

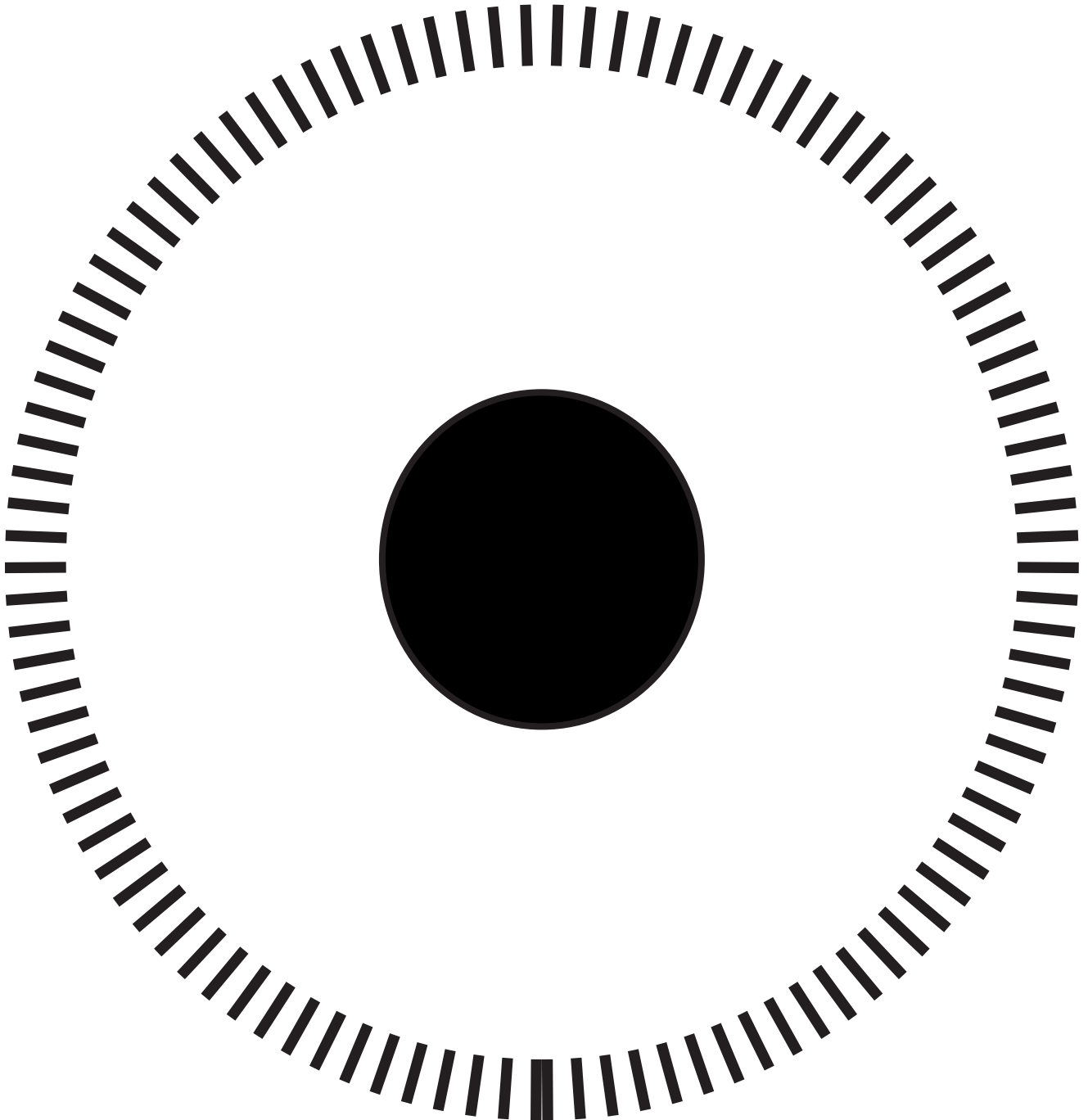
“In search of a center, a study on symmetry”

Written component master thesis

Submitted in partial fulfillment of the requirements for the degree of Master of Arts

(MA) at the University of Applied Arts Vienna,

Institute of Fine Arts and Media



Konstantinos Politis // Registration Number : 1174109 // Vienna, January 2017

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Supervisor: Prof. Virgil Widrich

Index

Chapter 1

Introduction / Personal Statement_____ pages 3 - 8

Chapter 2

Historical Chronology / Few words for every solid and its meaning_____ pages 9 - 17

Chapter 3

Technical details and functions_____ pages 18 - 25

Chapter 4

Work Process / Acknowledgements _____ page 26

Chapter 5

References_____ page 27

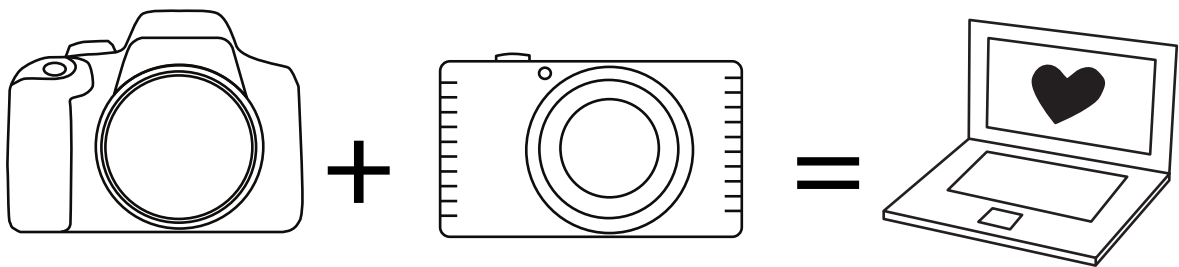
Chapter 1

Introduction / Personal statement

With the completion of this project, an important personal circle comes to an end giving birth to a next one, for my personal development.

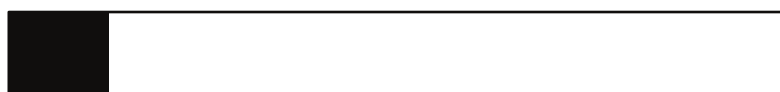
Topics around philosophy, arts, global intellect and science, set the basis of this diploma project. Below, there is a brief introduction of the means chosen for the construction of this installation and lastly, hints are given in order to reveal the nature of this work

The social “game” as it is played in a stressful, major city as Vienna, works mainly with the power of Image. Internet’s power is ceaselessly becoming so dominant, that covers, various social needs of our western “first” world.



As my thoughts develop, I take per se, that the internet, is the driving force that composes a form of a global “trend”. I don’t intent to analyze Web itself, but its social influence around the topics of art and science. A misuse of the Web can create dark loops, manias, discriminations and over - consumerism. On the other hand, the internet works as an amazing invention that reaches the levels of global “gift”, serving users with access to information, entertainment, social connectivity, global accessibility, in such high levels, previously unknown for humanity. The dark and the bright side of internet, both, have to be taken under consideration, as equal parts of the equation that forms the “global conscious”.

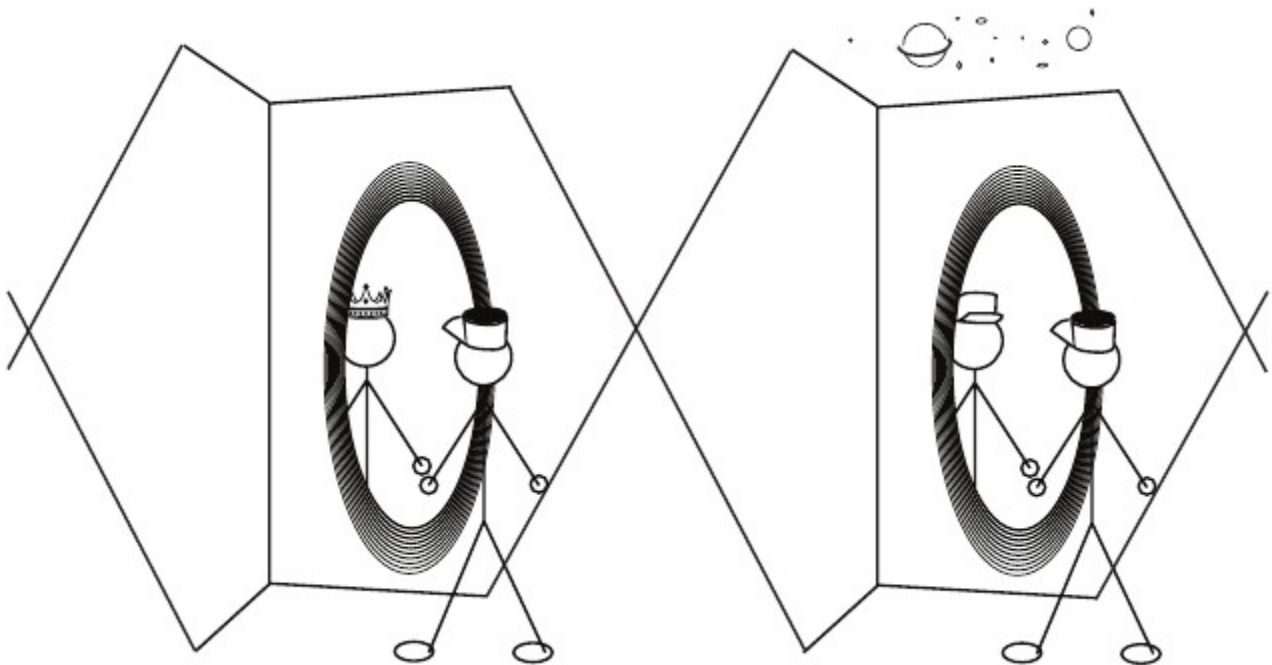
The conscious mind around the topics of science and arts are major factors of this department and mine personally.



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Based on these facts, considering the ever-growing power of the image, one could assume, that the meta-image era, at least for the thinkers of this world, will likely become far more introvert, opposing today's narcissistic fever. Due to this assumption, the sophisticated users of the web are more likely to concentrate on technicalities, leaving behind the mass projection of image - materialism. As a result, the necessity for distinguishing the "inaccurate" and valid information, emerges as paramount in today's society. Therefore, the development of the "spherical view" and "multiperspectivism" should become fundamental elements for this goal. In terms of the above, the filtering of information that includes historical, economical and cultural factors will activate multileveled comparisons. Finally, this multiperspectivism enacts a "spherical" (as opposed to linear) understanding of any situation. This "holistic" understanding will always be an important "tool" of responsible people throughout history.

This project uses semantic references of the notions of "inner" , "outer" and " multi – single perspective".



