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„Platon came the nearest to the truth,
even though he did it in an ancient manner:

The ultimate thing in human research
might be a kind of mathematical system”.

Werner Heisenberg
Physicist and co-founder of the
quantum mechanics.



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**GRASP THE
SPACE**

cube one

**SPACEPUZZLE
AND
TURNING
INSIDE-OUT
GAMES**

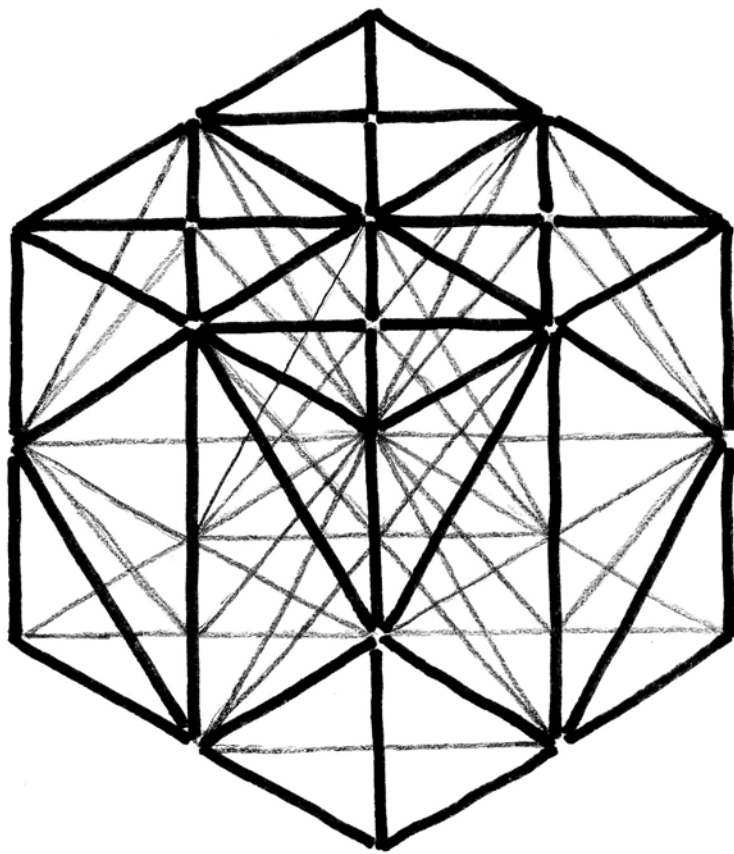
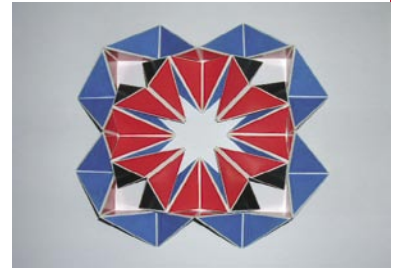
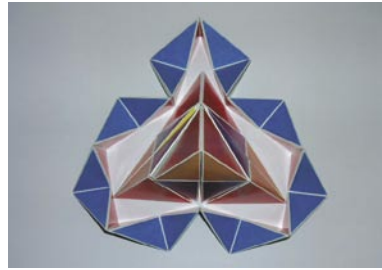
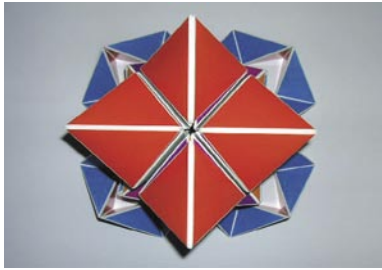
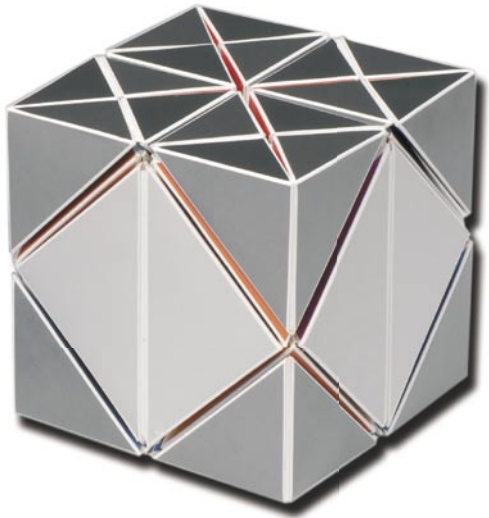


Fig. 1
»cube one« in isometrical sight.
You can see all the hinge-edges
of the inside chainlinks.



cube one

»cube one« is a three-dimensional geometrical transformation solid, a space-puzzle, which is composed out of four interlaced chains (Kaleidocycles).

