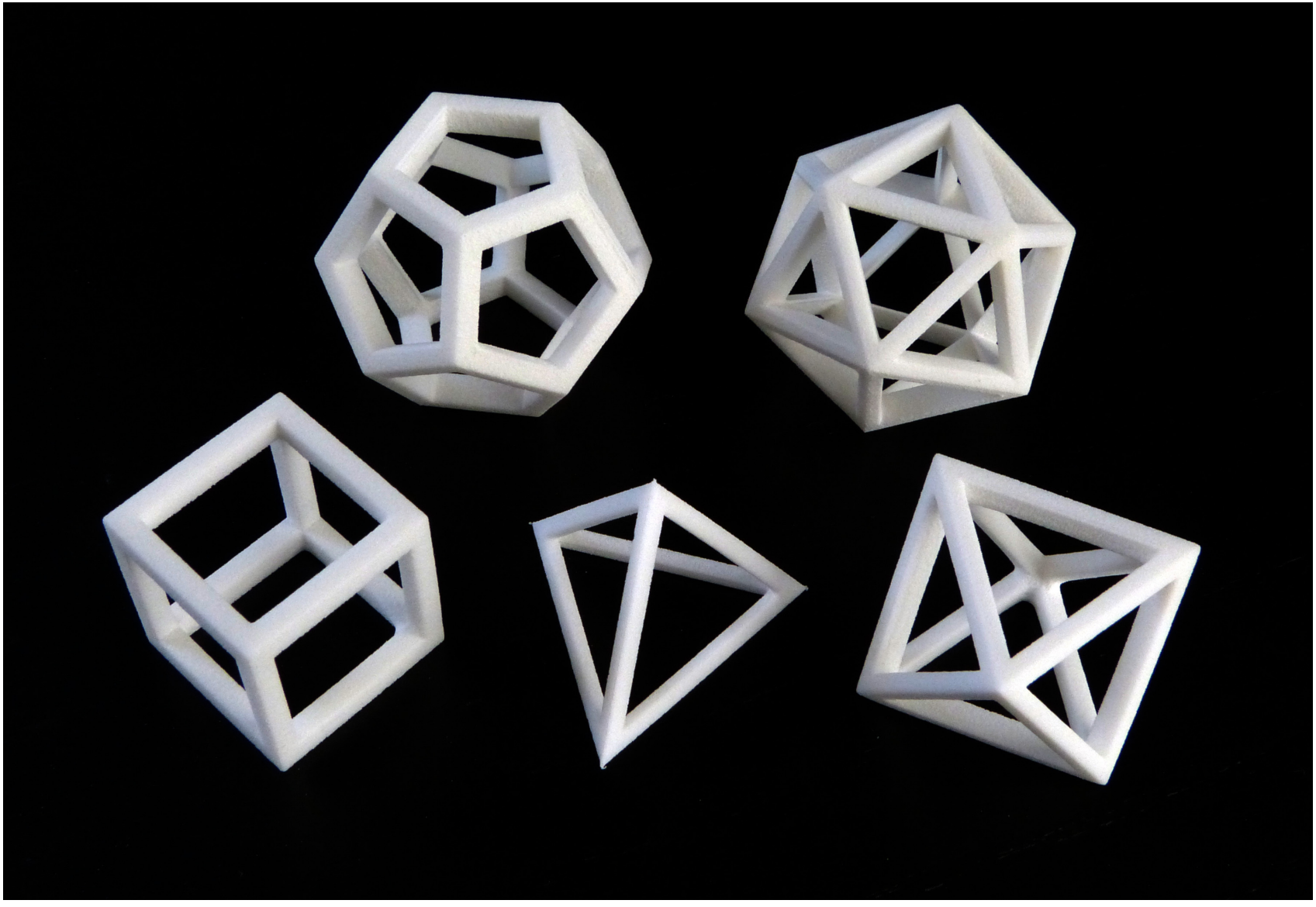
More amazing properties of stereographic projection



