

**einar thorsteinn
olafur eliasson**
**to the habitants of space
in general and
the spatial inhabitants
in particular**

The book is dedicated to Elías Hjörleifsson

einar thorsteinn collaboration with olafur eliasson

Imprint

Title Olafur Eliasson / Einar Thorsteinn
To the habitants of space in general – and the spatial inhabitants in particular
Edited by Christine Kintisch, Bawag Foundation
Curator Bawag Foundation Edition
Brigitte Huck
Text and Design Einar Thorsteinn, epilogue by Olafur Eliasson
Plans and Buildings Einar Thorsteinn
Digital graphics Sebastian Behmann
Graphic design Einar Thorsteinn, Andreas Koch, Sebastian Fesel
Proofreading Ethan Sklar
Organization Caroline Eggel
Photographs anonymous photographer of Timinn newspaper
Dirk Buddenberg
Switbert Greiner
Frank Haugwitz
Haukur Halldórsson
Pat Kalt
Manuela Loeschmann
Ilse Schmall
Einar Thorsteinn
Cover Einar Thorsteinn, Andreas Koch
Reproductions CopyHaus, Berlin
Printed by Hausstaetter Produktion, Berlin
Edition 1500
Printed in Berlin
(c) Olafur Eliasson, 2002
ISBN 3-9501578-1-6
Volume 2 of the Bawag Foundation Edition
Volume 1 Florian Pumhösl, Champs d'expérience, Vienna 2002



Physics has found no straight lines – has found only waves – physics has found no solids – only high frequency event fields.
UNIVERSE IS NOT CONFORMING TO A THREE DIMENSIONAL PERPENDICULAR-PARALLEL FRAME OF REFERENCE.
The universe of physical energy is always divergently expanding (radiantly) or convergently contracting (gravitationally).

Buckminster Fuller 1895–1983

foreword

Our world is an enigmatic place; a place we all observe every day. And because of our common, learned definition of things, we assume that nearly everything is known about our natural, planetary and cosmological surroundings.

This is our first and most significant mistake; a mistake that we then build entire social and cultural structures upon – all of our own creation. These structures then become our commonly accepted reality, the “that’s the way it is” of our existential security.

In this complicated process of human awareness, there is but one trade, or human endeavor, that has the accepted course of contradicting this way of thinking, consciously going against our existential security. This trade, of course, is art.

More than that, it is the outright duty of art to go this alternate route, to disassemble the rigidity of our common thought-structures. If art does not fulfill this purpose, or does not explore the freedom of this specific quest, it becomes no more than decoration for the social elite.

From this perspective, it is easy to understand that without the spectator, art is without meaning. But further, without an understanding of our ability to process reality, or an appreciation of the role the artist can play in this, the spectator could misinterpret his own role in the larger observational process through which he ultimately defines his place in the world.

Ideally, through this observational process he would draw ever closer to a conclusion of how the human being is actually put together, and thus functions. This understanding would eventually allow the spectator to iron out his or her conflicts with existence.

Observation is the very first issue on the agenda of understanding. And even though forms and structures are delightful phenomena to observe and study, once you have played with them for some years and then put them in their place, it is their background that then becomes more interesting.

For me, it has also been like that; moving from logical ways of how loads can be naturally supported, through 3D geometric studies where the capacity of the human brain reaches its obvious limits, and then on to the multi-dimensionality of things. And then further, where the human side of observation is investigated, and the circle is closed.

So today, it is no longer the forms and structures of the observable phenomenal world that are my playground / working area. These are more like a trade I used to work at, and still can. Instead, it is the conditions of the observer him-, or herself, on a multi-dimensional level, that has become my focus of study.

And as many before me, it is here that I come into conflict with our present reality structures, and therefore with our culture. As a matter of fact, I have to be defined as an artist to get away with it!

It is our western cultural reality that is at stake here, where, for example, the definition of human consciousness is so onedimensionally / materialistically defined that it becomes agreeable to call the intelligence of machines, “artificial intelligence” or AI.

