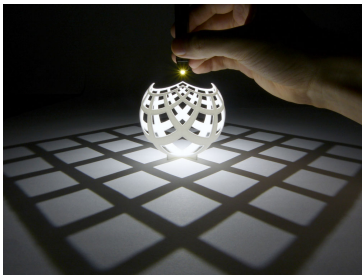
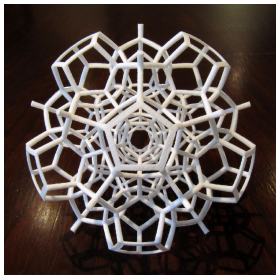


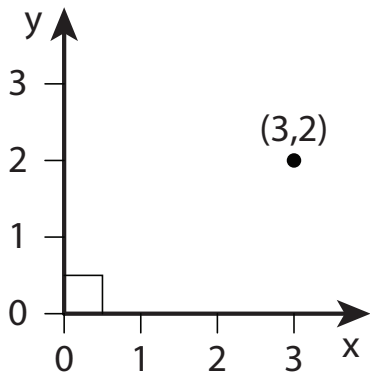
Henry Segerman
Oklahoma State University
Brilliant geometry



What is 4-dimensional space?

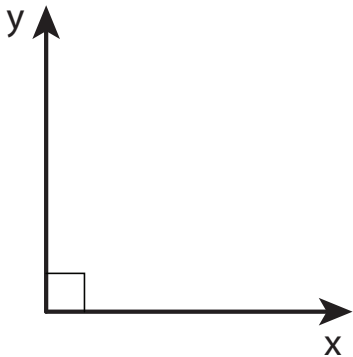
What is 4-dimensional space?

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



What is 4-dimensional space?

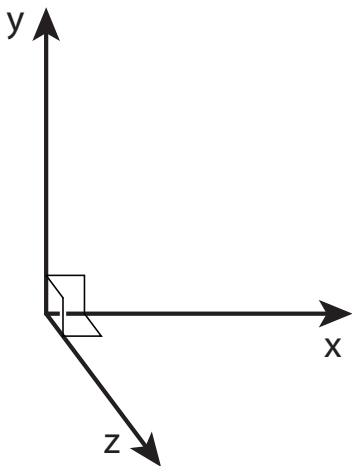
We describe a point in **two**-dimensional space using **two** numbers, say (x, y) .



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) .

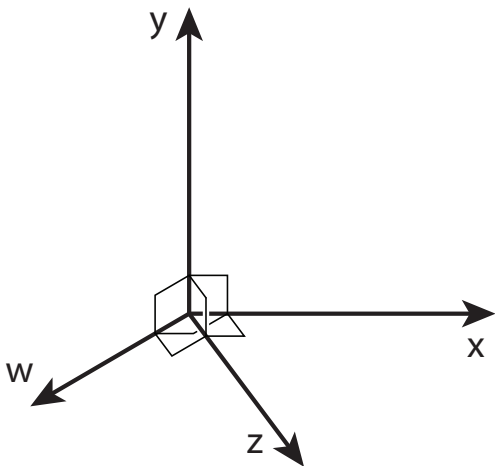


What is 4-dimensional space?

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) .