Regular Polytopes in 2-dimensions: Regular polygons

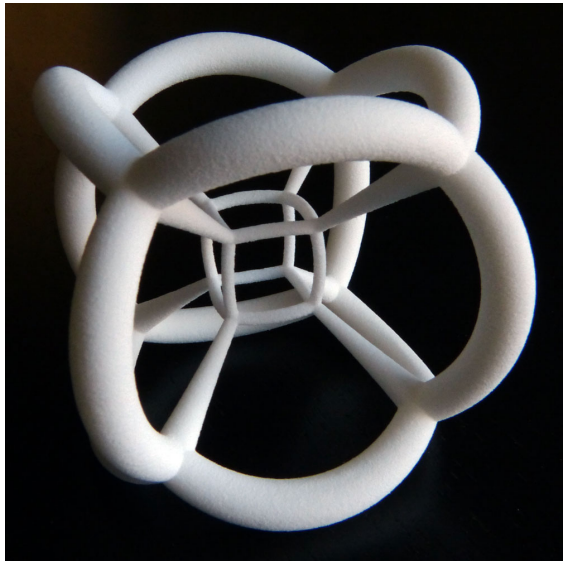


Regular Polytopes in 3-dimensions: Regular polyhedra

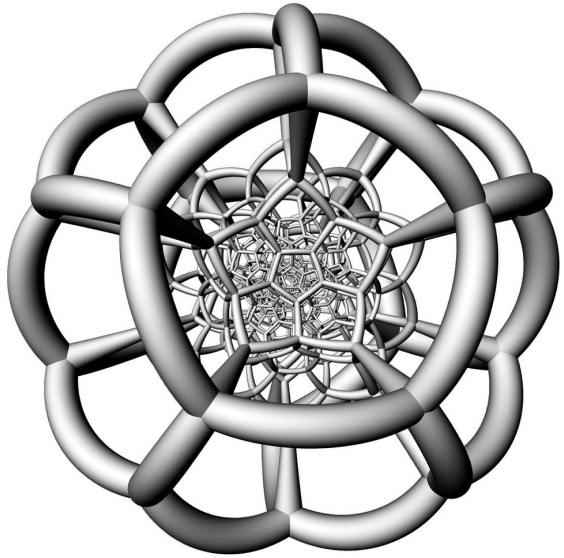


Regular Polytopes in 4-dimensions: Regular polychora

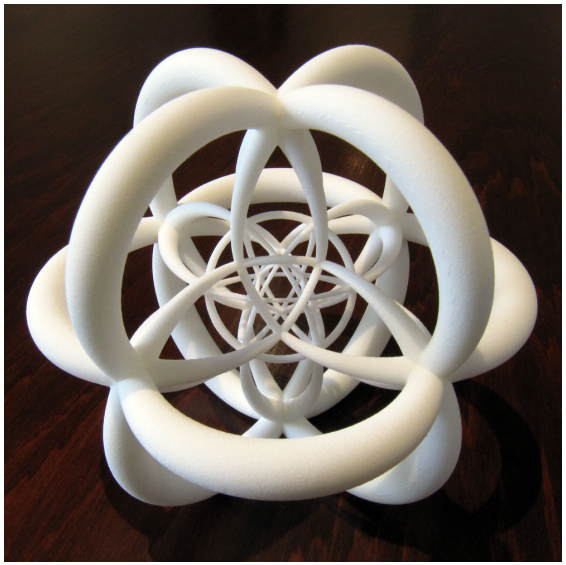
5-cell