I should say a few words about multi-dimensionality at this point in order to avoid a misunderstanding. Our so-called space-time dimension of the visible universe, is only one dimension of the many “sandwiched” into our being.

Similar to the invisible zero-point energy field that penetrates the universe and that our most creative physicists have managed to present to us intuitively, the original energy “field” of our being, which I like to call the “human field”, is also invisible to us. But it is of ultimate importance to our existence.

Both fields provide the basis and framework for known phenomena; on the one hand for what we know as matter defined with physical laws, and then for what we know as physical human beings but are still trying to define. Without this invisible background, we would not exist as visible and tangible matter.

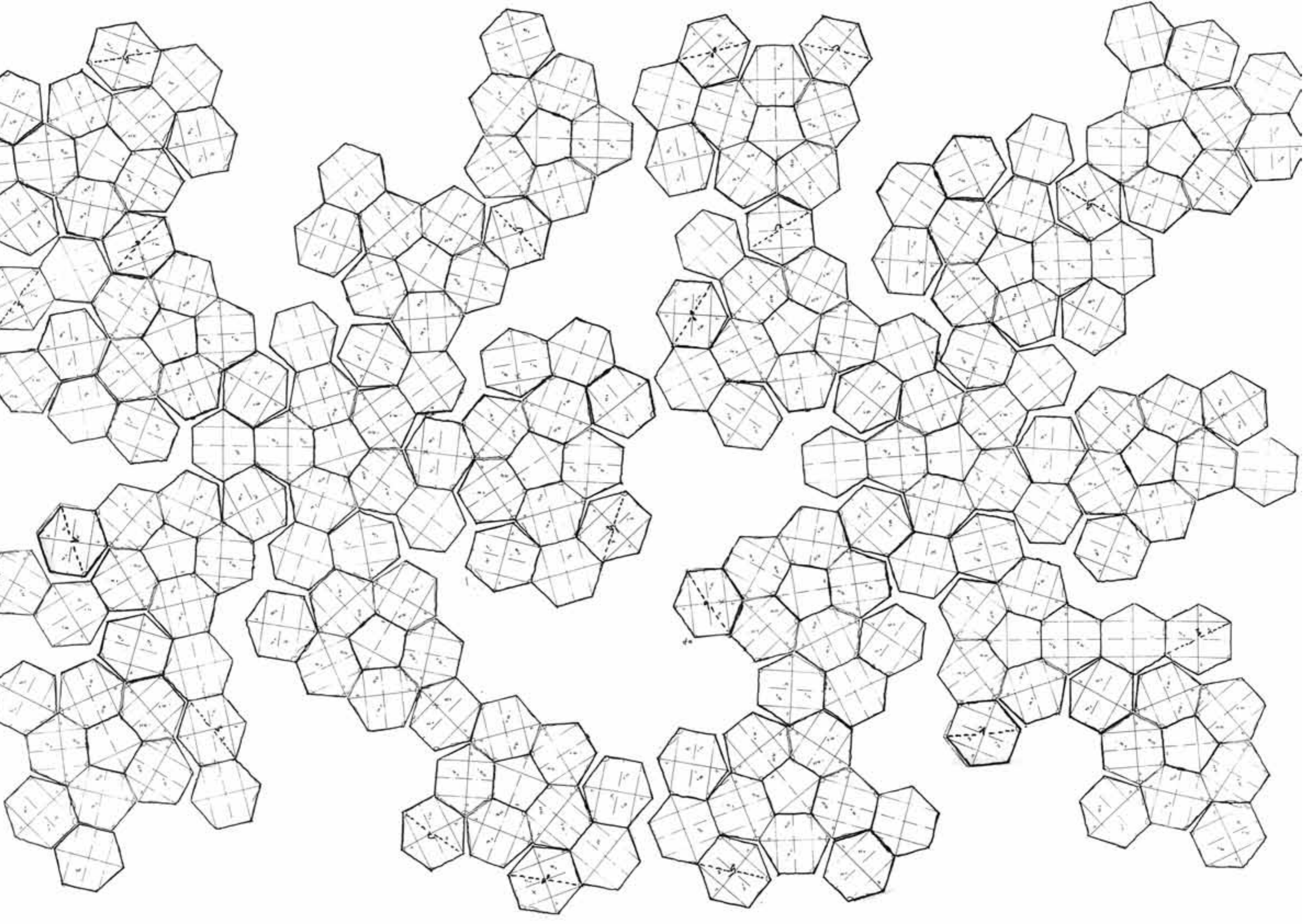
In our case, the “human field” happens to be supported by at least three phenomenal dimensions of different accessibility to – or freedom from time and space, hence our multidimensionality. But on top of that, we have a second type of “is there”, indefinable by our phenomenal standards.