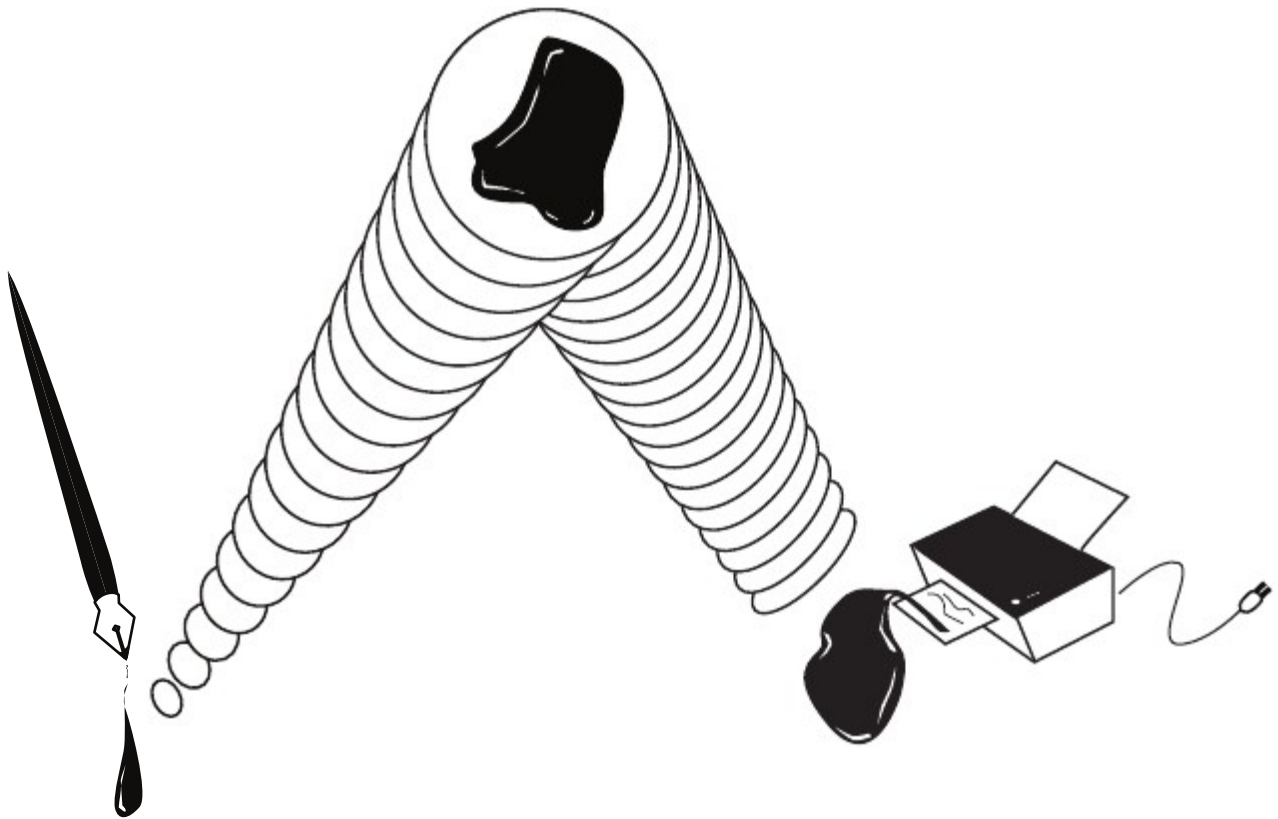
Plato, on the movement of the soul and its relation to sense and knowledge:

"...hovering around the sensible world and when the circle of the diverse also moving truly imparts the intimations of sense to the whole soul, then arise opinions and beliefs sure and certain. But when reason is concerned with the rational, and the circle of the same moving smoothly declares it, then intelligence and knowledge are necessarily perfected. And if any one affirms that in which these two are found to be other than the soul, he will say the very opposite of the truth." ¹

Plato (360 B.C.)

The “nature” of Web arts

Through this Internet global prism, the “notion” of art expands so much that it tends to dissolve. The term “artistic” is enriched with relativity and subjectivity like never before. A piece of art lives in a space though mostly validates through internet platforms and advertisements. Additionally, the majority of the internet users, have the ability to participate in online lessons in order to express themselves individually. Art, through the pluralism of examples and forms, transforms, while the role of critics, gallerists and art historians expands rapidly.



The “nature” of Web science

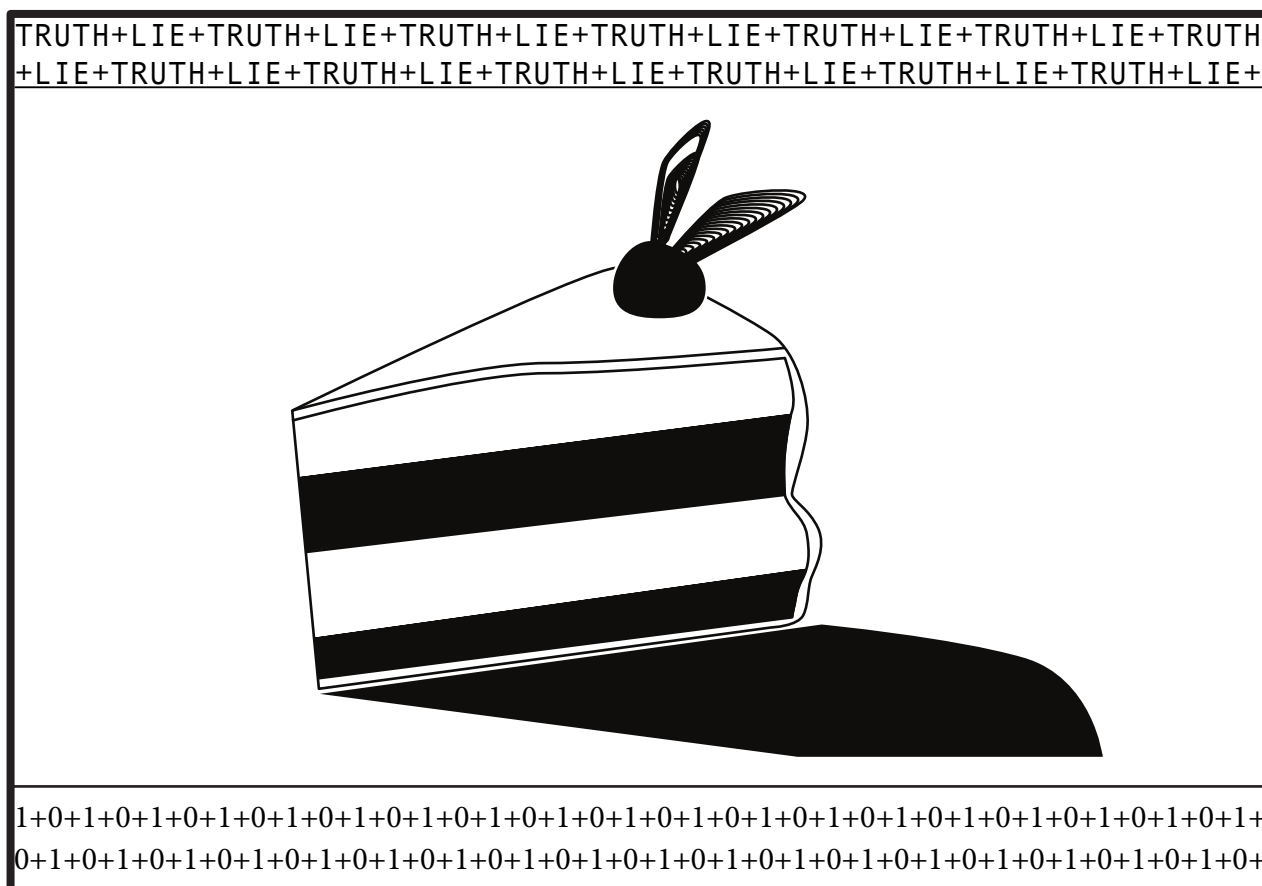
The access to information that the Internet provides, eliminated a lot in global terms, the role of religion and superstitions, while in parallel it enriched the importance of science as an objective source of “truth”. Using technology and mathematics, science, represents the epitome of human efforts in order to explain so far unexplained phenomena and also provides solutions to technical or physical problems. Therefore, this growing intelligence and developing technology makes human the designer of his / her own future. Scientific research becomes, more than ever, the strongest mean of this effort.

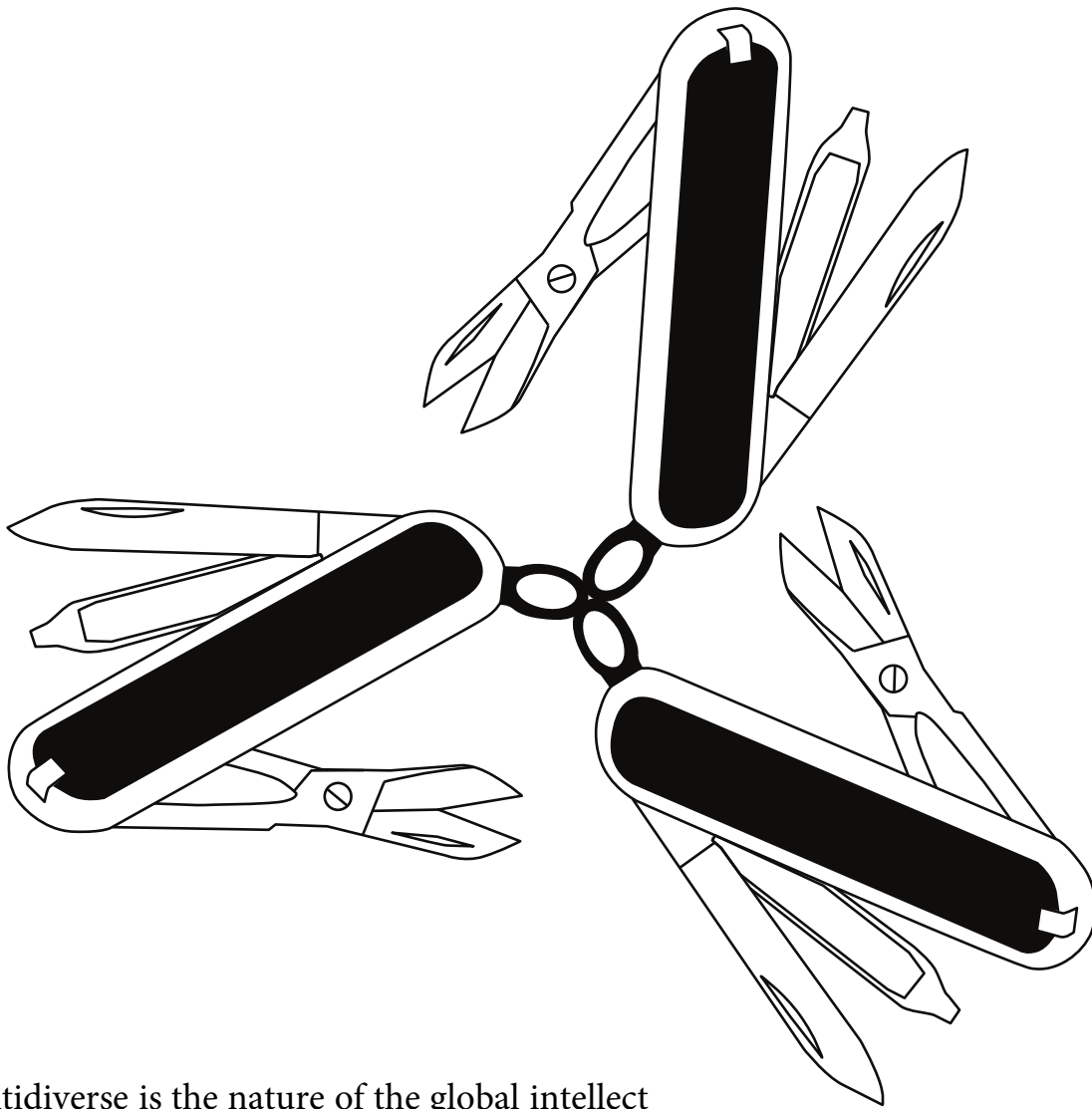
In research, the best of the best is required in terms of human resources and involved apparatus. This condition gives an indisputable, “Godlike” profile to science. This profile, as anything powerful, in Today’s world, is being often misused. The ancient fake miracles that used to enrich the power of “belief” to church pupils are now replaced with pseudoscience, usually in the name of profit. Biased researchers, sponsored by companies are likely to produce pseudo-products based on pseudo-publications that appear as “miracles” to global communities.