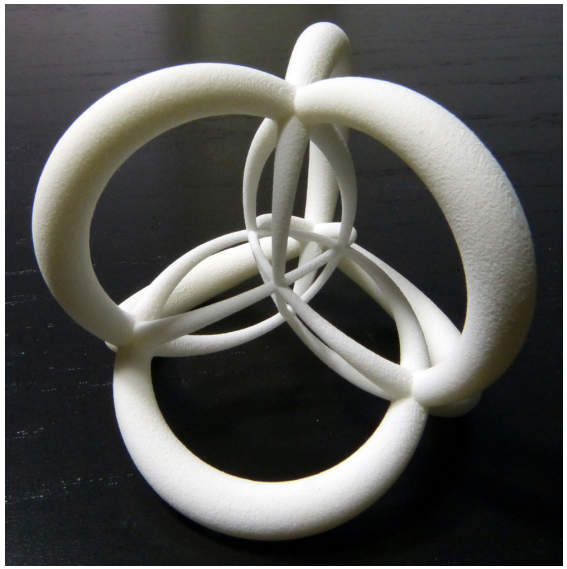
8-cell



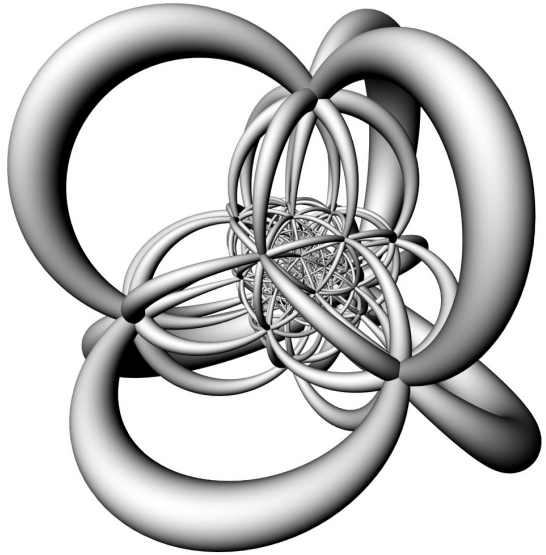
120-cell



24-cell



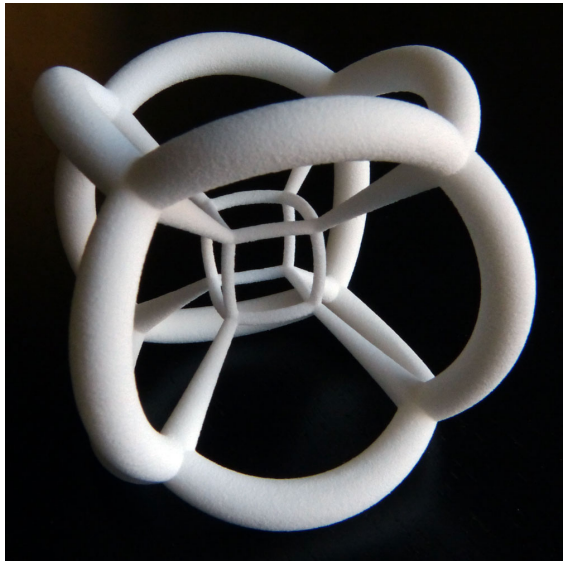
16-cell



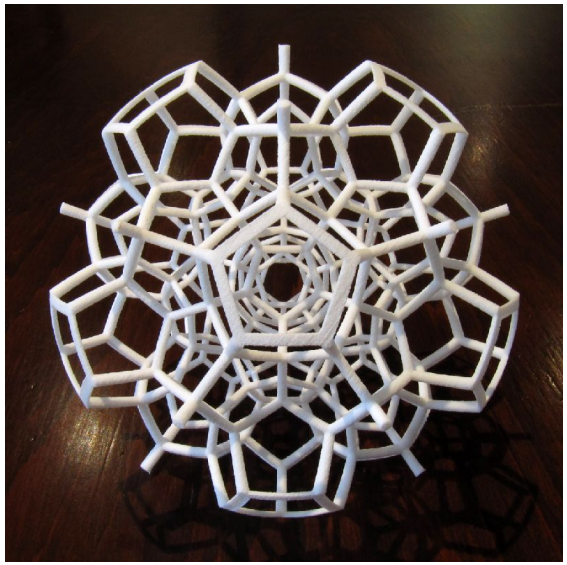
600-cell

Regular Polytopes in 4-dimensions: Regular polychora

5-cell



8-cell