To my satisfaction, I have found a natural inclination towards these same issues in the work and philosophical background of Olafur Eliasson. My part in our collaboration has been to recover some formal and structural studies from my “attic”, though still far ahead into the future for many. In the process, some new things have developed as well. Some have fit into his aesthetic approach, others not. But also, I have given structural definition to some of his new form-finding ideas.

But most important of all in my view, Olafur has marked himself a good starting point in the real sense of what art stands for. Thus, consciously or not, he is able to work towards “breaking up the rigidity of our common thought-structures” with his art.

This process will function as one more stepping stone on the long road that will ultimately lead us all towards a new and less destructive reality.

*Berlin, August 20th 2002
Einar Thorsteinn*



geodesic domes

8900054



"In January 1964, I was just some three months into my architecture studies at the Technical University of Hannover in then-West Germany when something crashed into my consciousness that still matters to me.

At that intersection in time (just seven weeks earlier president Jack Kennedy had been shot to death in Dallas Texas), I received through the mail my new issue of TIME magazine. And with a mixture of awe and surprise, my gaze was fixed upon an unusual, but beautiful, picture on the cover by the Russian-American painter Artzybasheff.

This picture spoke volumes to me then without thinking, or having to refer to what I already knew, and an immediate déjà-vu type of recognition took place: "This is it" – like it had always been...

The man on the cover, of course, was Richard Buckminster Fuller, someone I had yet to hear anything about. He was pictured there with a geodesic dome on the top of his bald head. And around him were a few of his objects, all very fascinating to me.

Anyway, at this very instant I knew from my internal dimension that this was the correct way to go in architecture. And I later proceeded to go this sustainable way.

This was my first contact with geodesic domes, almost forty years ago."

"Although I am sure most people have heard of geodesic domes, it is not without reason that a few facts about this fivefold symmetry structure should be mentioned here.

In historic architectural retrospect, the construction of a dome was a step in material efficiency due to form comparable to the Roman arch. Only in this case, the construction is comprised of a pretty complex, doubly-curved surface, whereas the Roman arches were one-directionally curved, and thus a more simple concept.

Through many centuries of known cultural history, only a few, however large, masonry domes from ancient times are known today.