"...Now when people say that I am a relativist, if they mean that I don't believe that the way science produces objectivity should lord over all of the other truth conditions, that that is perfectly true. I think that that is a mistake and that it has corrupted science as well as corrupted the other forms of truth production. So I think there is no advantage in associating truth and knowledge. Knowledge is about objectivity, let's do it, it does it very well, sometimes, and it has to be defended and protected against criticism, but truth is something else entirely. There are no reasons to attack science in the name of truth, nor to protect it. It's a category mistake but rationalists love to do this category mistake because they charge 'science' with everything: morality, politics, religion, law, etc. So when people say I'm a relativist, I say, let's protect science against this excess of weight that unnecessarily burdens science with things it cannot produce or deliver.

*Science produces objectivity, it doesn't produce a good life, it doesn't produce law, it doesn't produce religion, and it doesn't produce poetry. There are many other things that we need to live in a collective that science cannot deliver. Why charge it with the weight of holding civilization on its back, if it's not able to deliver [all of these other things we need to live in a collective]? Let science deliver something else. The only thing science does well is produce objectivity about the state of the world, and it's not even protected against that because you need money, you need people, you need training, all of these things would disappear from the view of science which is usually projected as Truth about Science. I am part of those who want to protect science against the excess of epistemology, but also against criticism; for that you have to provide a realistic definition of what science is."*²

Bruno Latour (2013)





Multidiverse is the nature of the global intellect

It is unavoidable that old people pass away and new people are born. The era of analog reality vanishes, while young, embodied with technology generations, grow as time passes. The middle - aged part of society, directs the currents of humanity's river. Therefore, the role of the intellect is traced at this aged group. The thoughts and aesthetics of these people will eventually create global trends and movements. The "openness" of expression on modern Web, created platforms of discussions on a uniquely large scale, but on the other hand exculpated gossiping on the same scale, obliging the following generations to face and deal with it. Balance is required among the "dark" and "bright" messages. A balance between self centricism and collective awareness, between self importance and modesty is sought.

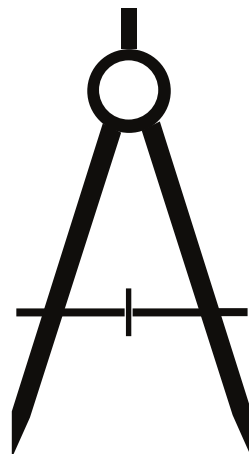
As mentioned before, I would attempt to point out some of the basic characteristics of a modern thinker. The "holistic" approach that one has towards forming an opinion. The availability of the facts through today's internet platforms, places a user of the Web into a much better critical position than in the pre - internet era. "Multi - perspectivism" refers to the ability of an intellect to change place and, if possible, temporarily become the source that provides the information with its full characteristics and differences. The global intellect holds the hopes of innovation and progress. If an intellectual wishes to react in movements, they should consider not just an imminent plan for a final solution but also its management after this "final" product. The educational part of modern thinking, passes the torch of hope to younger, more advanced generations of future thinkers and problem solvers.

Wishing to deliver an optimistic project, I seek in ancient human achievements for inspiration in order to find unspoiled concepts. This final project, combines balanced and symmetrical fields that fascinate me. Art, Science and Philosophy. I will attempt to recreate the five Platonic solids, in order to reveal their esoteric meanings, in a way that hasn't been attempted so far.

The relationship of the essence of these shapes, with their own form, is remarkable. The correspondence of the outer shell with the esoteric meaning, when seen, creates instantly the feeling of transparency, clarity and meaningful modesty. The geometry of each of these shapes, is until today a remarkable benchmark for science, while their form satisfies many geometrical symmetries and relations among them. Biology and maths make these solids something more significant than they appear to be.

The attributes of Plato's solids, are still today subject of theoretical physicists. Timaeus holistic approach has been outdated by most acceptable and recent physicist theories, though the study of these elements seems to help still in the research by different sciences. Through the honesty of the connection of these shapes – forms, with their inner meaning, the mechanism of spherical observation, as well as multi perspectivism is immediately enabled. This happens, to direct almost primitively the viewer and student of these solids, with the notions of global intellect as mentioned before. A positive example of “image” corresponding to “the truth that it bears”. An old example of “form follows function”, with scientific nature that connects classic thinking, with our today's natural elements.

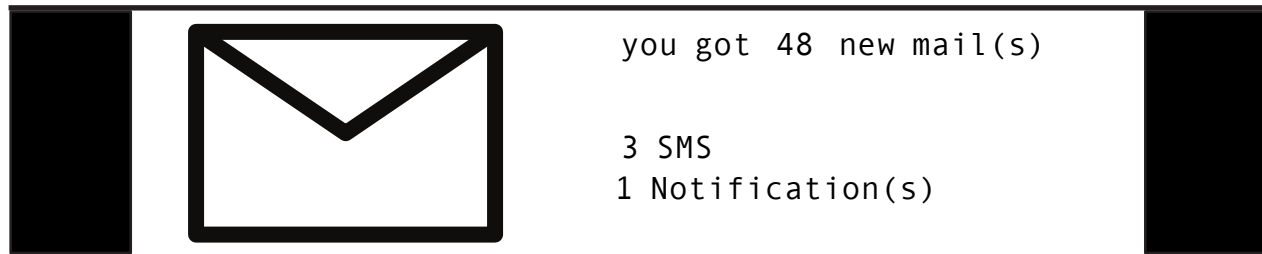
My intention, will mainly focus on the recreation of these shapes, hoping to create a memorable educational installation. My aspiration is placed on younger generations and not prejudiced individuals, who will interact with abstraction, with the revealing symbolism of every shape. I will try to create a vivid game within every solid, creating spectacular conditions, around 5 different tiny scaled planets. CAD software, electronic circuits, prototype shields, holographic projections and natural elements, communicate, a deeper understanding of these shapes.



Chapter 2

Historical Chronology

Knowledge passes from thinker to thinker. An introduction to the previous theories Plato studied before composing “Timeus”. Pre - Socratic cosmo-theories³ :



Thales 624 – 548 B.C.

Thales for the first time in greek ancient history opens the path to philosophical thinking by supporting the theory in which the beginning of all living beings is water. Water’s characteristics unify materialism and energy. This theory implies the unity of all beings that collectively compose the universe. Their production comes out of after a natural cause, their endless change is traced in their primal essence and explains their cause.

Anaximandros 610 – 546 B.C.

Anaximandros thought of a general law that can be traced in all parts of universe and named it “essence”, which is infinite in form and size. Anaximandros’s universe is unharmed and endless. Human in planet earth is found “ready” without being an evolutionary product, for the simple reason that for the first years of his / her life, they need the care of their mother. Therefore, Mother, Father and children belong together in time and their soul has “air-type nature”.

Anaximenis 598 – 525 B.C.

Anaximenis formed a theory which connects air with soul as a “starting cause” of universe. In this way, we are introduced for the first time to the theory of micro and macro universe, with major influences to the next century. Air is the “infinite start”.

Pythagoras 580 – 500 B.C.

Pythagoras discovered that the harmony of music, the harmony of functions in nature, the harmony of the construction and functions of all living beings, can be described with fundamental mathematical equations. He concludes in the theory, that the basic principles are numbers. He relates the even numbers with infinity and odd numbers with finite. Furthermore, he believes that harmony is born out of the marriage of different natural forces, and proposes humans to adjust their inner lives according to the arithmetical codes of harmony, therefore Pythagorean Ethos is born.

Xenophanis 580 – 485 B.C.

Xenophanis criticizes harshly the human nature within greek Gods as well as the false of ancient priests to connect human -like behaviors with Gods. Ionian physicists who discovered the notion of “unity” and a “holistic word”, helped Xenophanis to form the broad concept of “godlike”, which is considered as the beginning of the universal world. This rational concept connects god-like essence with the high level spirituality of the world and opens the path to religions.

Parmenides 540 – 480 B.C.

The philosophy of Parmenides is located around his teachings on “the living being”. This being, the presence and the essence of the world, combines the meaning of the world as has being discovered from material-animalists (Ilozoistes) with the theory of Xenophanis. Parmenides’s “being” is static and unmovable. Every form of movement is only within this being. The only knowledge is the one of this being. Every other knowledge is fake and distorting. Every moment in nature teaches that being is unborn and immortal because it is unmovable and endless. Has never been and will never be, because “now” is future and past combined.

In this way, Parmenides traces everything (human, nature and universe) within the sphere of God, by creating a unity among them. This theory opens the gates of metaphysics, that last until the end of Neo-Platonic philosophy.

Zenon 490 – 430 B.C.

Zenon is a big supporter of Parmenides theory and after a series of logical thoughts, proves that pluralism can’t be. Therefore, within the world, the comparison of beings and phenomena has positive and negative forces that result eventually in zero. Within this theory movement is impossible. This cancelation of time and space as well as the conditions of the limits of a moving start in history of nature, are reference points of research and discussions of scientific and religion groups until today.

Empedokles 495 – 435 B.C.

For Embedokles, though “being” in a large scale is unharmed, static, complete and infinite, in a smaller scale “being” and its parts move. The basic elements that compose the world are water, ground, air and fire. Nothing becomes out of “not being” and nothing ends in “not being”. Under this theory a human’s birth and death are nothing but the unity and the separation of these first elements and their by-products. Therefore, these elements are infinite and immortal while matter itself is constantly changing. Soul for Empedokles is something out of this world and the only way to connect soul with God is through love.