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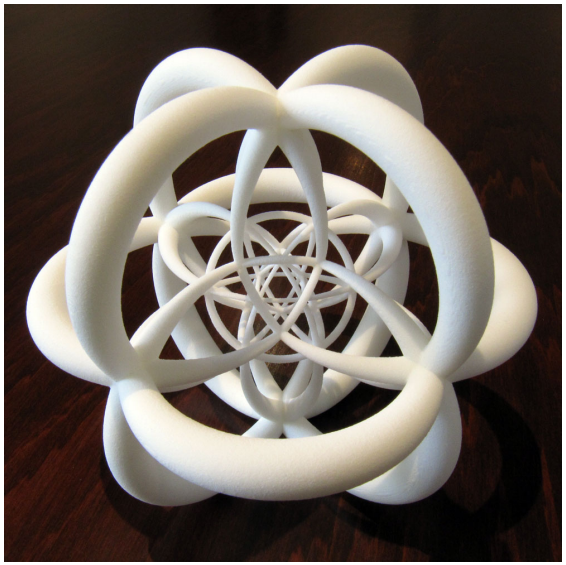

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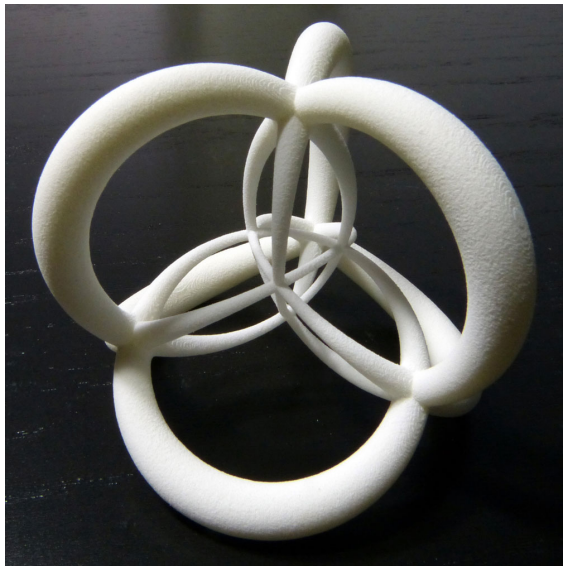
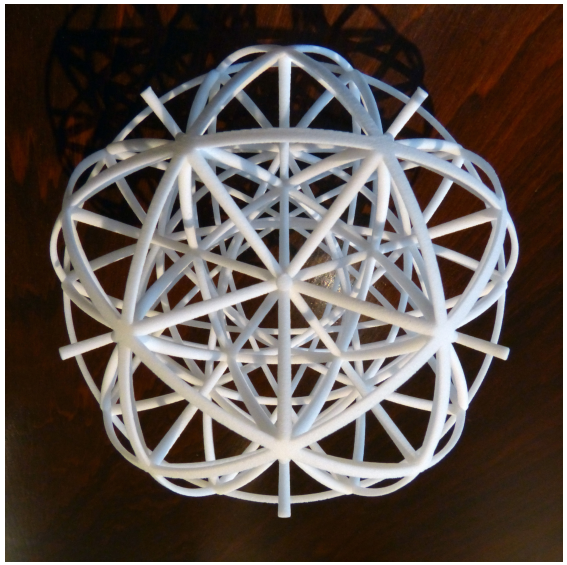
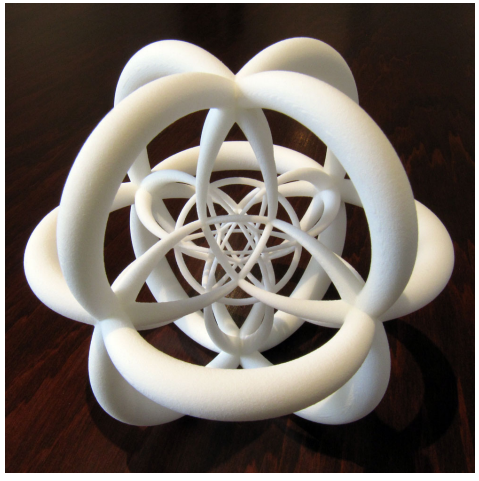
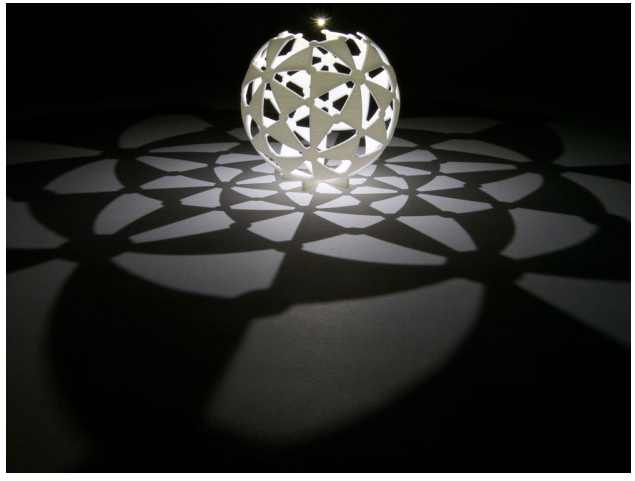
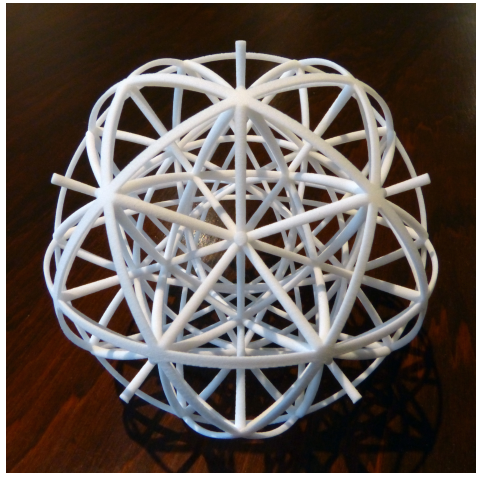