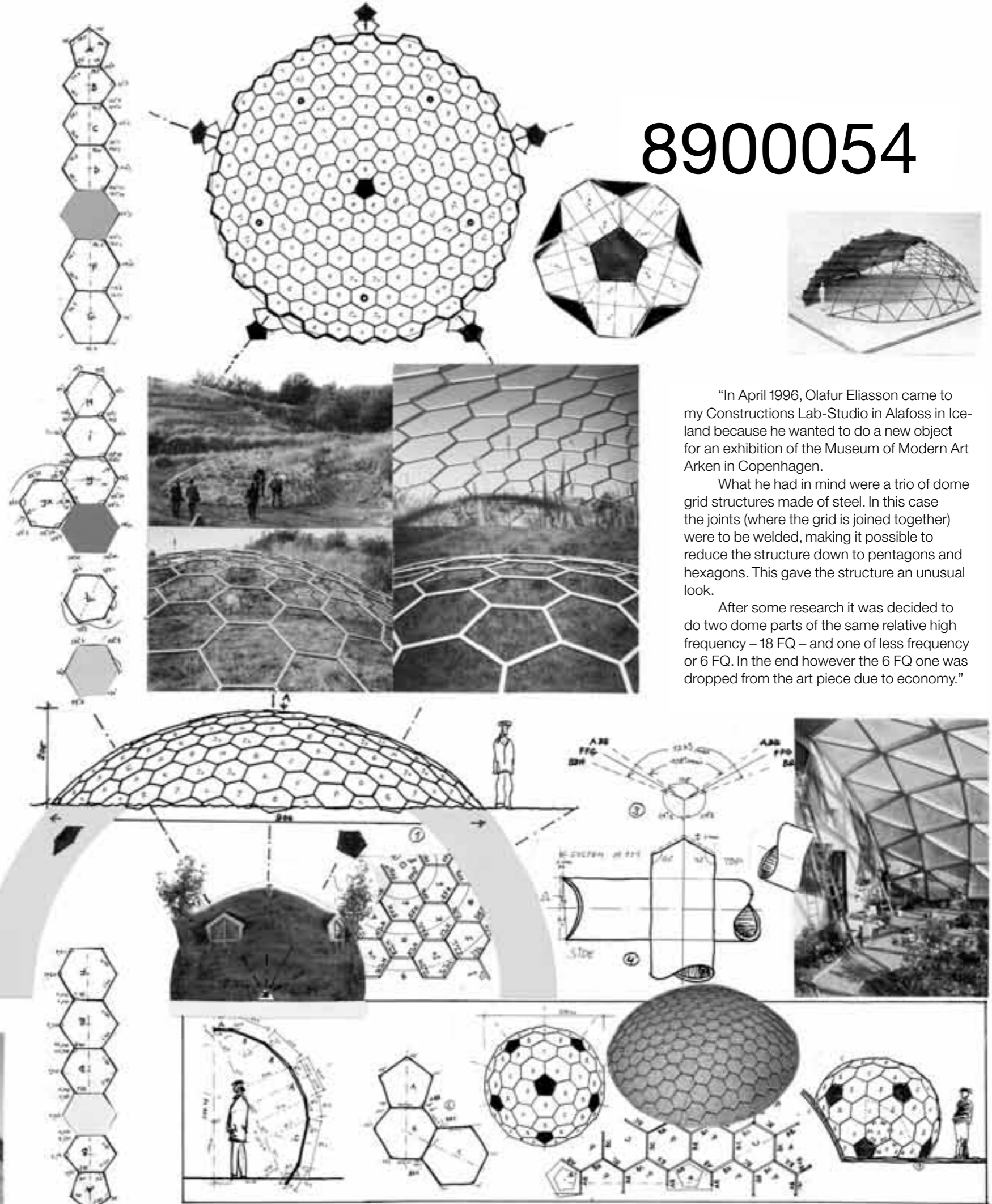
But then, as the industrial revolution could not be stopped any longer, the idea of mass-produced components was born. And it would follow that a geometric division of the dome into components was needed to produce them.

There exist two German books from the middle of the 19th century that took on this new challenge. As a result, it should surprise no one that by 1923, the first metallic geodesic domes were constructed by the Zeiss Ikon Factory in Jena, Germany.

They were only used, however, as the rigid interior structure of ferro-cement domes for astronomical centers. This was done in connection with a visual demonstration technique developed by that company. The engineer and developer of these first geodesic domes was Walter Bauersfeld.

Much later, or in 1949, after all those German structures had been destroyed, along came Buckminster Fuller, a man of many talents, who rediscovered the usefulness of the dome. And he received a patent on certain construction details.

