Historical Meditations on Symmetry

Pietro Frè
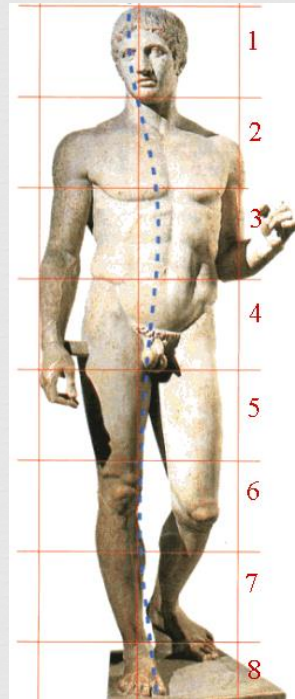
The Episteme of the XXI century and the Fundamental Laws of Nature

ΕΠΙΣΤΗΜΗ ΚΕΛΣΟΥ

ɑ The current status of the episteme is the following:

ɑ The Fundamental Laws of Nature are nothing else but….*Symmetry Principles*
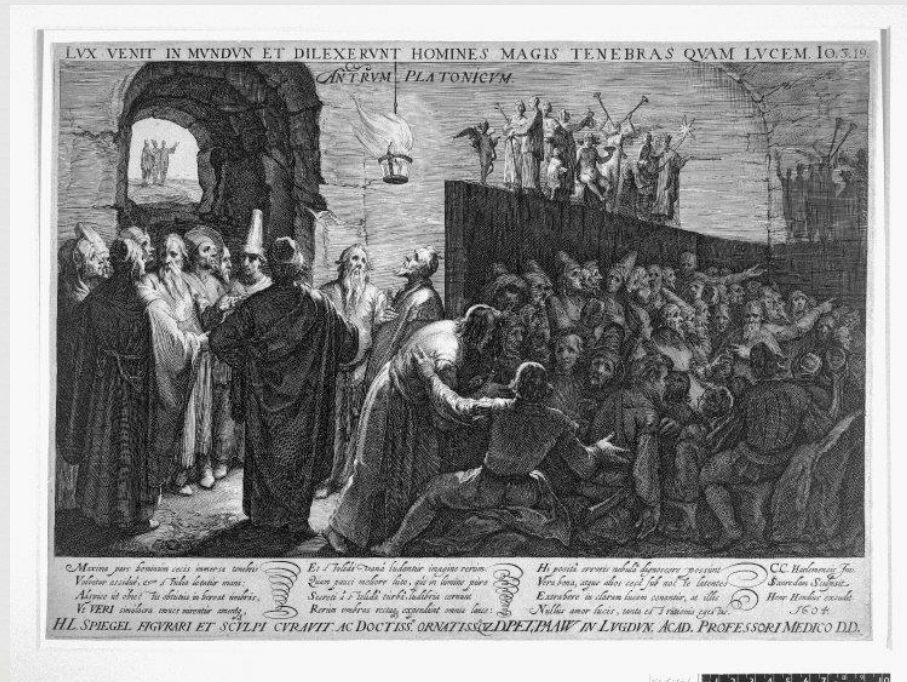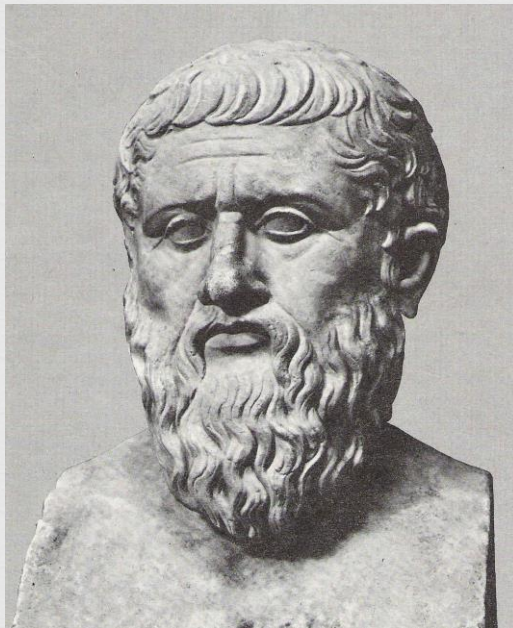
Symmetry for Ancient Greeks

We easily realize what symmetry essentially meant for the classical Greeks: it meant measure–ratios provided by rational numbers p, q where both the numerator p and the denominator q are small integer numbers from the set 1,2,3,4,5,6,7,8. The extension of the head should be 1/8 of the full extension of the body, the extension of the torso 3/8 and so on.