16-cell



600-cell

Thanks!

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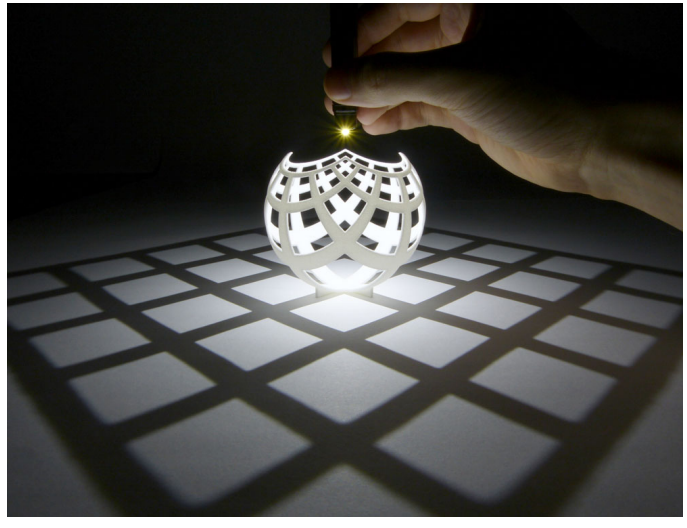
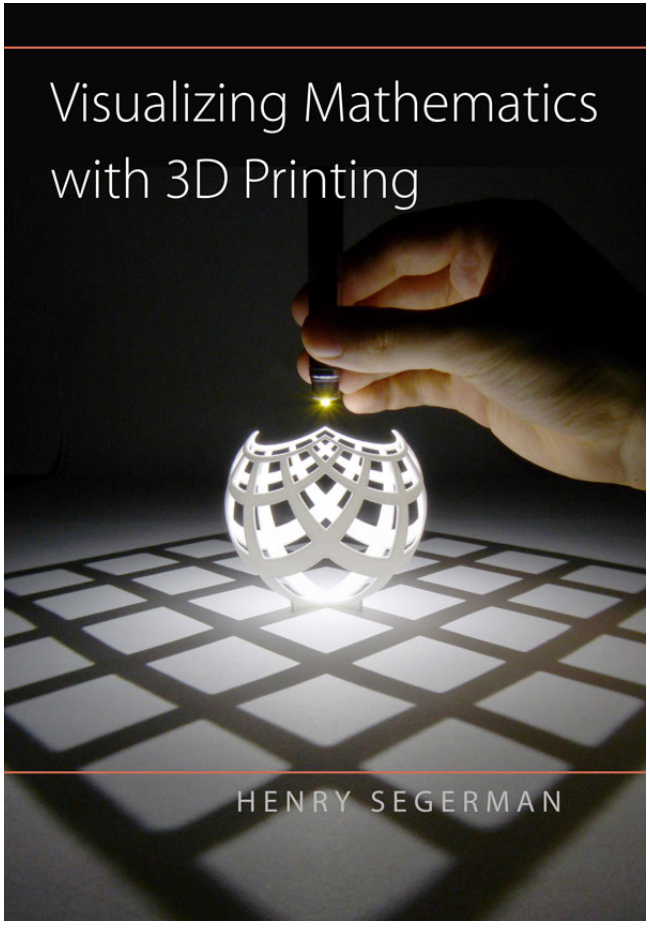