Anaxagoras 496 – 428 B.C.

Anaxagoras believes in Eleatic Ontology. Nothing in this universe starts from zero and concludes in zero. Therefore, “being” is infinite and qualitative unharmed. Life and death is the forming and the separation of fundamental elements that by nature are constant. For Anaxagoras, cosmos with an inner approach, means “order within the cosmic system” while the creator of this order, is godlike spirit. Moreover, he supported that intellect power combined with the soul form the notion of mind.

While soul moves everything, mind is infinite, powerful , wise and can be found everywhere. Anaxagoras is the first thinker in the history of the world, that separated matter from spirit within the soul and non- soul entities. Furthermore, the notion of the cosmic mind includes all the laws that express the “godlike” activities.

Socrates 469 – 399 B.C.

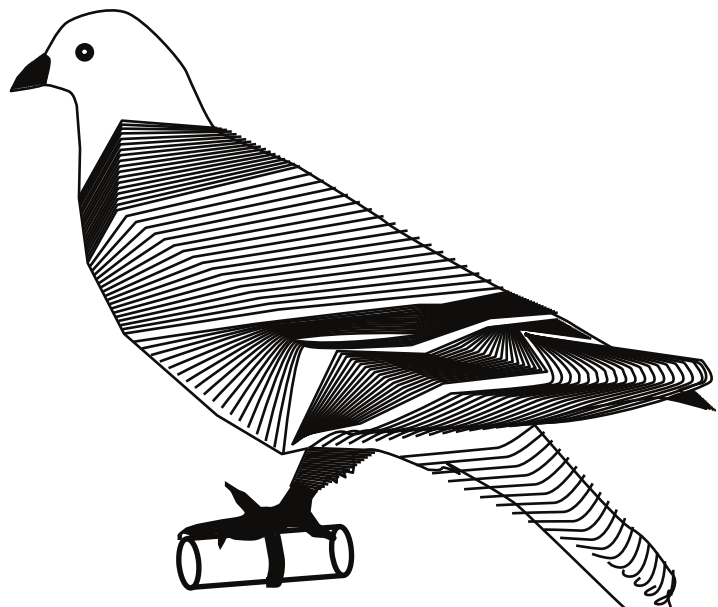
His life and teachings have provided the basic “fuel” in all modern thinkers, therefore Socrates contribution is limitless and defines “classic” among the fields of knowledge.

Plato 427 - 347 B.C.

Through his work, Plato, is placed among the top personalities of all times, along with his teacher Socrates and his student Aristotle. Through his works, Plato, presented and established various up to date theories. Among them, the true nature of love, the notion of precaution, the subjectivity of reasoning speech and ideas, the model of an ideal state, laws of physics and many more.

Aristotle 384–322 B.C.

Aristotle was one of the most important western philosophers, a student of Plato and teacher of Alexander the Great. Aristotle wrote on logic, nature, psychology, ethics, politics, and art. He is credited with developing the deductive reasoning. He is considered to be the “father” of science and scientific research.



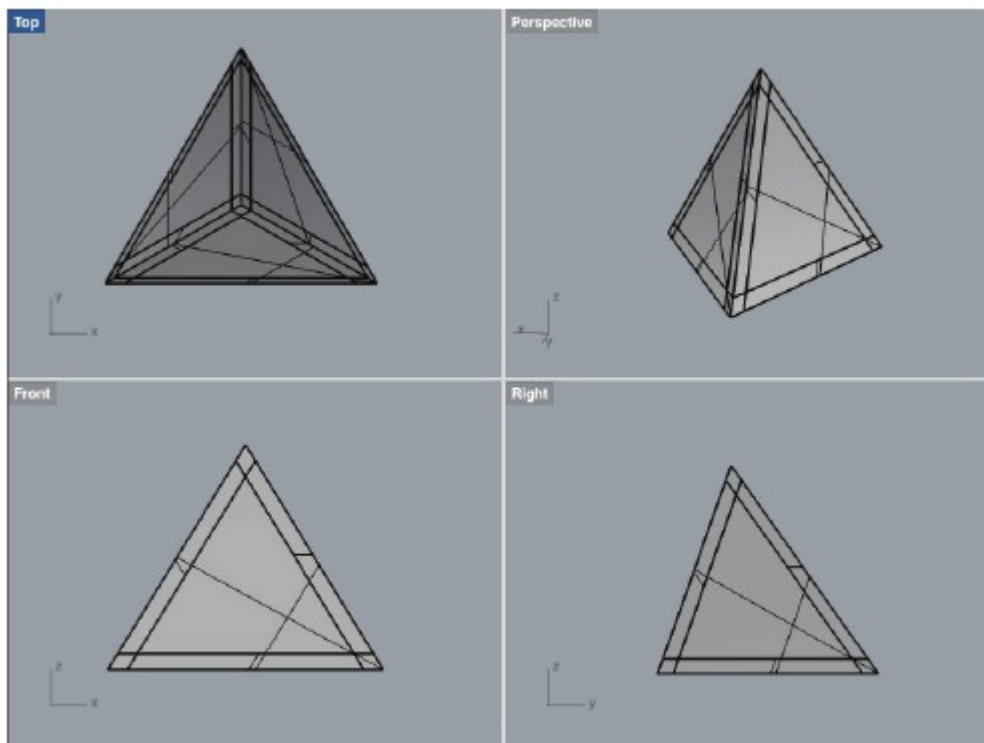
Few words for every solid and its meaning.

With “Timaeus”, Plato connects symmetrical defined geometries (Regular Polyhedra) with the fundamental elements of nature ⁴ . Tetrahedron symbolizes Fire, while it is considered easy to move, sharp, acute and light. Hexahedron symbolizes Earth, because it stands steady on its own base. Octahedron symbolizes Air, as it is considered to rotate freely around the theoretical axis that crosses two of its opposite peaks. Dodekahedron (12-hedron in greek) symbolizes the Universe / Aether as it correlates with the number 12 (months of the year, the number of ancient Greek Gods and Zodiac signs) Icosahedron symbolizes Water as it has the biggest Volume of all and also bears more potentials to be transformed into other fundamental elements. These geometrical entities interact with each other and produce the world we sense and feel.

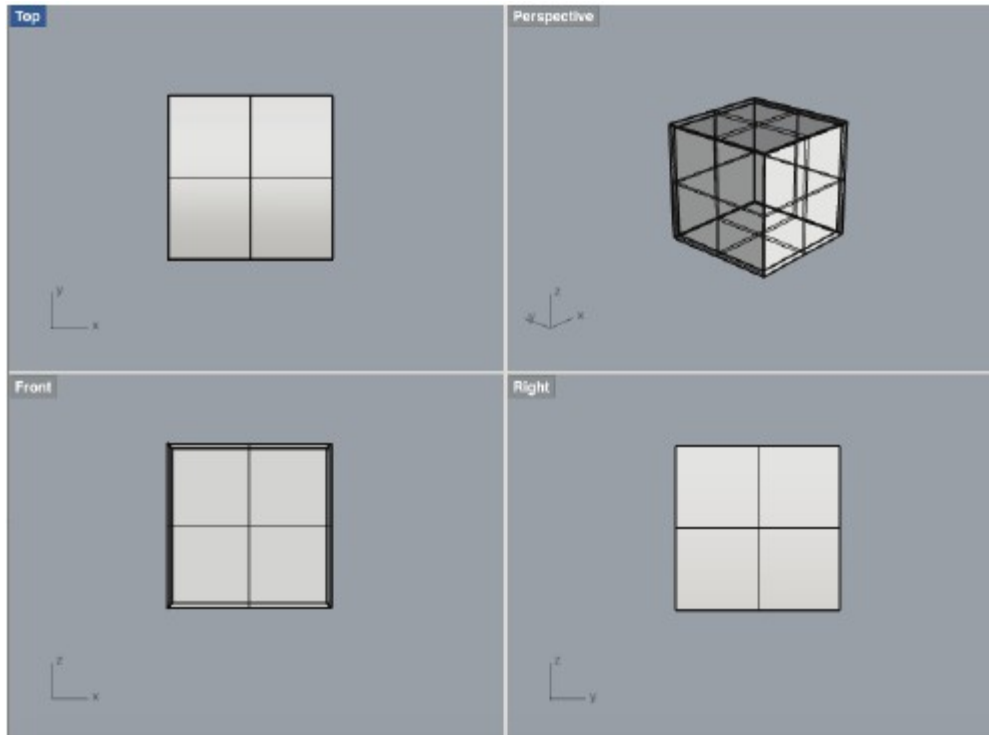
Before we continue with the transformations mentioned in “Timeus”, it is crucial to make some useful observations:

Platonic solid	Number of faces	Numbers of peaks	Number of acnes
Tetrahedron	4	4	6
Hexahedron	6	8	12
Octahedron	8	6	12
Dodekahedron	12	20	30
Icosahedron	20	12	30

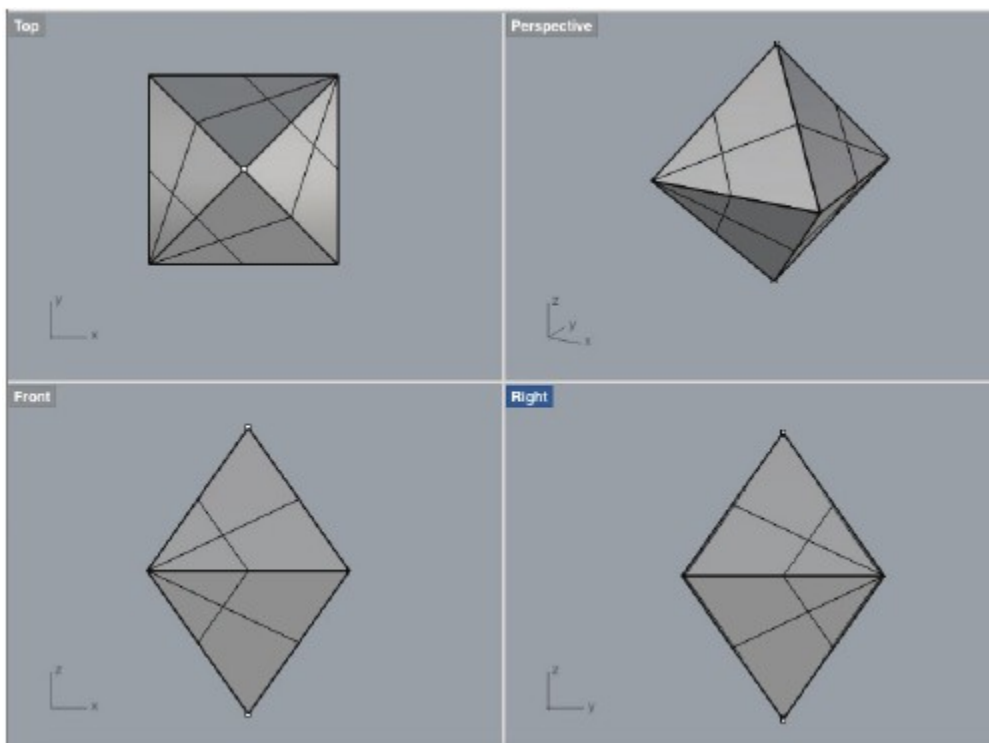
Hexahedron and Octahedron have the same sum of faces and peaks : 14 and share the same number of acnes. Same is the relationship among Dodekahedron and Icosahedron with a sum of faces and peaks : 32 and equal number of acnes again.