The word symmetry comes from the Greek $\sigma\upsilon\mu\mu\epsilon\tau\rho\acute{\iota}\alpha$ which is composed of two words $\sigma\acute{\upsilon}\nu$ (with) and $\mu\acute{\epsilon}\tau\rho\sigma\nu$ (measure). Literally $\sigma\upsilon\mu\mu\epsilon\tau\rho\acute{\iota}\alpha$ indicates the adequate proportion of the different parts of something, material or immaterial, and it is well represented in classical Greek literature.
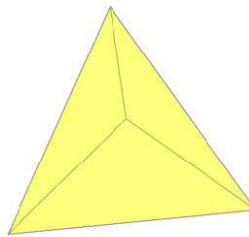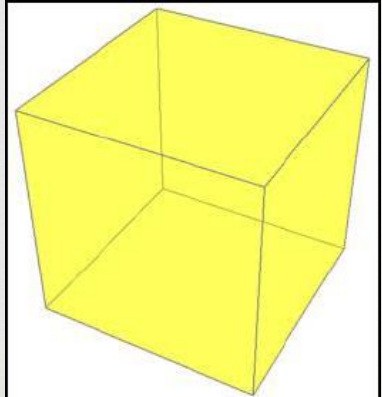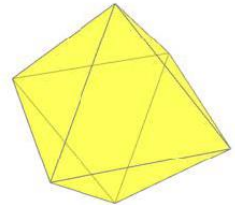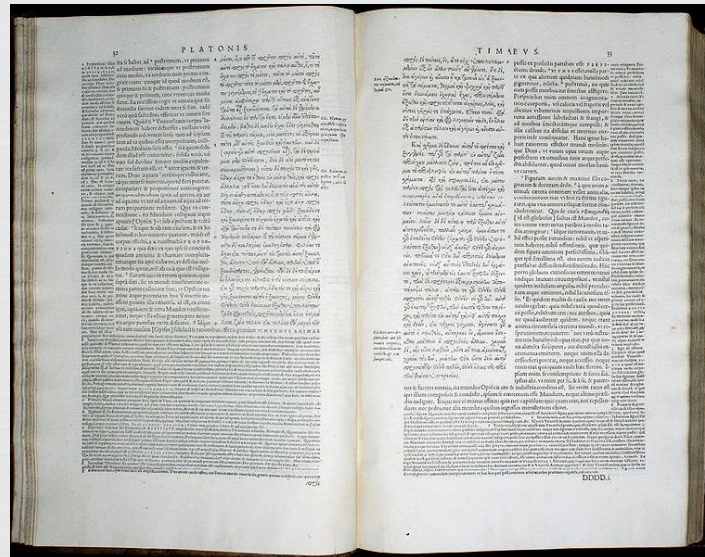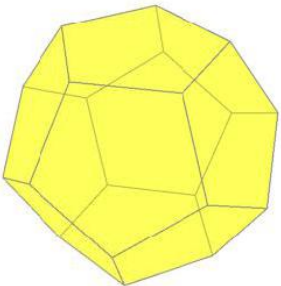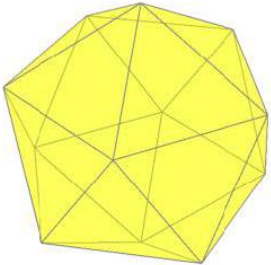
Antrum Platonicum

In some sense Plolykletos was prefiguring the Platonic philosophy of Ideas: the fixed simple ratios correspond to the Idea of a Human. An individual, namely an actualization of the Idea of a Human is the more beautiful as closer his/her proportions are to those encoded in the Idea.
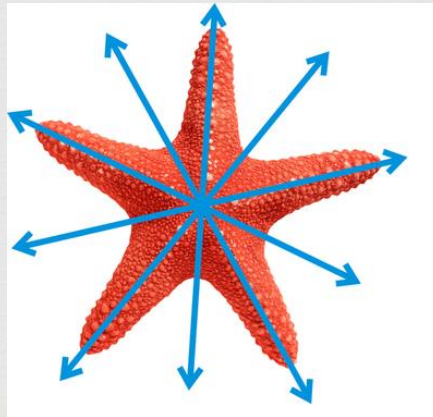
The 5 solids and Timaeus

Symmetry principles

What are at the end of the day symmetry principles? Loosely speaking they are a powerful predictive instrument.