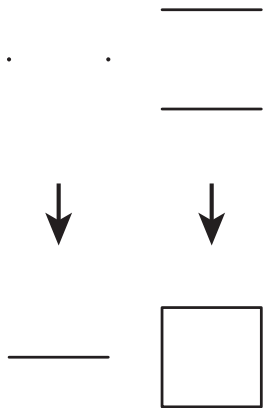
Example: how to make a hypercube

• •

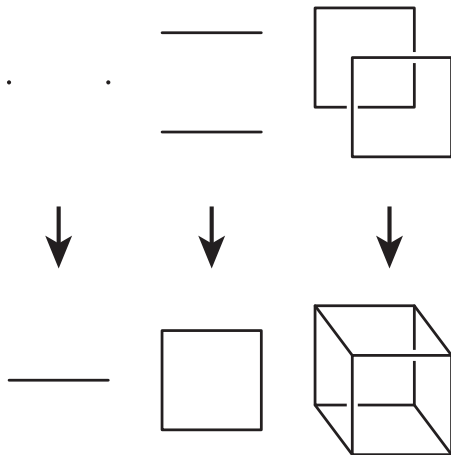


—

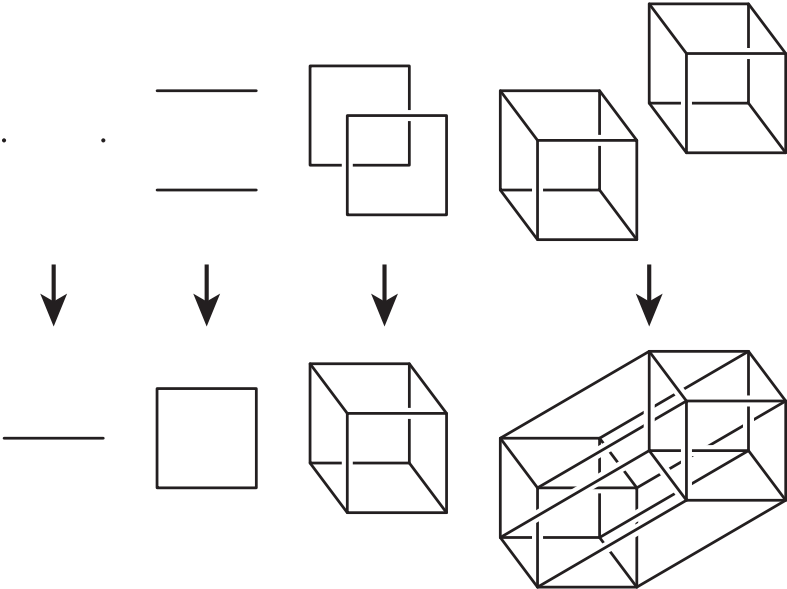
Example: how to make a hypercube



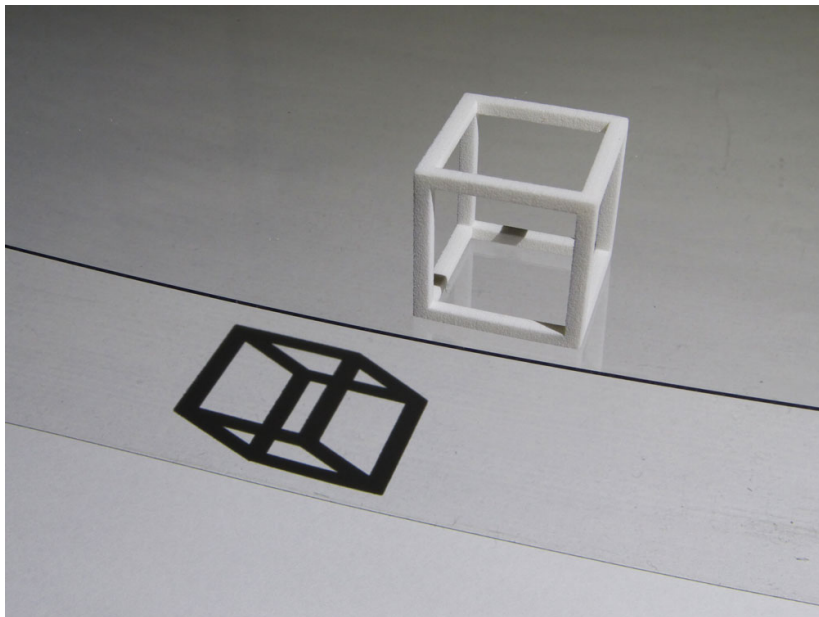
Example: how to make a hypercube



