Quasicrystals - mathematical beauties
(Amos Nevo and Felix Pogorzelski)

In 2011, the Technion physicist Dan Shechtman was awarded the Nobel prize for chemistry for discovering quasicrystals in nature.

The method of use was through so-called diffraction experiments.

Roughly speaking, those are about impacting the solid under investigation by X-ray radiation, and then investigating the structure of the scatter patterns evolving from the interference.

Shechtman found in 1982 that certain alloy-type materials amount for a pattern with non-crystallographic symmetries. This observation triggered a boom of the mathematical examination of diffraction experiments which in turn evolved into a beautiful and rich theory combining various areas of research.

Our learning project aims at developing some parts of mathematical quasicrystal/diffraction theory from scratch.

We will produce tons of quasicrystals, examine their properties, admire the structures we find. Shooting pencil-paper-X-rays on them (taking the Fourier transform), we conduct diffraction experiments, thus walking a bit in the footsteps of a Nobel prize laureate.

Prerequesites: one course in measure theory and knowing the Fourier transform of functions in R^d.

Being a bit familiar with matlab or mathematica is helpful in order to produce beautiful pictures.