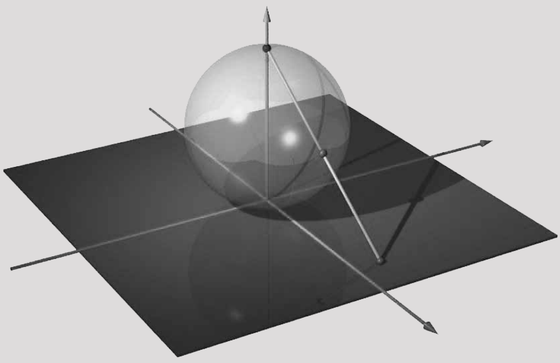
Stereographic projection

Points on a sphere are projected from the north pole onto a plane that is perpendicular to the axis through the poles, usually the plane through the south pole.



All points of the sphere can thus be projected onto the plane, except for the north pole itself, and a point at infinity is therefore associated with the north pole.

Stereographic projection projects circles on the sphere onto circles in the plane, and preserves angles.

Design: Aurélien Alvarez,
Étienne Ghys, Jos Leys

Anosov Flow

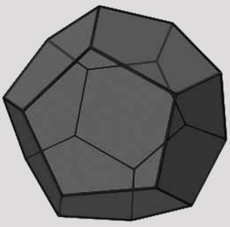
Dynamics is the study of motion. Topology is the study of shapes. Arithmetic is the study of numbers.

Sometimes, concepts coming from arithmetic have a dynamical aspect and create interesting shapes! In this picture, you see shapes produced by the so-called “modular flow” which is fundamental to understand numbers, and in particular prime numbers.

Design: Aurélien Alvarez,
Étienne Ghys, Jos Leys

The Hecatonicosachoron

The hecatonicosachoron, also called the “120-cell”, is a regular polytope in four dimensions. It is the four dimensional analogue of the three dimensional dodecahedron, that has 12 pentagonal faces, 20 vertices and 30 edges.



The hecatonicosachoron has 120 “faces”, but they are in 4 dimensions, so they are in reality three-dimensional faces: they are all dodecahedrons!

The two-dimensional faces of these dodecahedrons are of course pentagons, and there are 720 of them. There are 600 vertices and 1200 edges.

Design: Aurélien Alvarez,
Étienne Ghys, Jos Leys

The Hecatonicosachoron (continuation)

The images in the exposition show the 120-cell drawn through stereographic projection, but of course not the normal stereographic projection from a sphere in our three dimensional space on to a plane through the south pole. This is a stereographic projection from a sphere in four dimensions onto our space of three dimensions.

This projection shows the symmetries of the 120 cell very well. Note also that the two dimensional faces of the object are all pieces of spheres, and that the vertices are all segments of circles.

Design: Aurélien Alvarez,
Étienne Ghys, Jos Leys