Kaleidocycles are chains which can be turned inside out endlessly.

Each chain consists of 16 tetrahedral chain links which are flexible connected to each other by linen ribbons.

Two of them form octahedra.

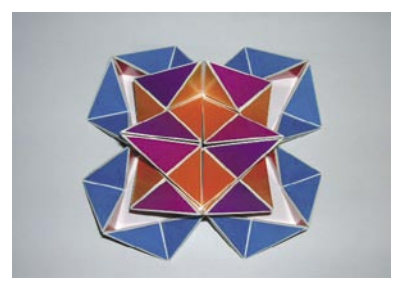
Both of the octahedra are dual in relation to the cube, which means that their vertexes are tangent to all the centers of the cube surfaces.

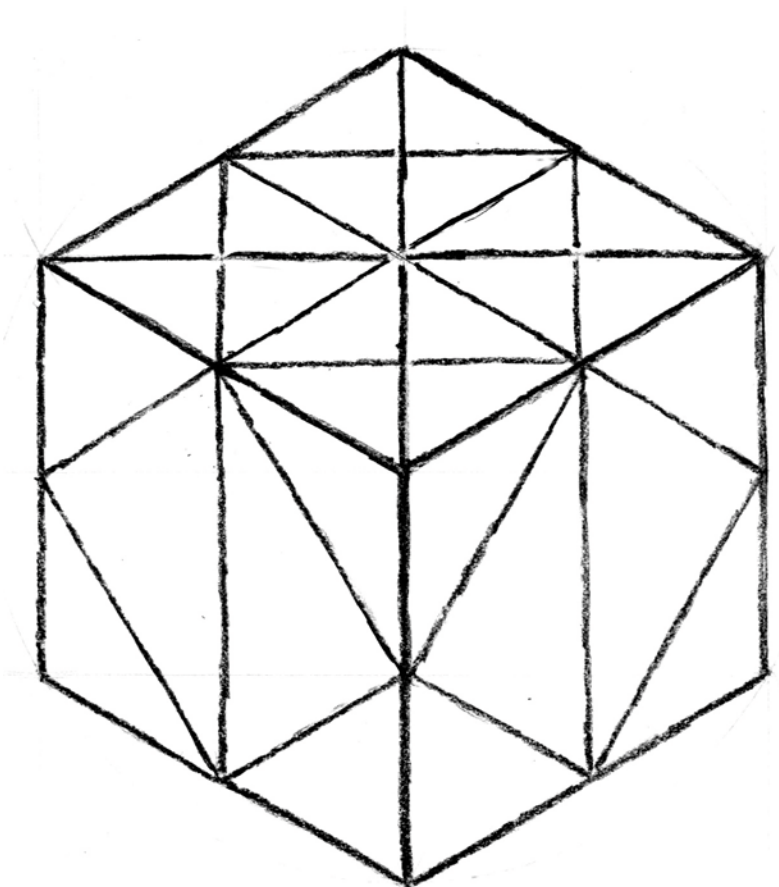
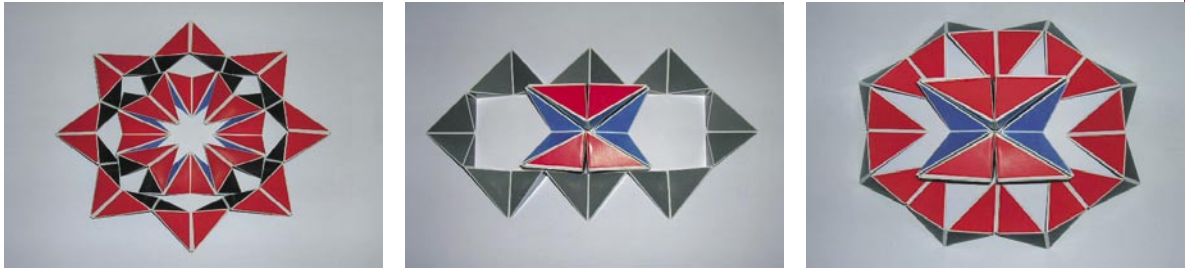
Two of the kaleidocycles form tetrahedra.