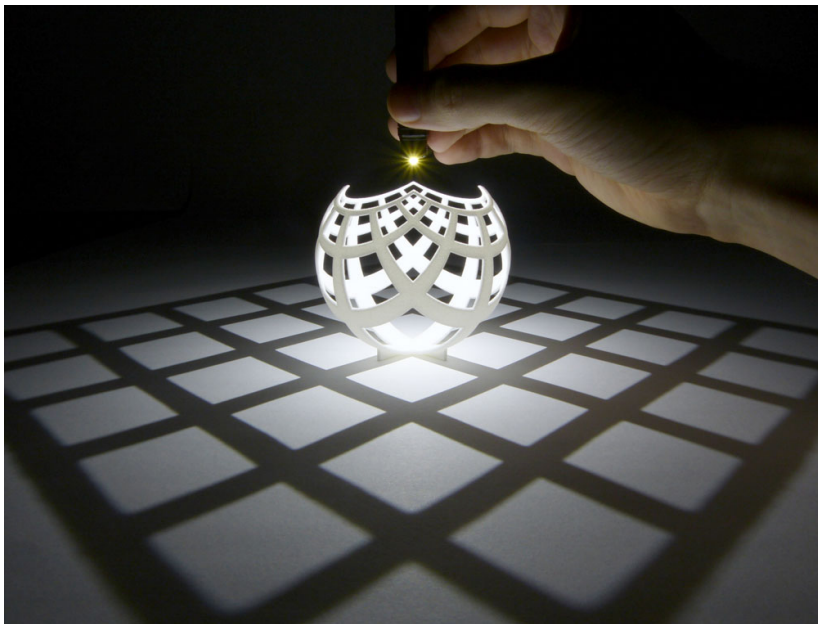
Example: how to make a hypercube



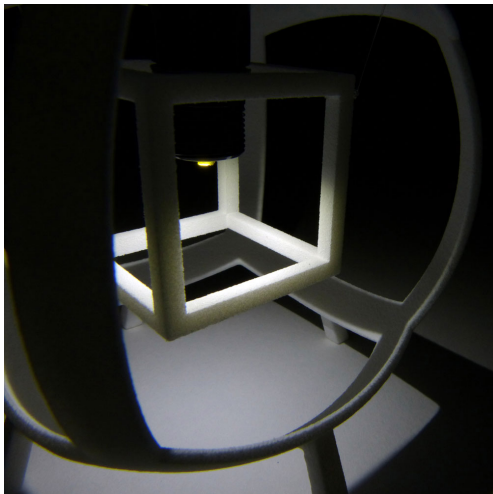
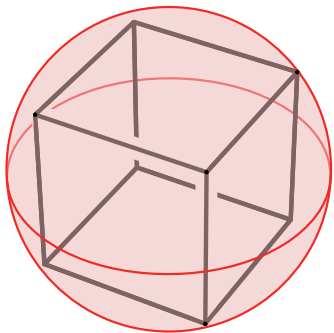
How can we see 4-dimensional things?



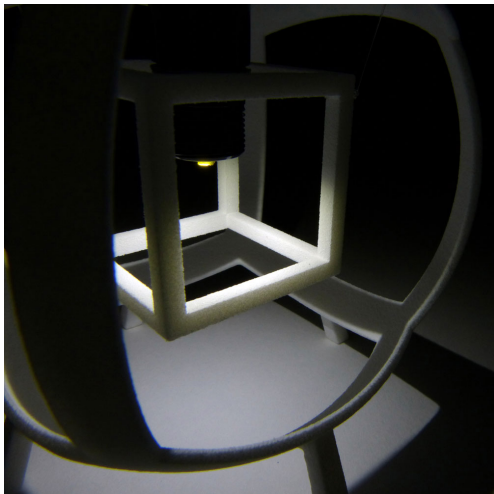
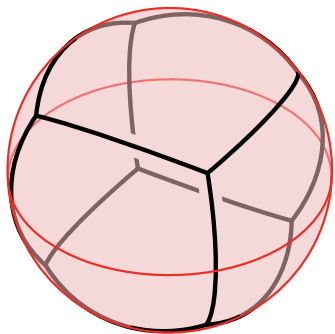
Stereographic projection