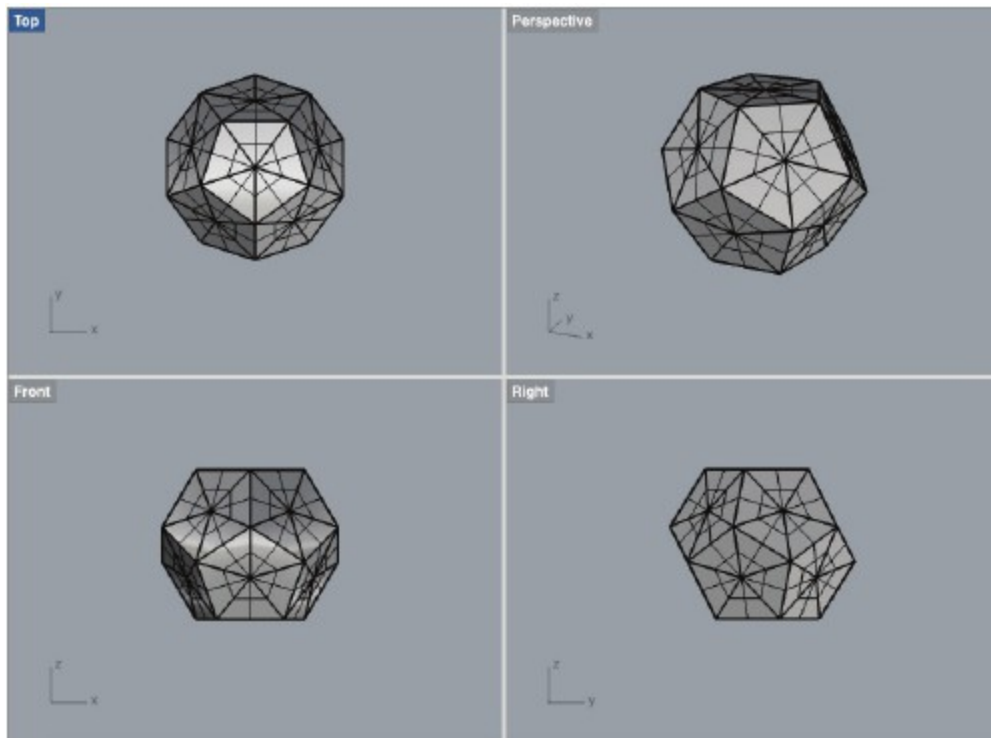
Tetrahedron the element of Fire



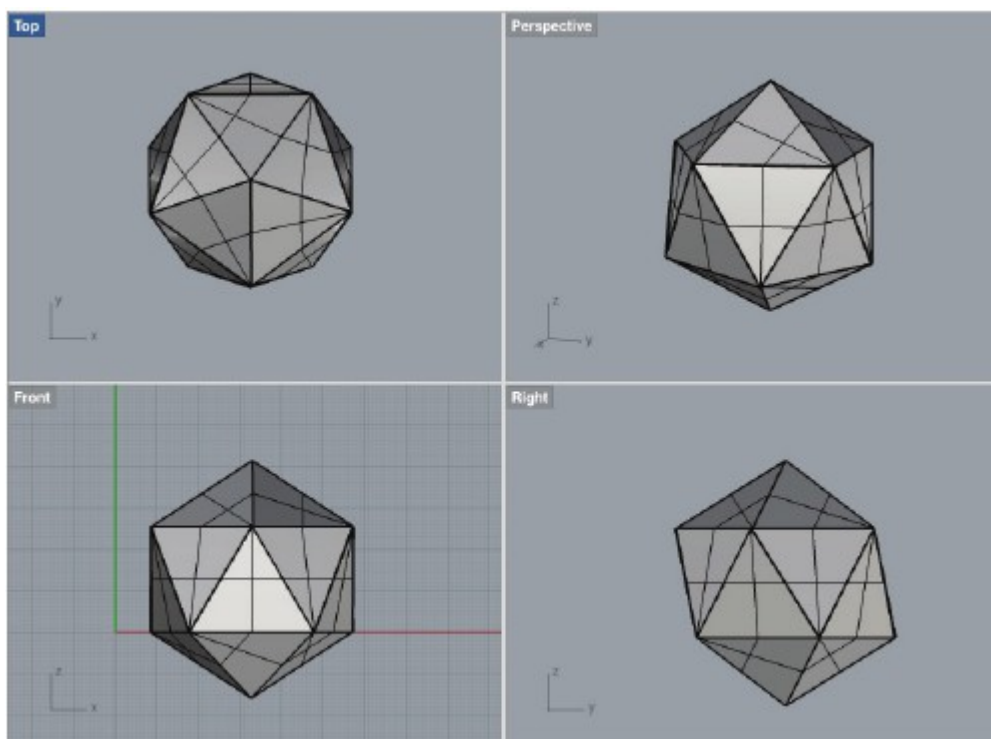
Hexahedron the element of Earth



Octahedron the element of Air

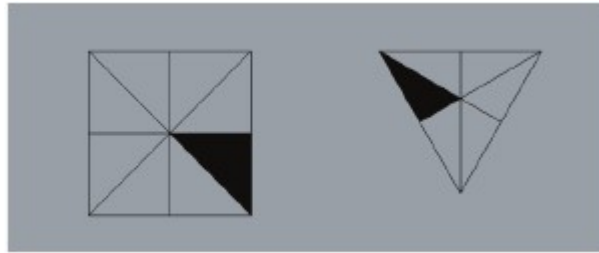


Dodekahedron the element of Aether / Universe



Ikosahedron the element of Water

All the elements (Tetrahedron, Hexahedron, Octahedron and Icosahedron) are composed from even smaller units. The basic units of all creation, are for Plato, two right triangles. The one with 45 – 90 – 45 degrees and the other with 60 – 90 – 30 degrees. These triangles have been presented, as a concluding outcome, after the, in depth, study of Pythagorean geometry and Empedoklean biology. The square shape is made out of eight 45 – 45 degree right triangles and the equilateral triangle out of six 60 – 30 degrees right triangles. The relative characteristics of these shapes, as mentioned above, allow “Timaeus” to apply transformations among them, Through Diophantine mathematical analysis ⁵. The transformation A (water into air), B (water into air and fire), C (fire into air), D (fire into water) with the following equations ⁶



Transformations among solids:

A. Water vaporizes (under special conditions) into air.

1 part of water – 2,5 part air

1 Icosahedron into 2,5 Octahedra

$$1 \cdot 20 \cdot 6 = 2.5 \cdot 8 \cdot 6$$

$$120 = 120$$

B. Water can be dissolved into air and fire.

1part of water – 2parts of air + 1 part of fire

1 Icosahedron into 2 Octahedra + 1 Tetrahedron

$$1 \cdot 20 \cdot 6 = 2 \cdot 8 \cdot 6 + 1 \cdot 4 \cdot 6$$

$$120 = 96 + 24$$

$$120 = 120$$

C. Fire is transformed into air.

2 fires – 1 air

2 Tetrahedra – 1 Octahedron

$$2 \cdot 4 \cdot 6 = 1 \cdot 8 \cdot 6$$

$$48 = 48$$

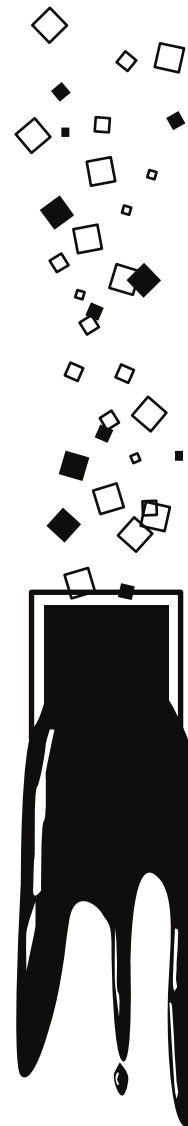
D. Fire is transformed into water.

5 fires are transformed into 1water

5 Tetrahedra – 1 Icosahedron

$$5 \cdot 4 \cdot 6 = 1 \cdot 20 \cdot 6$$

$$120 = 120$$



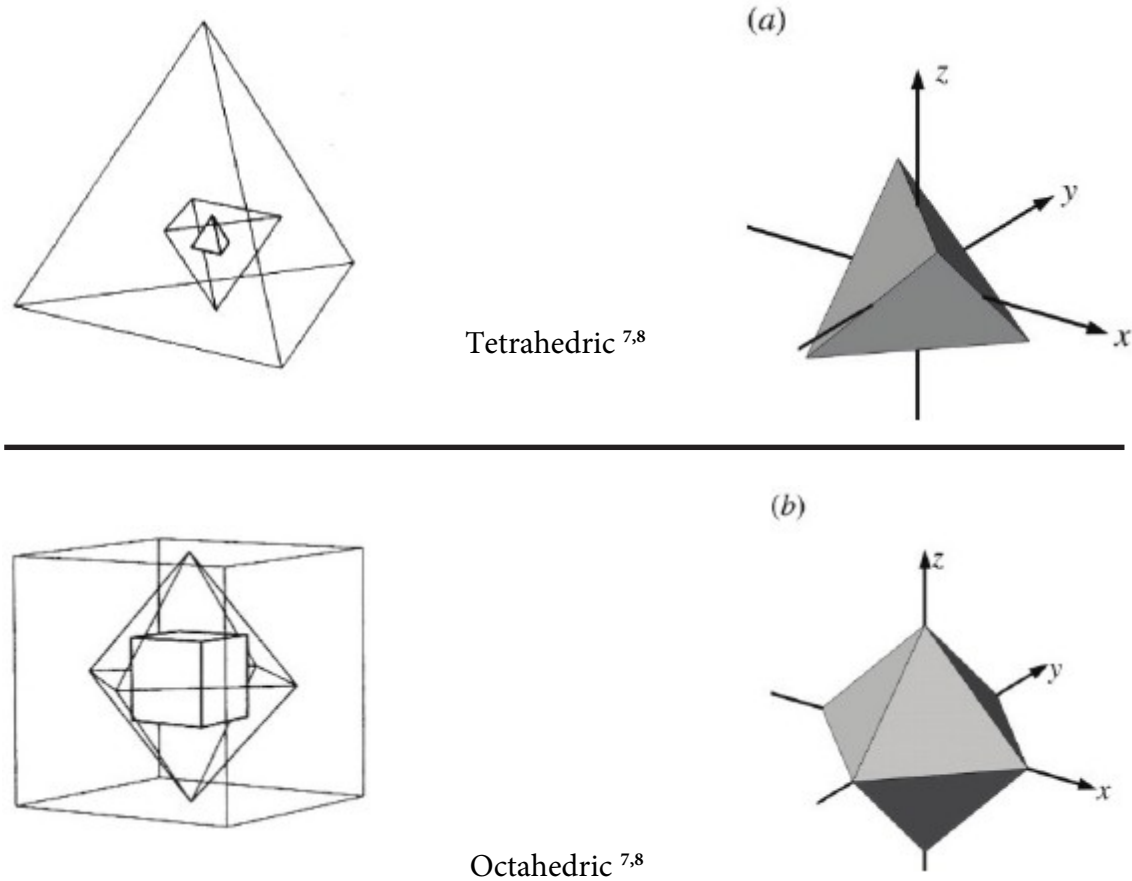
The reason that Earth (Hexahedron) is not a part of these equations doesn't reduce it's crucial role in the construction of the universe. Earth works as a storage place of the other three elements as well as a helper in the transformations and, of course, can be analyzed into them. (Hexahedron = 48 right 45 degree triangles).