The tetrahedra have the size of the cube-inscribed tetrahedron.

For the first time one can „see and grasp“ the following thing:

The volume of the two cube-inscribed tetrahedra plus the volume of the two cube-dual octahedra are the same as the volume of the surrounding cube.





Besides the fact that each chain on its own forms a regular polyhedron (in this case a tetrahedron and a octahedron) which belongs to the five platonic solids (tetrahedron, octahedron, hexahedron, dodecahedron, icosahedron) are now arising out of the interlacing, a third regular solid: the cube.

Three of the five platonic solids (tetrahedron, octahedron, cube) are combined in one solid.

The 'trick' lies in the fact that there are different possibilities to bring together the chains to the cube.

Besides forming the regular solids one can create countless space solids, by using the chains separately, or by interlacing two, three or four chains. There are two different possibilities to come towards »cube one«, to work or »play« with it.

Fig. 2
»cube one« combined
Variation Nr. 1





Fig. 3
Duality - octahedron - cube.
The vertexes of the octahedron are tangent to all the centers of the cube surfaces.

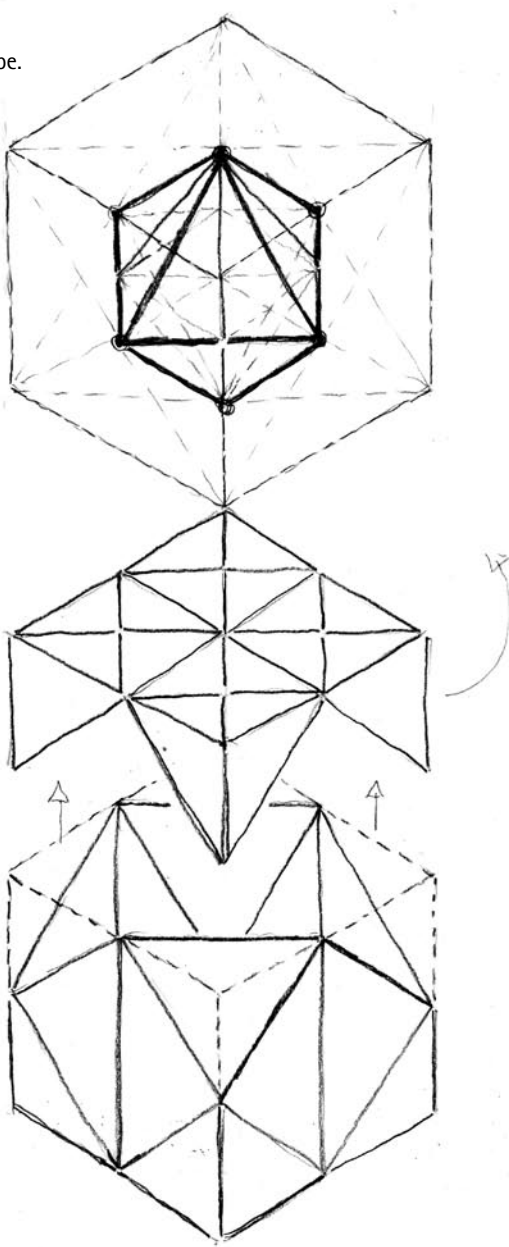


Fig. 4
The octahedron-chain is uplifted.
The four external pairs of links are capsized.

The first possibility:
One can discover manifold and demonstrate the geometrical law of numbers-, edges-, surfaces- and space volume-proportions from three of the five platonic solids amongst each other.

For a geometrician, in search of constitutionally coherencies in the sense of Goethe: „So that I may perceive whatever holds The world together in its inmost folds.“, a lot of measure- and space connections will come into the picture. There is for sure the possibility to interlace two tetrahedra, (both with the size of the cube-inscribed tetrahedron) in such a way, that they fit together into the cube.