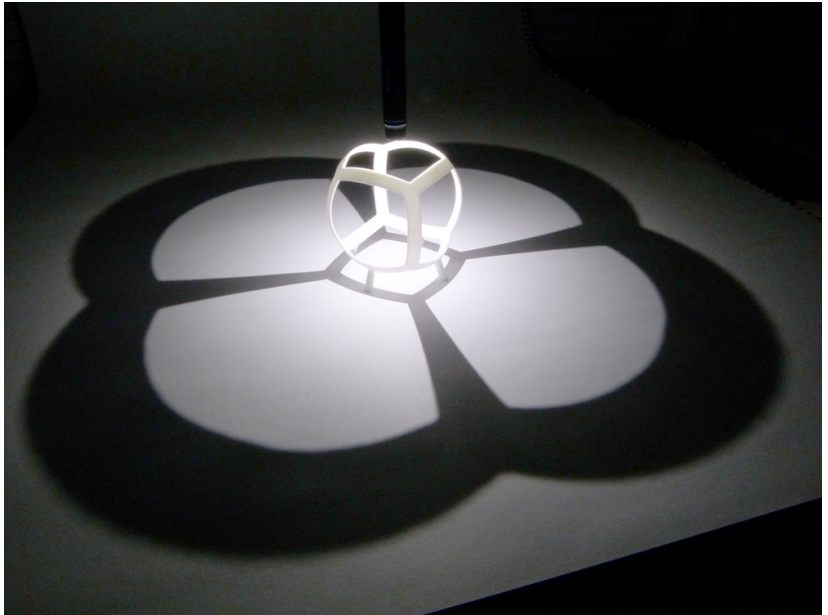
First radially project the cube to the sphere...



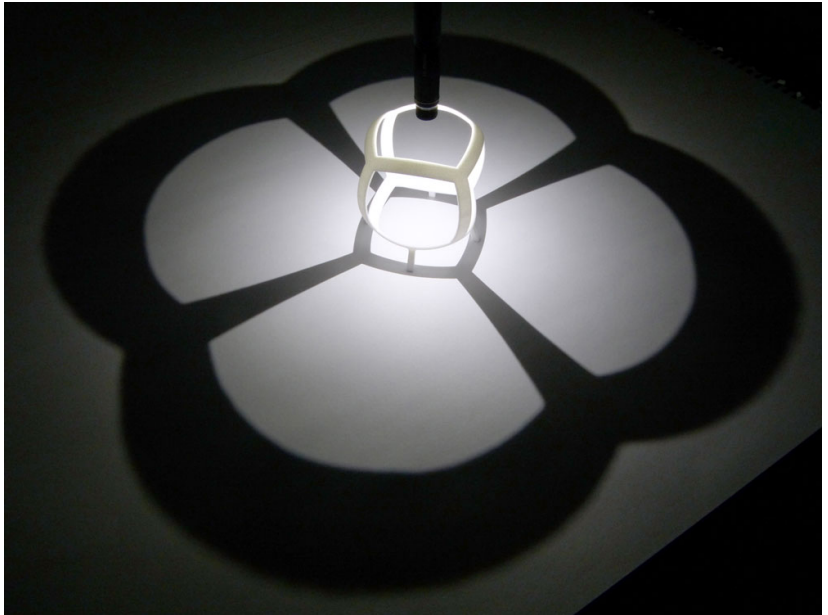
First radially project the cube to the sphere...