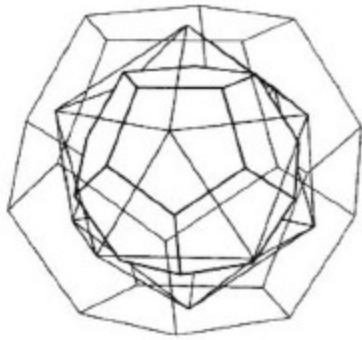
The fifth element, Dodecahedron, is referred in Timeus in a poetic way, but is presented more detailed in another work of Plato, "Epinomis". Dodecahedron (Aether / Universe) symbolizes the clear upper air, the residence of the Gods. It's model and deeper meaning has been a subject of various studies until today.

Plato separates his work from materialist Philosophers Lekipus and Demokretus and develops a theory of mathematical nature. Atoms through Plato, are flat geometric shapes that belong to the conceptual world of mathematics but also are finite. One regular Polyhedron can be transformed into another by simply exchanging some of their triangles, without creating a vacuum space throughout this transformation. The scale level of this transformation is impossible for the human eye to observe, but their results, do create our known 3D Euclidean Space.

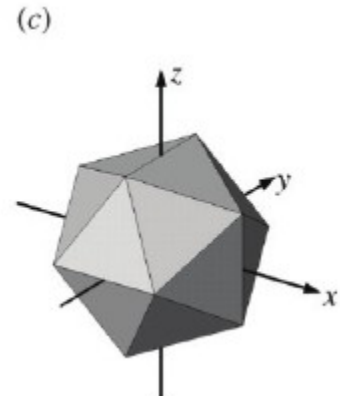
Furthermore, a series of symmetries around many theoretical axis reveal the "in space" connections among these geometrical entities.

Solids	Symmetries	Symmetry groups
Tetrahedron	24	Tetrahedric
Hexahedron	48	Octahedric
Octahedron	48	Octahedric
Dodekahedron	120	Icosahedric
Icosahedron	120	Icosahedric





Icosahedric ^{7,8}



Recent impact of Plato's solids

Many scientists and mathematicians (R. Descartes, L. Euler, J. Kepler) have been influenced by "Timaeus" theory, as well as many painters and designers by the beauty of these shapes, such as A. Durer L. Pacioli, L. Da Vinci. Le Corbusier. Recently, Plato's opinions on the Cosmos revived after the research by a small group of French and American researchers with Jean – Pierre Luminet as a head researcher at LUTH laboratories (Laboratoire Universe et Theories), Meudon, Paris.

They supported that the universe, seems to have the form of the regular Dodecahedron. According to their research, the universe is a finite, arched Dodecahedron, similar to the typical football. This model is able to explain better the measures of Cosmic (Big – Bang) radiation than other form models. In this theory, a ray of light that travels from point A, it eventually (in ideal conditions) returns to point A'. If we imagine a 2D space, and A is on the downside of a surface, then A' can be traced to the exact same location of A but on the side facing upward ⁹.

The work of the mathematician Jules Henri Poincare (1854 -1912) who studied many characteristics of Dodecahedron, concluding in theories of "Algebraic Topologie" (a study on the topological characteristics of these shapes) and "Groups de Rotation", as well as the connection of Dodecahedron with the "Theory of Graphs" by W. Hamilton (1859) .

Works such as "Timeus" have been serving humanity from their very start. The lifespan and ongoing contribution of this theory continues to fascinate.

Chapter 3

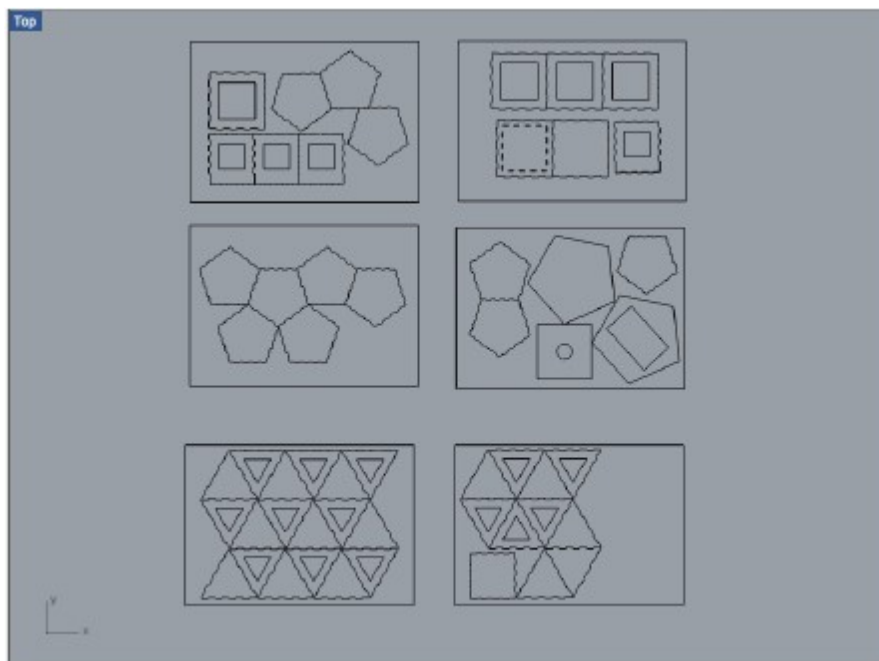
Technical details and functions

This chapter includes a more detailed explanation of this installation. The recreation of the regular Polyhedra was made through laser-cut procedure, in order to achieve high levels of precision and assemblage. Wood is chosen as the shell material (MDF 4mm) due to the convenience it provides, in terms of its further modification with household tools and the stability it creates to the final construction.

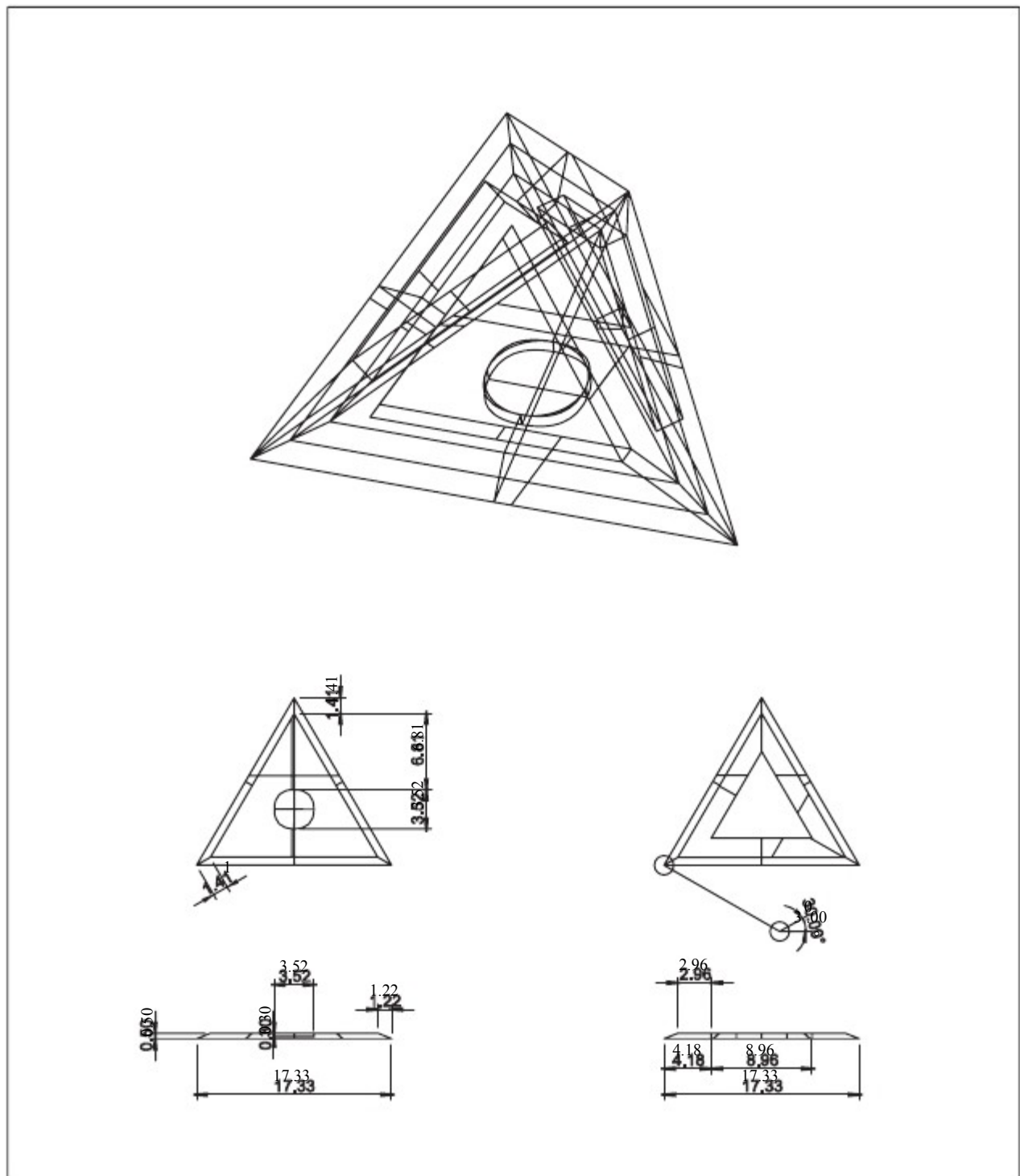
Emphasis is given to the center of every shape. Various ways are used in order to attract a viewer's attention. Movement, light, sound and texture variety, aim to reveal the esoteric meaning of the solids.