This can only happen on one condition: namely they must change their form. With retention of space volume, they have to change in form; they must turn inside-out like a glove, which you can turn inside-out - but they do not change their space volume - and then the tetrahedron-chains will fit into the cube.

They seems to say to us:

„It is now as it has always been, but you did not see it. Besides, it is not the only way to fit. There are more possibilities. And to complete the cube, we need two of our brothers, the dual octahedra, (two separat chains) and then the cube is perfect. Three of us are six of them and together we form the ONE.

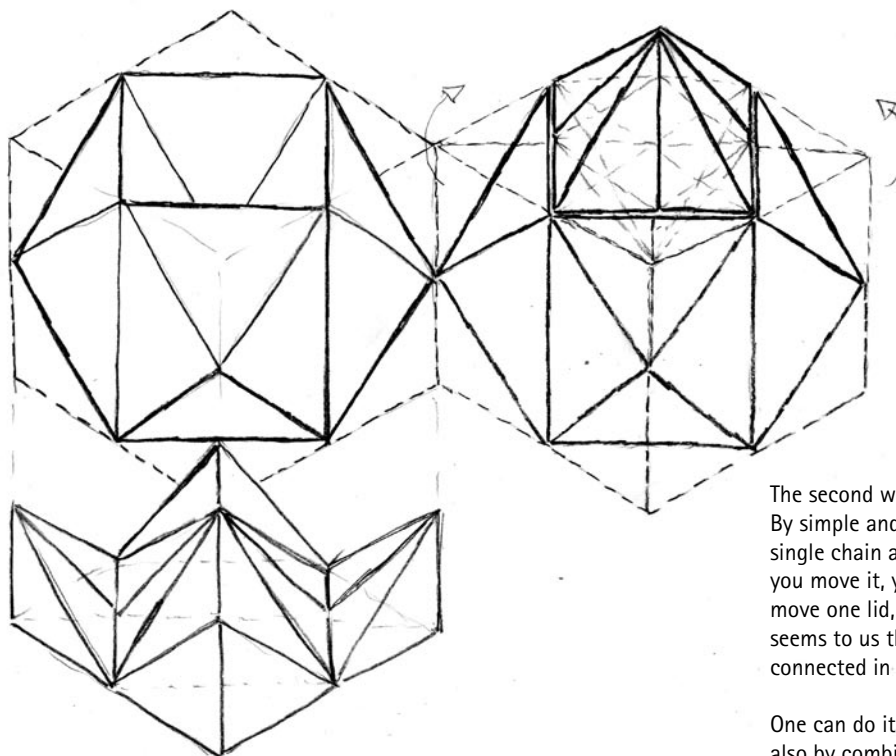
And that you can experience as you work with »cube one«.





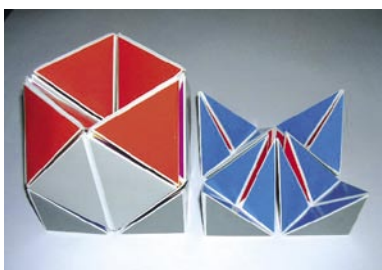
Fig. 5
Take out the lower octahedron-chain and in the middle a cubeoctahedron will remain.

Fig. 6
The upper octahedron-chain is capsized to form a octahedron.



The second way:
By simple and careful moving of a single chain and »discovering« whilst you move it, you can see, when you move one lid, the others will react, (it seems to us that they are all together connected in a social context!)

One can do it with a single chain, but also by combining one or more chains. What arises is a range of imaginative space shapes which can be both symmetric and/or asymmetric.



To work with free imagination, but at the same time be aware, because one is moving inside defined limits; in today's time of excess, - we try something, but we do not know where we are going and what we want, - one can benefit enormously, and experience, working with this is very calming and can be therapeutic.