Galois and the advent of group theory: a new concept of symmetry

- Relevant the transformations
- Operations can be combined (group G)
- Transformations on something can be applied to something else
- Important what remains invariant
- Structure of things is the algebraic structure of their symmetry group
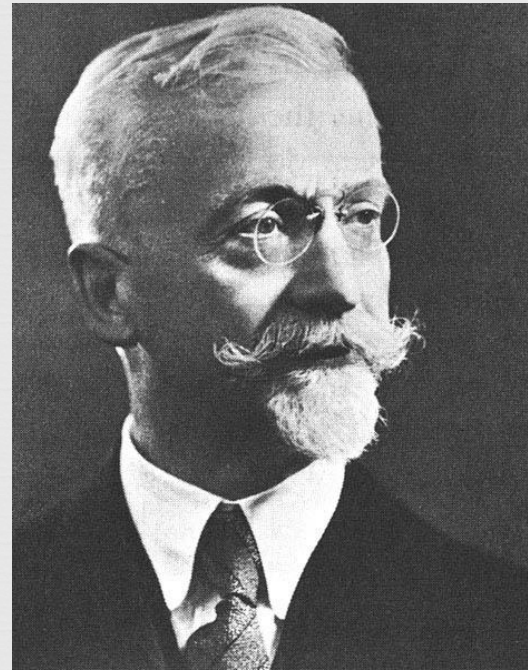
The spring of 1870 in Paris

Sophus Lie and Felix Klein were together in Paris in the spring of 1870…..They came to know better on Galois Theory and Groups from the French mathematicians Camille Jordan and Gaston Darboux.

Two different results from the same input: discovery of *Lie algebras* and the *Erlangen Programme* on the classification of Geometries.

Killing and Cartan

Exceptional Lie Algebras firstly discovered by Killing constitute a paradigmatic example in the route towards the modern neo-platonic episteme….
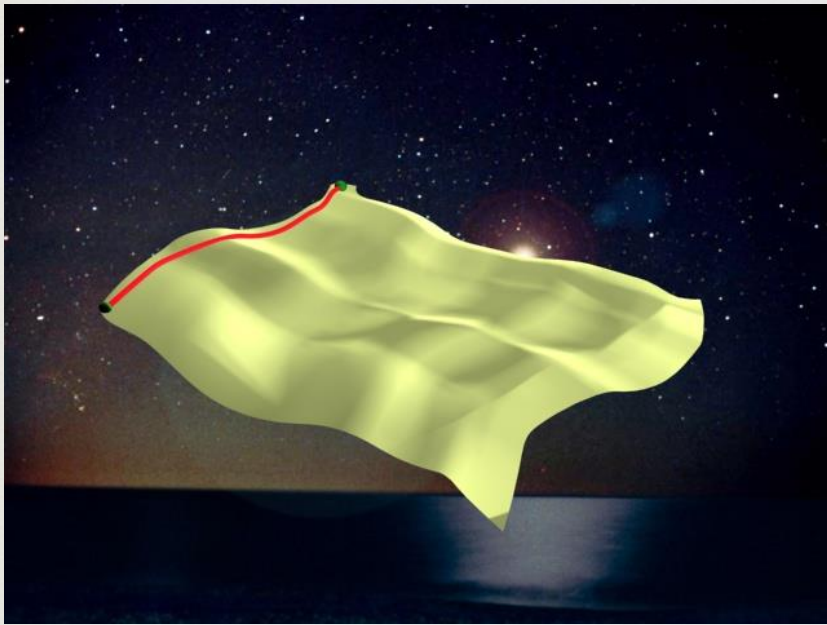
Hermann Weyl and the mathematical way of thinking…..

ᘓ In my work I always tried to unite the truth with the beautiful, but when I had to choose one or the other, I usually chose the beautiful…

ᘓ Words are dangerous tools. Created for our everyday life they may have their good meanings under familiar circumstances, but Pete and the man in the street are inclined to extend them to wider spheres without bothering about whether they then still have a sure foothold in reality.

ᘓ We now come to the decisive step of mathematical abstraction: we forget about what the symbols stand for. The mathematician is concerned with the catalogue alone; he is like the man in the catalogue room who does not care what books or pieces of an intuitevely given manifold the symbols of his catalogue denote. He need not be idle; there are many operations which he may carry out with these symbols, without ever having to look at the things they stand for.

The Super World is definitely Platonic

Thank you very much indeed to all for the very nice event you organized just for me!

Спасибо огромное всем!