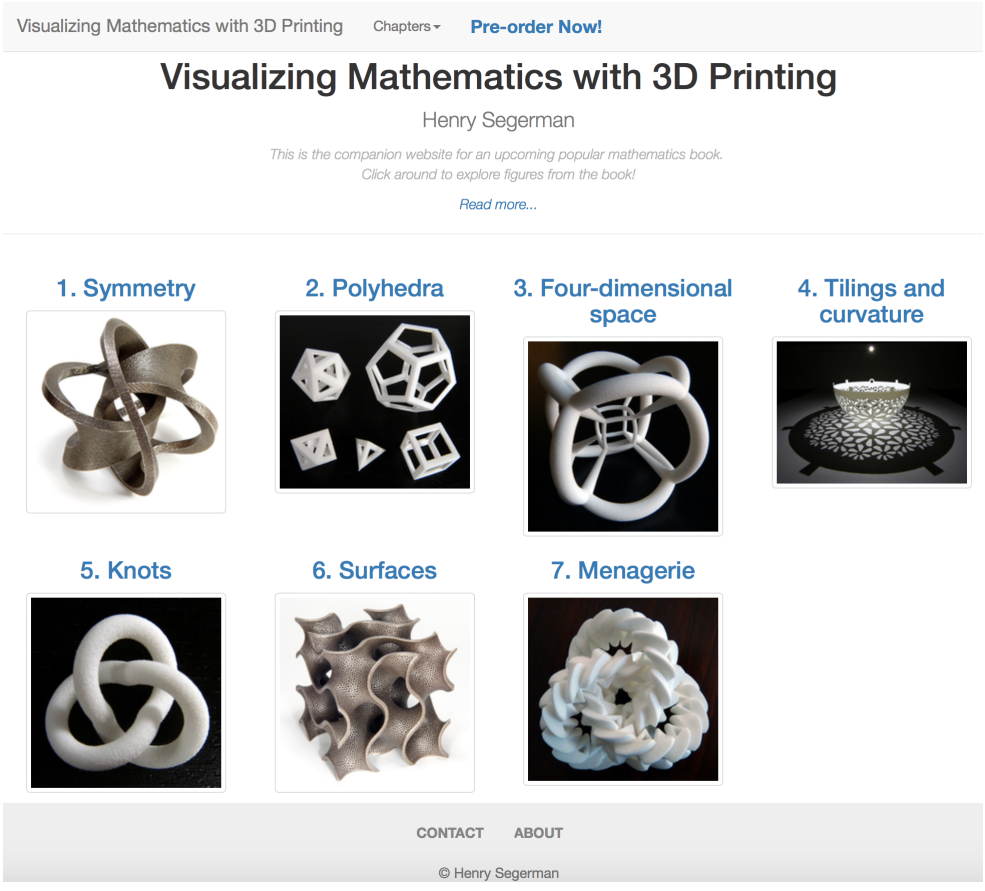


Visualizing Mathematics with 3D Printing





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