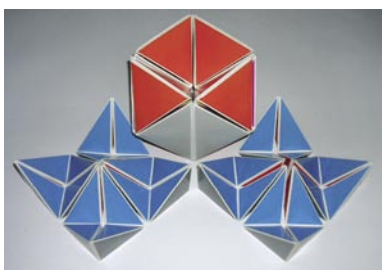




Fig. 7
The cubeoctahedron is composed out of two crowns. At the right side is the upper crown

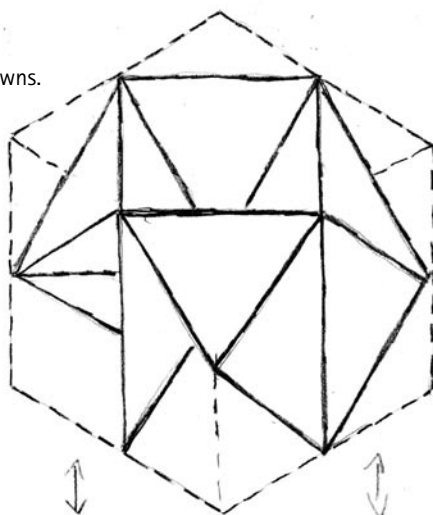
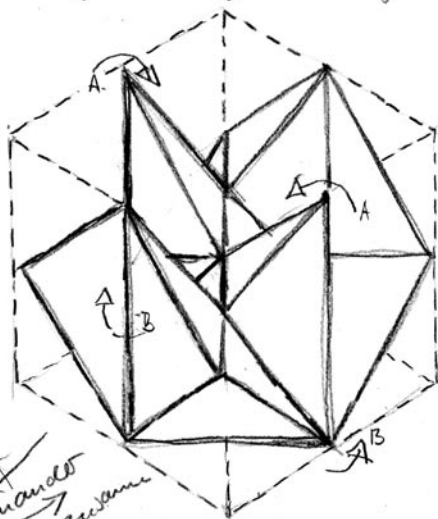


Fig. 8
Each of this crowns can be transformed into a tetrahedron..



1 auseinanderziehen
2 wieder zusammen

There are a huge number of design- and combination possibilities connected to the motto: »Play Plato« and a lot of rediscoveries and surprises are possible. Children will discover »a cathedral with garage« and architects will find new space forms which offer security both, in architectonic and in a statistic manner.

1 auseinanderziehen
2 wieder zusammen

A: Upper vertexes are turning inside-down

B: Lower vertexes are turning outside-up.

A new form appears, (form2)

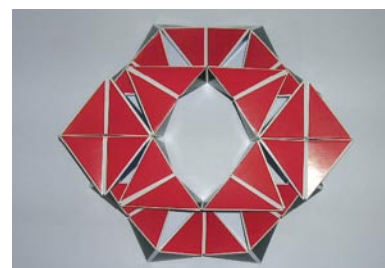
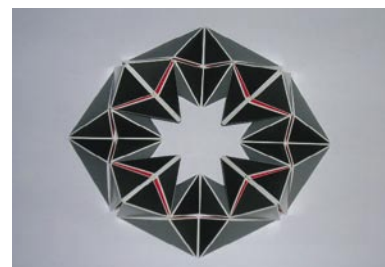
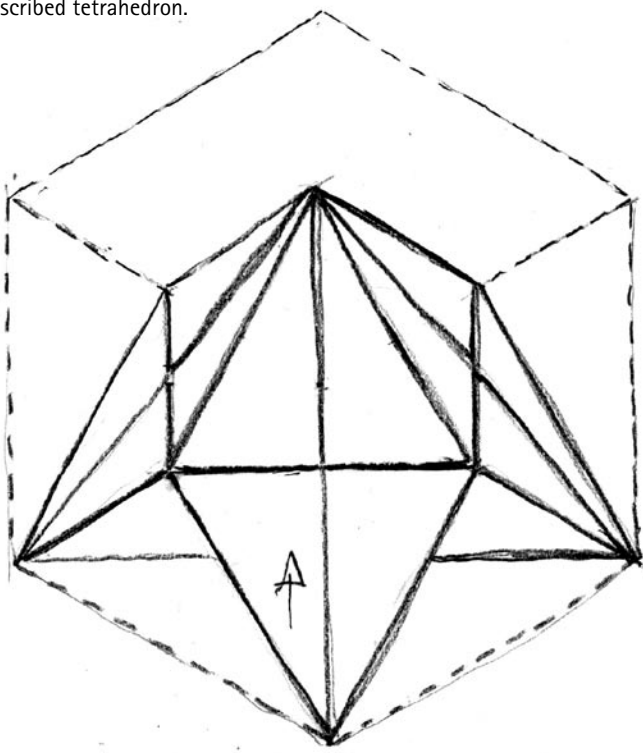




Fig. 9
 (form2)
 Capsice two of the four »rest«
 tetrahedra upside.
 A new form appears (form3)
 the inscribed tetrahedron.