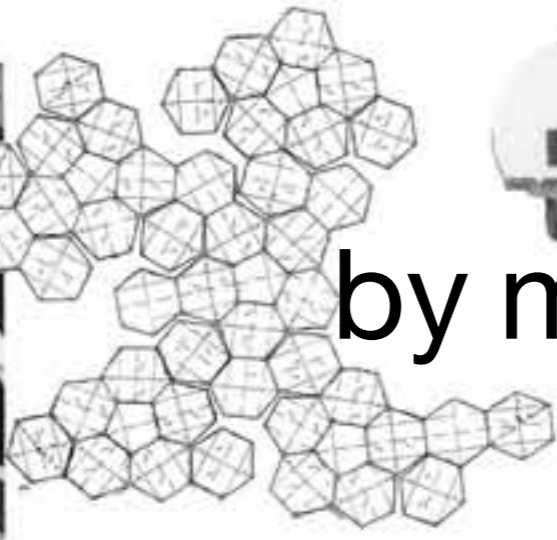
Domes were only one of his many projects, however he came to be known best for them. And he is today the Father of the Geodesic Domes."



"In April 1996, Olafur Eliasson came to my Constructions Lab-Studio in Alafoss in Iceland because he wanted to do a new object for an exhibition of the Museum of Modern Art Arken in Copenhagen.

What he had in mind were a trio of dome grid structures made of steel. In this case the joints (where the grid is joined together) were to be welded, making it possible to reduce the structure down to pentagons and hexagons. This gave the structure an unusual look.

After some research it was decided to do two dome parts of the same relative high frequency – 18 FQ – and one of less frequency or 6 FQ. In the end however the 6 FQ one was dropped from the art piece due to economy."



by means of a sudden realization

"I first had contact with Buckminster Fuller (or Bucky as we used to call him), in the summer of 1966. I had just finished a student university project at the industrial design department with Professor Jansen of the Technical University of Hannover.

It was the ground breaking "spherical house" for me. I designed a three-story apartment into a 1000 CM diameter sphere, complete with interior design and even appropriate city structure outlines.

I naturally sent a copy to Bucky, and his wife Ann answered my letter in a friendly tone. I later showed that letter to Bucky and it surprised him to see that his wife had taken some load off his back in this way, probably answering lots of other students' letters to Bucky.

In 1969 when I was working as an architect at Frei Otto's Atelier Warmbronn near Stuttgart in West Germany, I needed to contact Bucky again because of a project I was doing there.