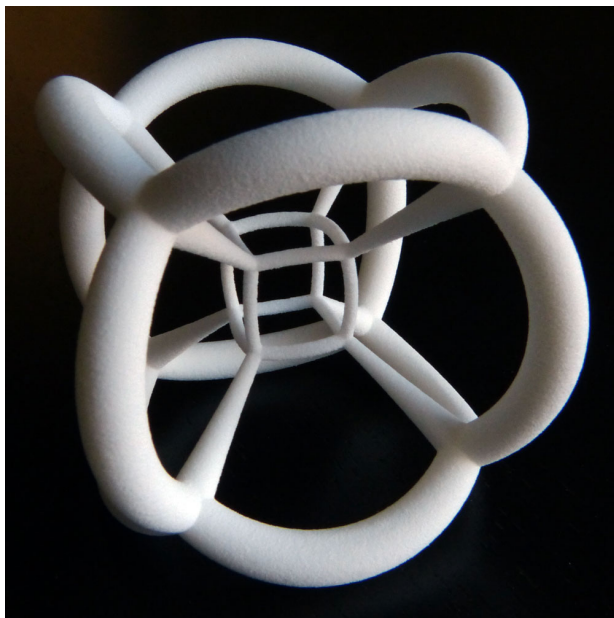
Then stereographically project to the plane



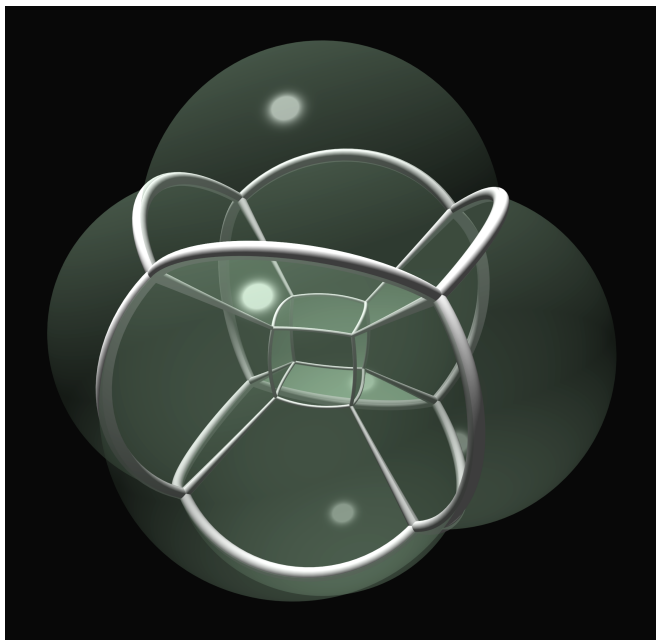
Then stereographically project to the plane



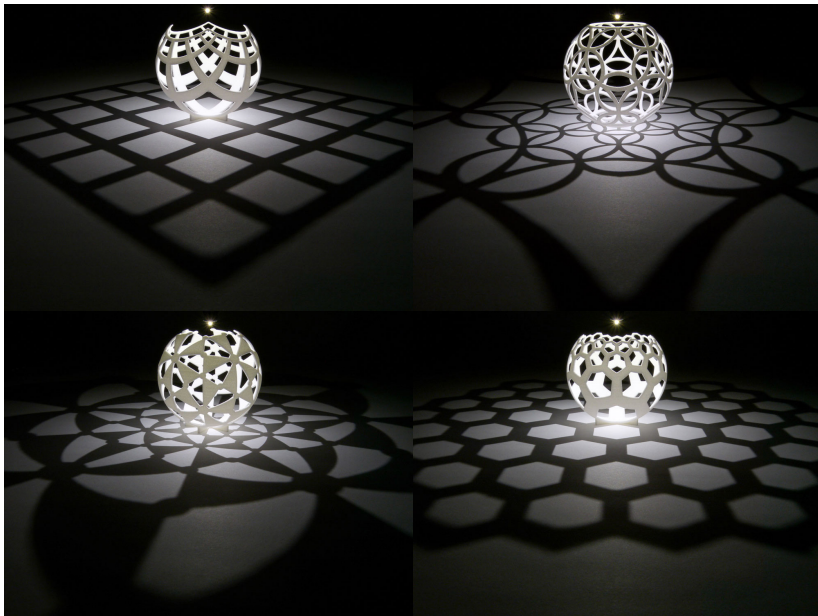
Do the same thing one dimension up to see a hypercube