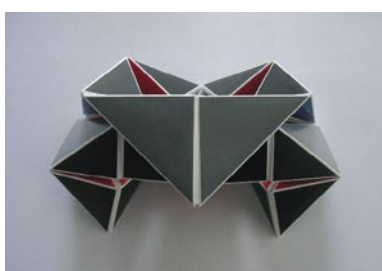


Result:

For pupils and students in practice, the spacepuzzle »cube one« can be a great help and support to enable and make education in and with geometry and mathematic spiritual.

One can »grasp« the space in the real meaning of the word. One is able to grasp with the mind and grasp with your hands.

One can be helped to increase self-awareness - to answer the question: where am I standing in the space surrounding me?- and to get an idea where one can give social input and where not.



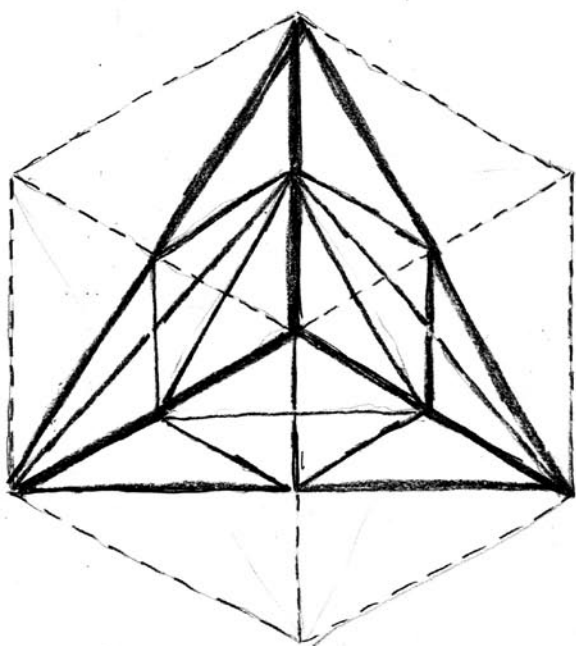
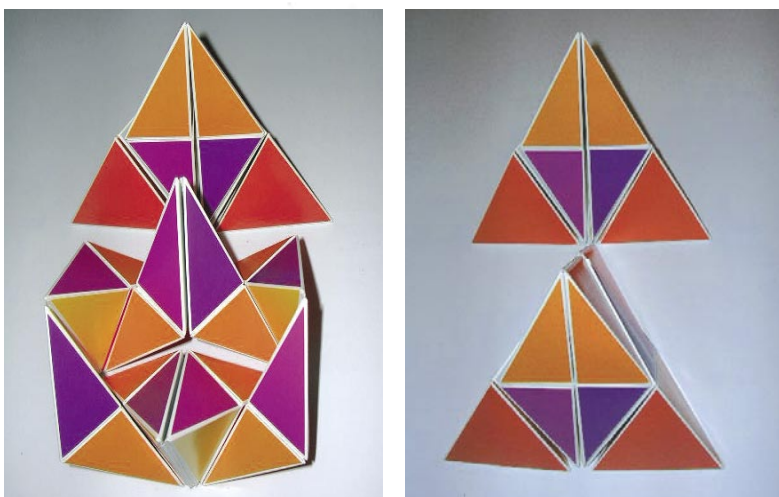
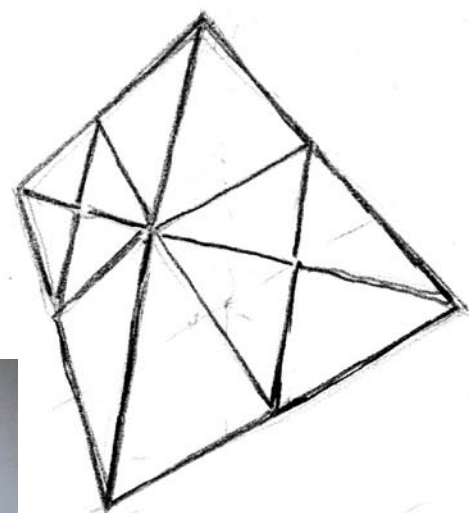


Fig.10
form 3
The „inscribed“ tetrahedron.
The 6 edges of the tetrahedron
form the diagonals of the cube
surfaces.