Tetrahedron - fire
Hexahedron - earth
Oktahedron - air
Dodekahedron - aether
Ikosahedron - water

In order to keep the right proportions among the Polyhedra, the installation, uses as basic building unit, the equilateral triangle [6* (60 -30 -90)] that creates one of the faces of the smallest solid (Tetrahedron). In this way, the volume analogy of the mentioned transformations, among the elements is easily observed.



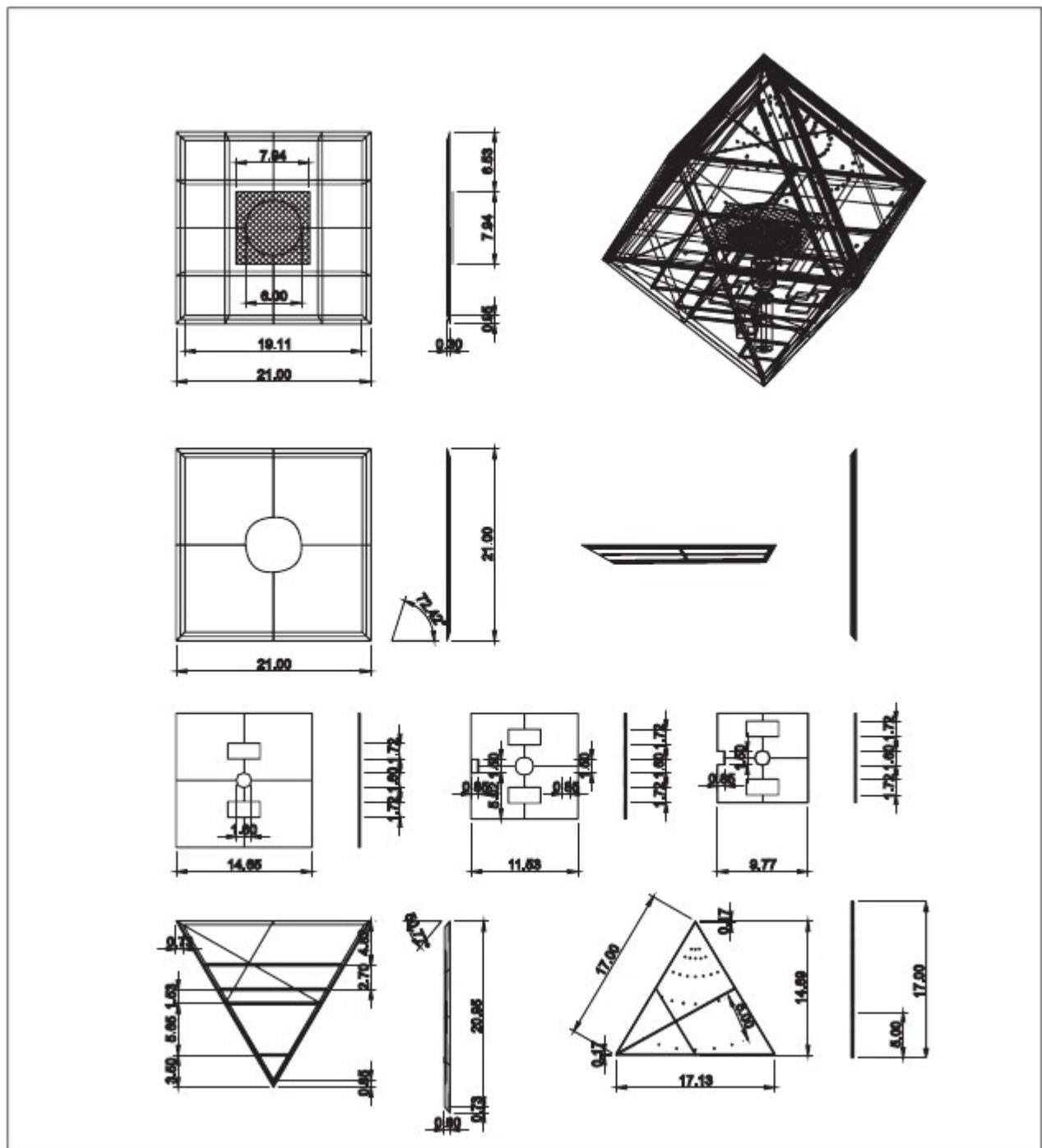
Final laser-cut plans



Tetrahedron plans

Tetrahedron

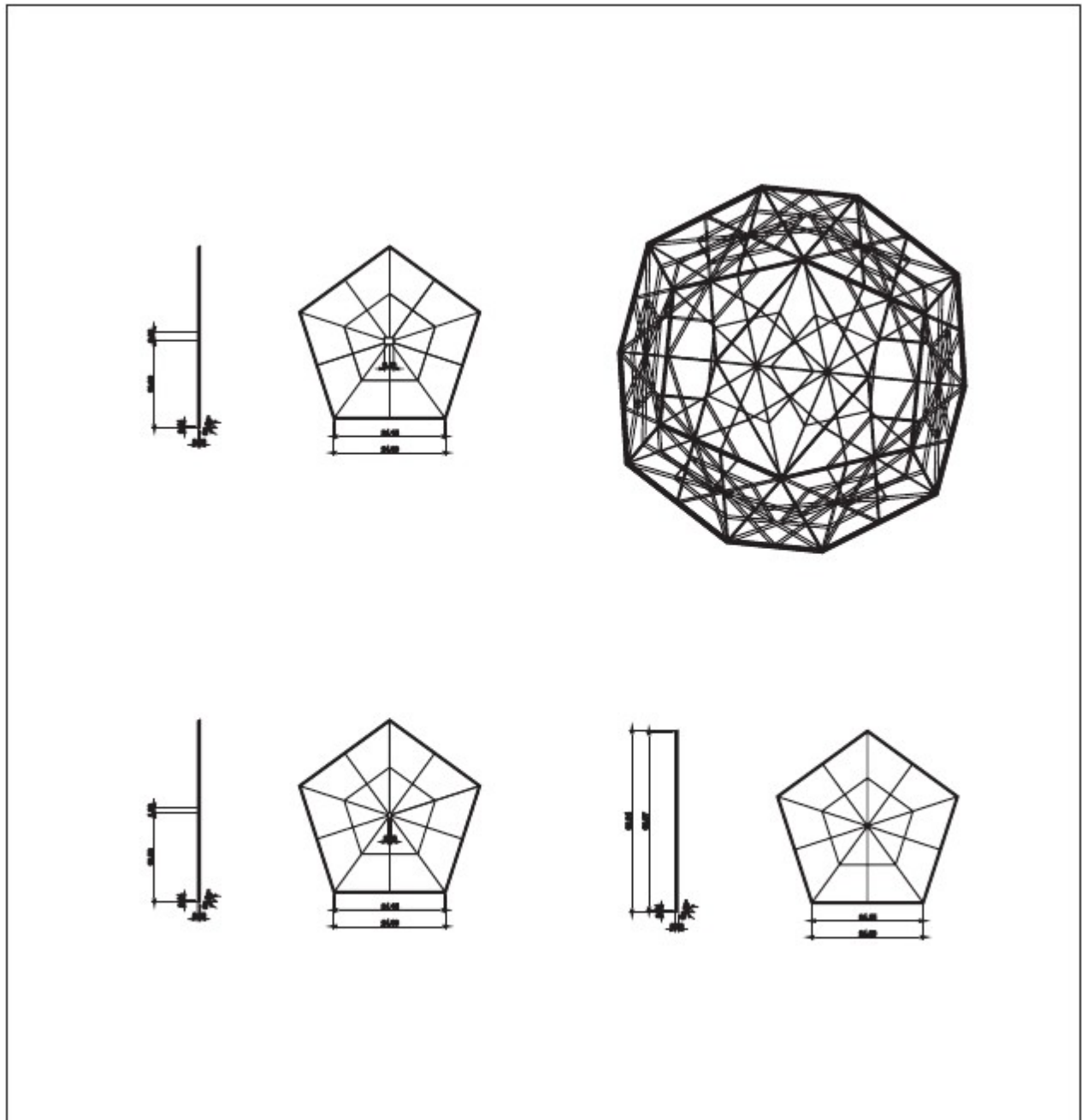
This solid, is designed to host a candle light. The geometry of the flame, is identical to the shell of this regular Polyhedron.



Octahedron plans

Octahedron

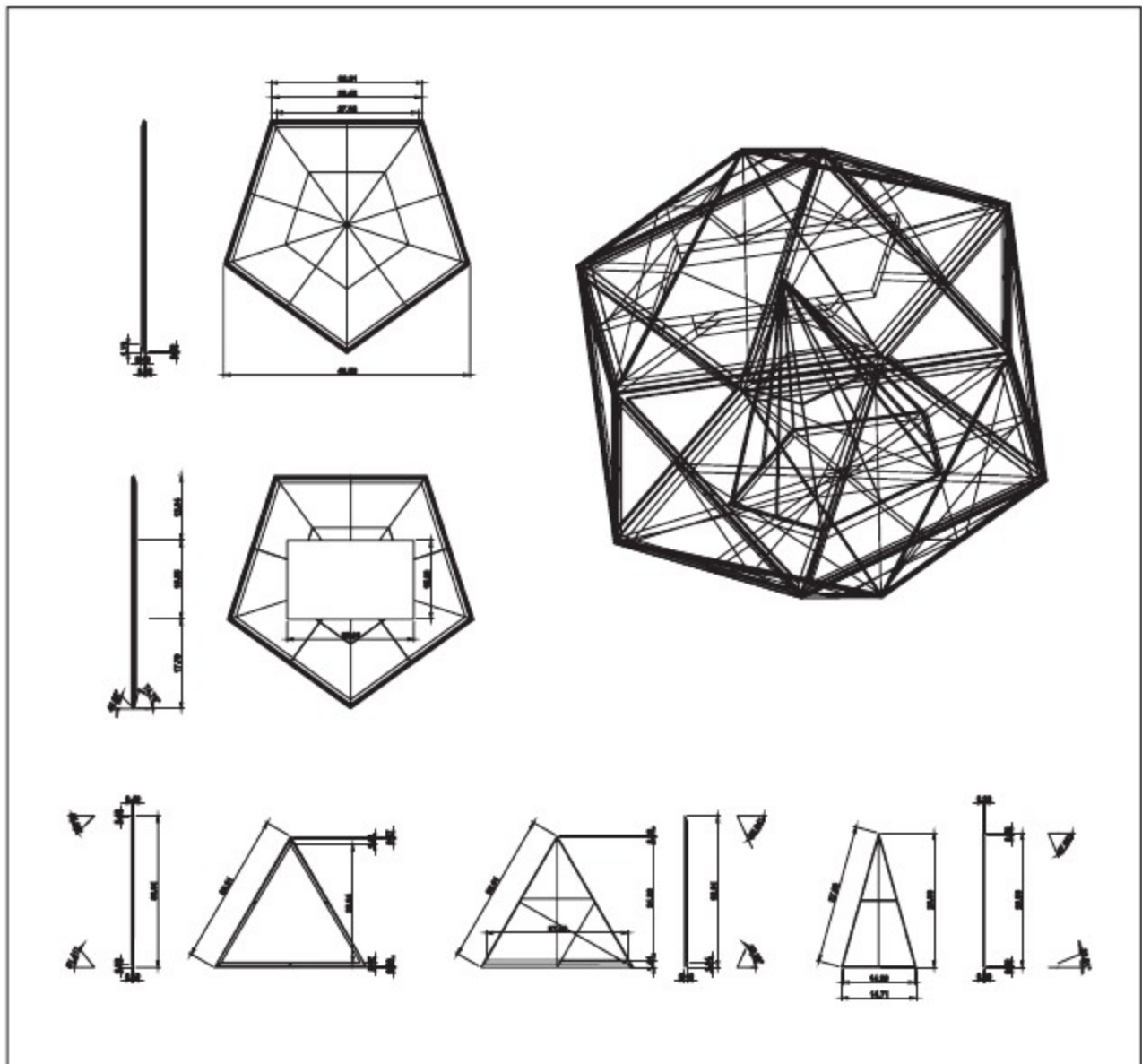
This solid, is designed to host a ventilator and styrofoam balls. The air current is revealed through the movement of the styrofoam balls.