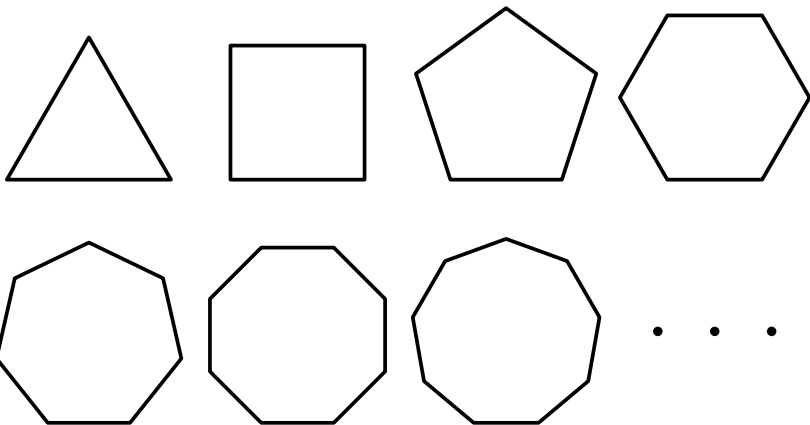
Do the same thing one dimension up to see a hypercube



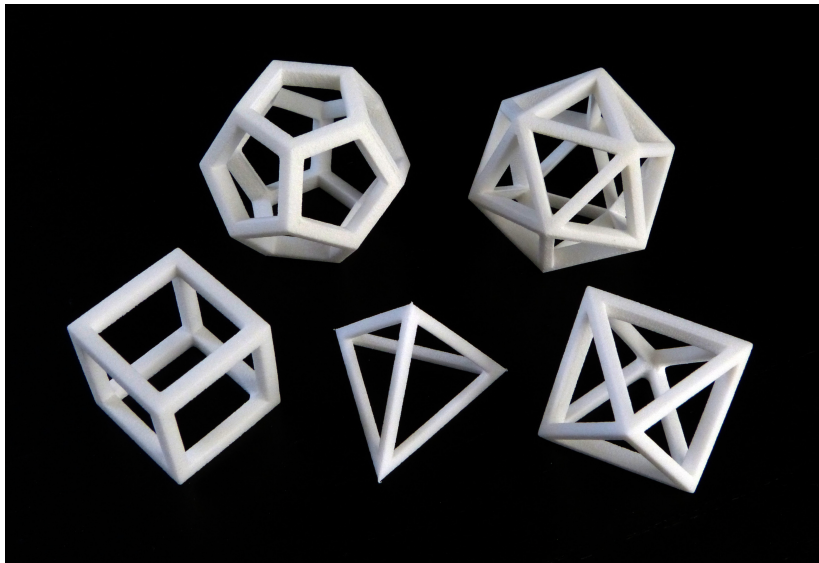
More amazing properties of stereographic projection



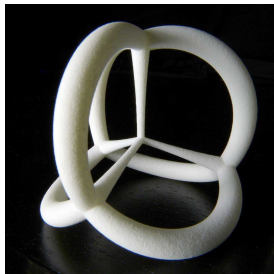
Regular Polytopes in 2-dimensions: Regular polygons



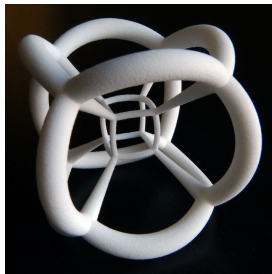
Regular Polytopes in 3-dimensions: Regular polyhedra



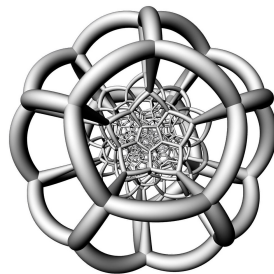
Regular Polytopes in 4-dimensions: Regular polychora