For adults (and especially the target-group architects, engineers, designers, therapists and moving specialists) »cube one«, is a very valuable suggestion to challenge imagination, and to discover the necessity of action and to grasp the legitimacy of space.



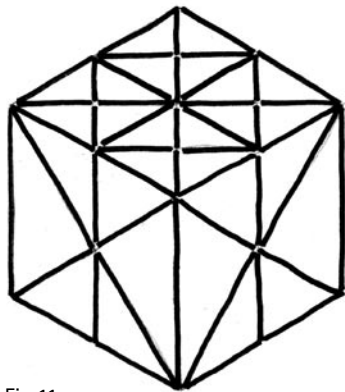
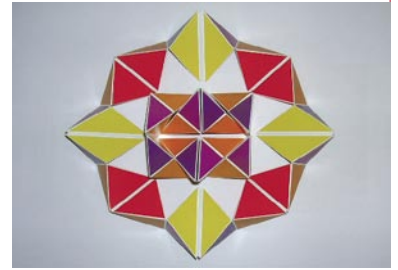


Fig.11
»cube one« combined.
Variation Nr. 2

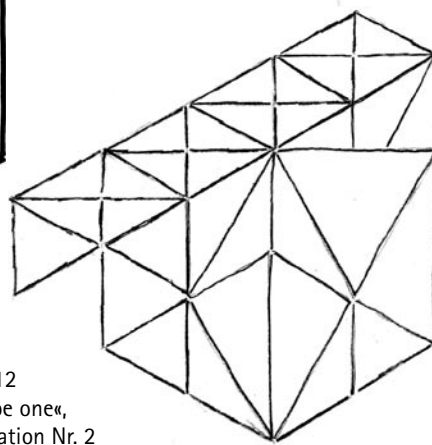


Fig.12
»cube one«,
Variation Nr. 2
Opened octahedron-chain



As mentioned before there are different possibilities to combine the four chains into a cube.

At the left side you see another variation.

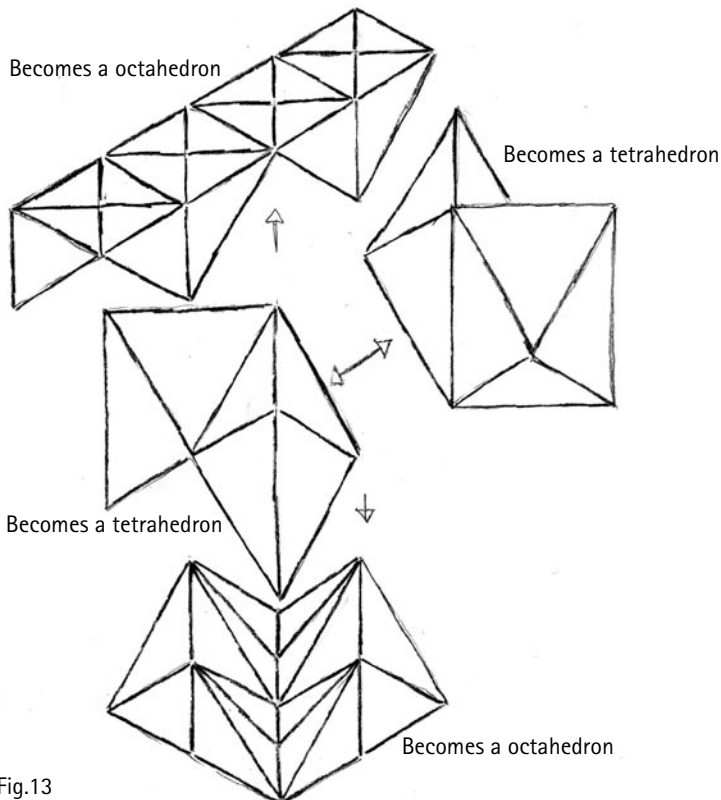


Fig.13
»cube one«
Variation Nr. 2