Dodekahedron plans

Dodekahedron

This solid, is designed to host a light - sensor theremin. Prototype boards allow the visitors to experience a scaling of sound frequencies, as they interact with the shading of the sensor. Aether / Universe, as the most unexplained element, communicates with the audience through the notion of “waves” (lightwave to sound wave) as light qualities are transformed into sounds.



Icosahedron Plans

Icosahedron

This solid, is designed to host a projection screen and a reflecting prism. Through the help of video editing programs and the prism surfaces, a hologram of a living fish is being projected at the center of this solid.

This project works in three parallel levels around Plato's Polyhedra.

1 The solid shells.

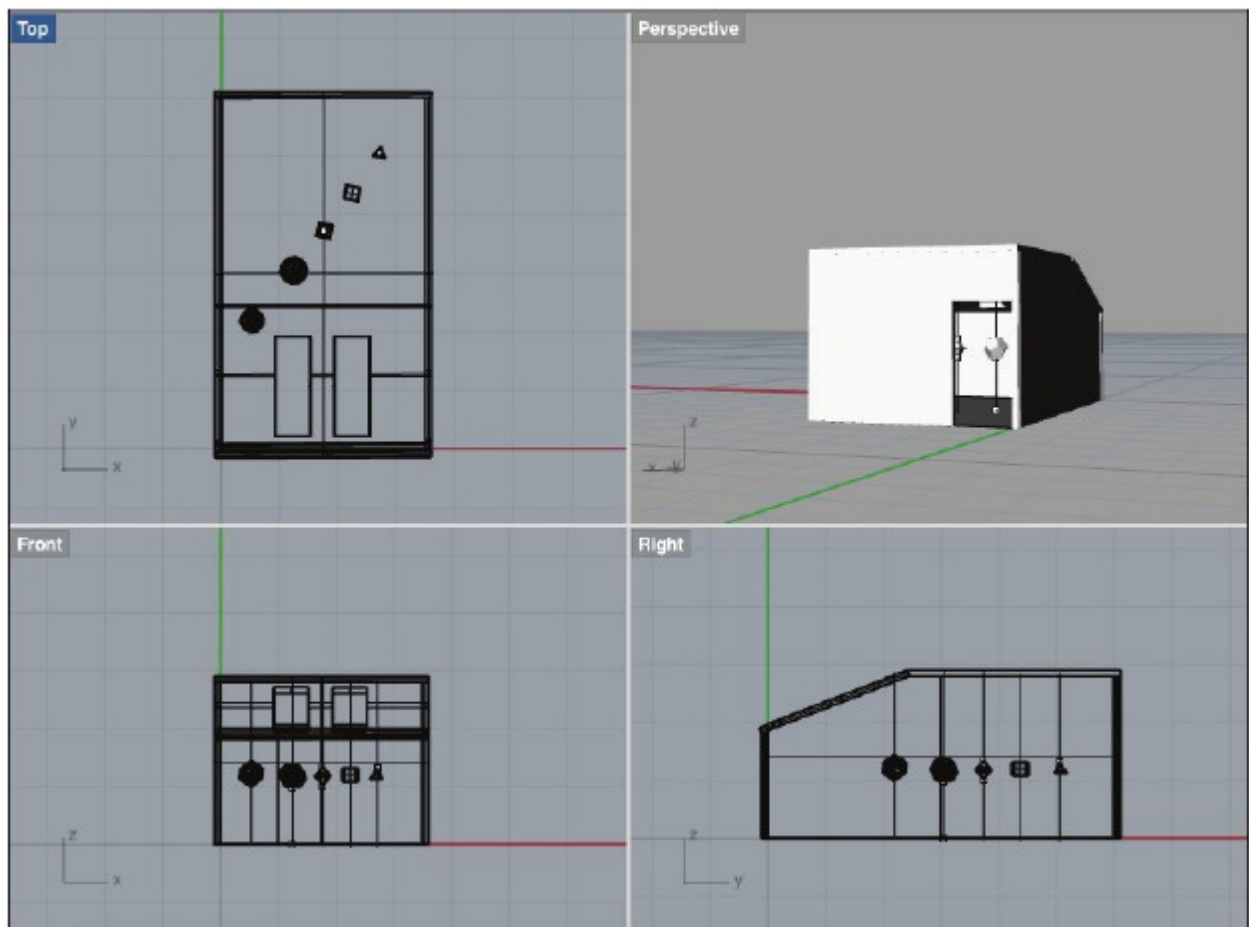
Firstly a walk from the element of "fire" to the element of "water" is being suggested. This path aims to reveal the "holistic" approach (Chapter 1). Moreover, the visitor of the installation is introduced to Plato's Polyhedra, the models that used to explain the composition of all nature.

2 Inside the shells.

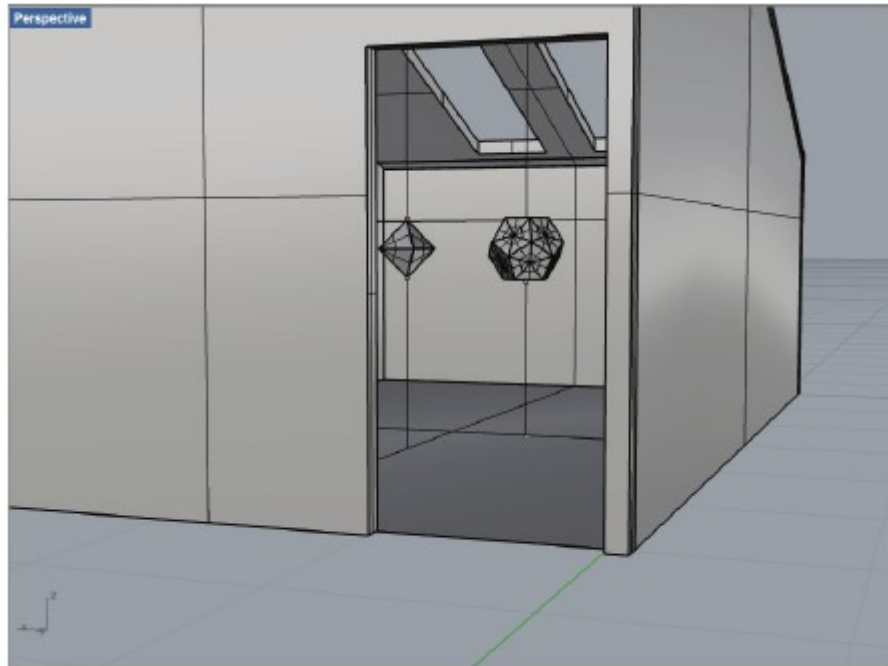
Through this walk, the openings at the surface of solids, aim to focus viewer's attention at their geometrical center. This decision, hopes to communicate a better understanding of the Platonic "meaning" every Polyhedron holds. A second perspective of these shapes is presented, giving an additive meaning to the strong symmetrical geometry that these shells create.

3 Outside of the shells.

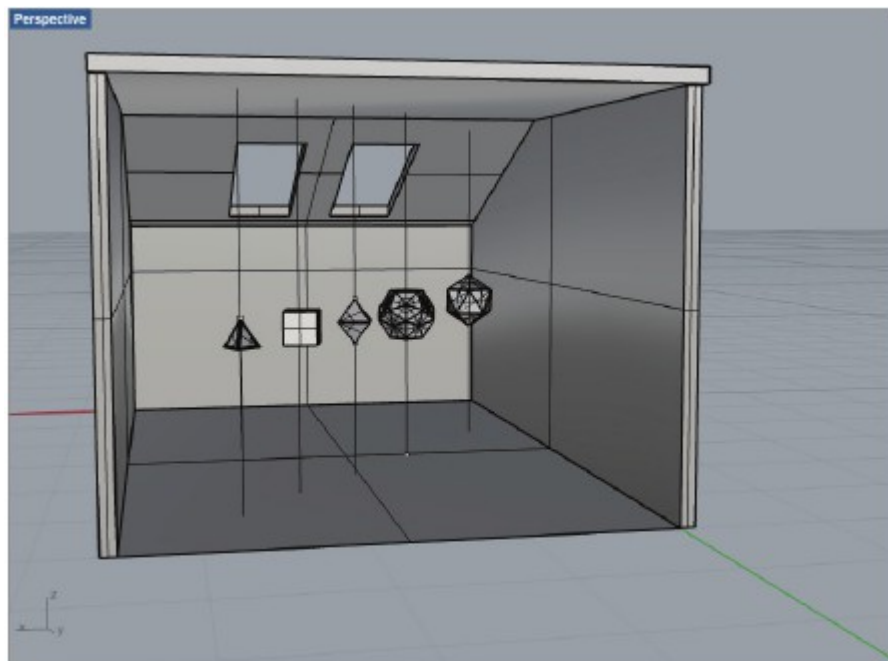
A geometric installation at the exhibition area, aims to change completely the scale of the so far, viewers observation. This change of focus, hopes to enact, a third level of observation, connected to "multi-perspectivism" (as mentioned in Chapter 1).



Seminar Room 93_3d Drawing



Ideas on the actual installation



Trying to eliminate the in-situ uncertainties

Chapter 4

Work Process

This installation aims to focus a viewer's energy, around the wide topic of global innovation and transcendent thought. The possible further enactment of a visitor around such theories works as a counterweight, to the surfaced image centered post - internet societies.

In a global scenario that seems discouraging, innovative solutions, will provide hope, into a promising future.

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