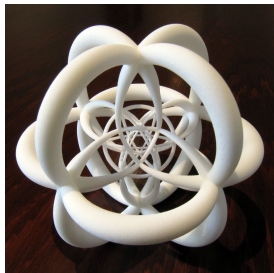
5-cell



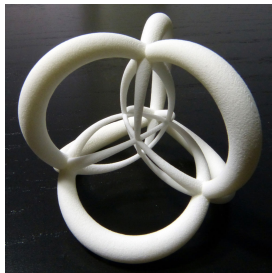
8-cell



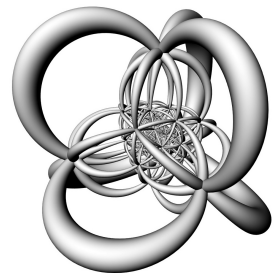
120-cell



24-cell



16-cell

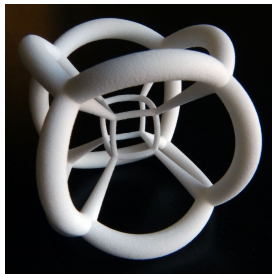


600-cell

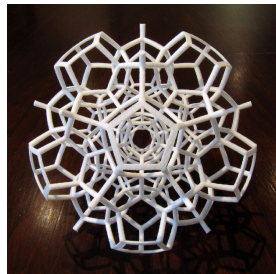
Regular Polytopes in 4-dimensions: Regular polychora



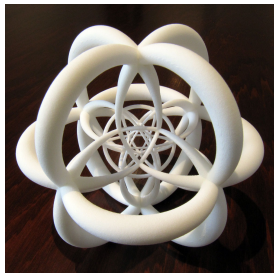
5-cell



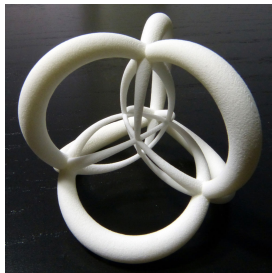
8-cell



120-cell



24-cell

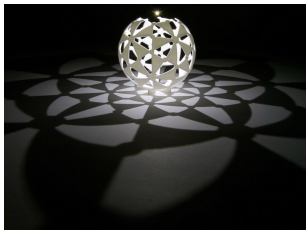


16-cell



600-cell

Thanks!



@henryseg

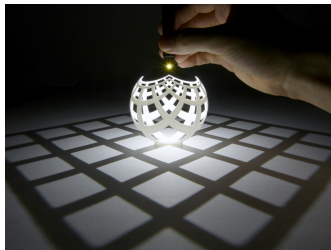
3dprintmath.com

segerman.org

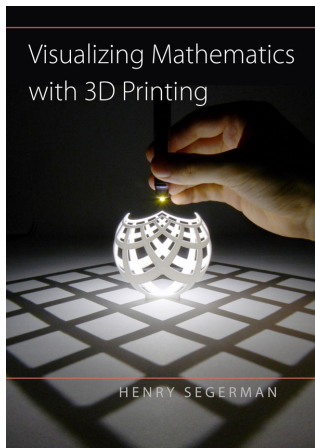
youtube.com/henryseg

shapeways.com/shops/henryseg

thingiverse.com/henryseg



Visualizing Mathematics with 3D Printing



Visualizing Mathematics with 3D Printing Chapters - [Pre-order Now!](#)

Visualizing Mathematics with 3D Printing

Henry Segerman

This is the companion website for an upcoming popular mathematics book.
Click around to explore figures from the book!

[Read more...](#)

1. Symmetry



2. Polyhedra



3. Four-dimensional space



4. Tilings and curvature



5. Knots



6. Surfaces



7. Menagerie



[CONTACT](#) [ABOUT](#)

© Henry Segerman

<http://3dprintmath.com>