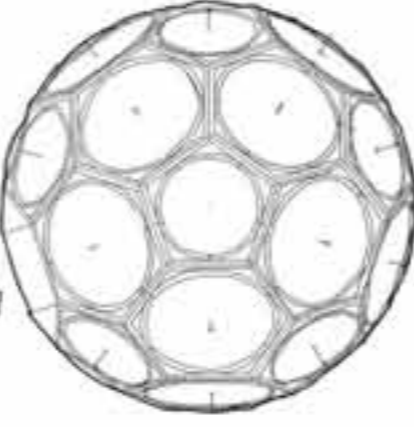
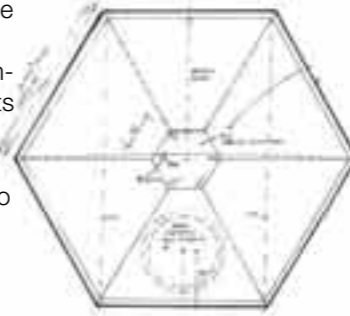
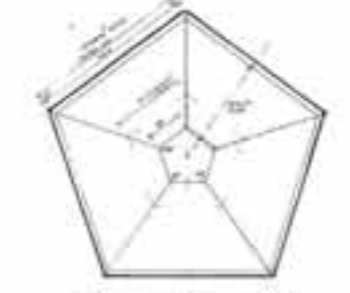
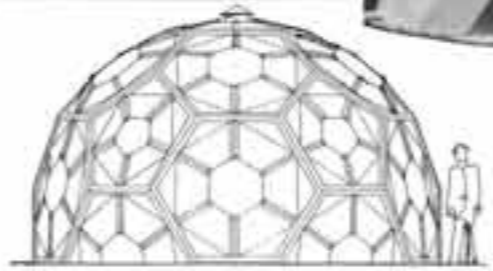
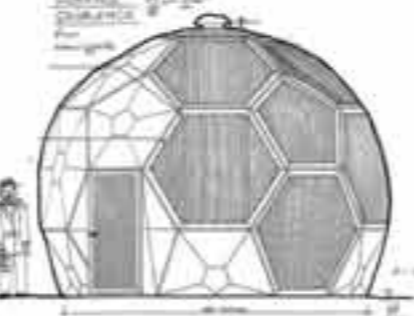
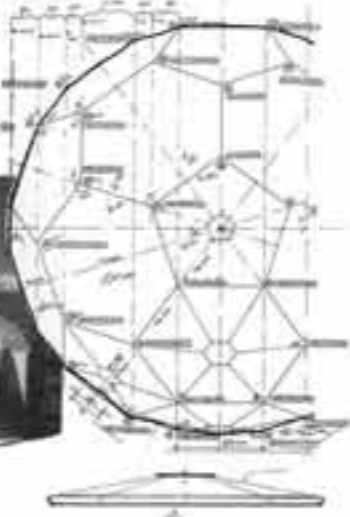
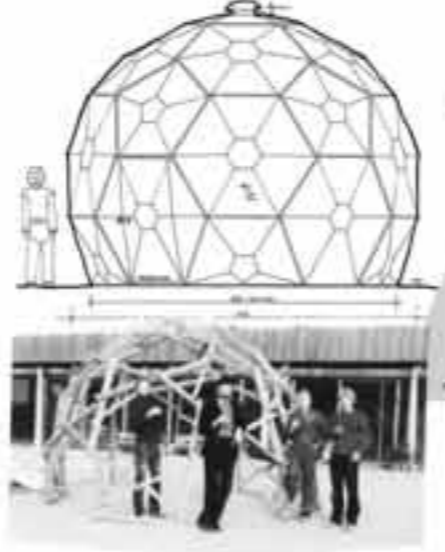
But it was in 1975 that I first met Bucky in Iceland and we had many discussions about various subjects. I soon found out that his interests were far and wide but somehow always connected through humanity's success as the intelligent species of Space-ship Earth.

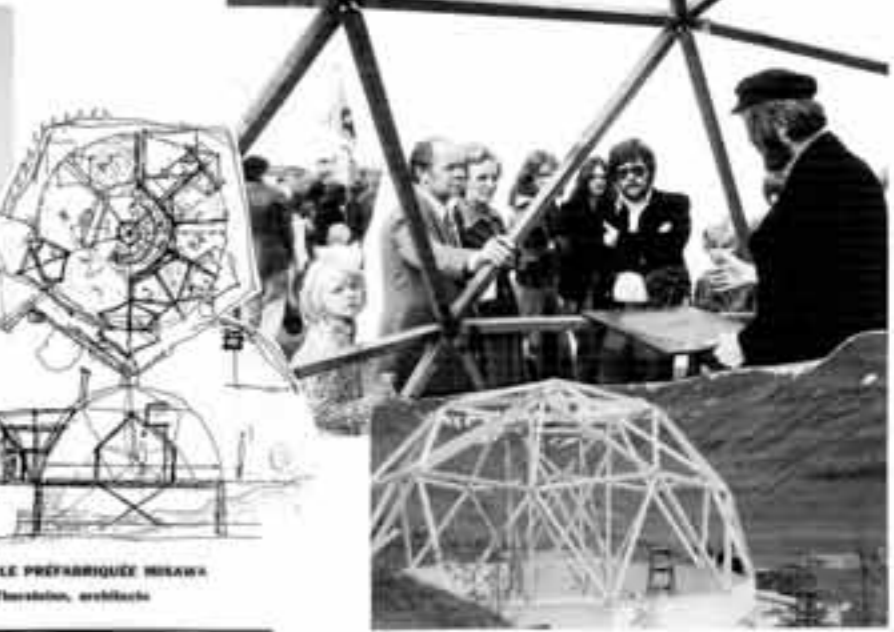
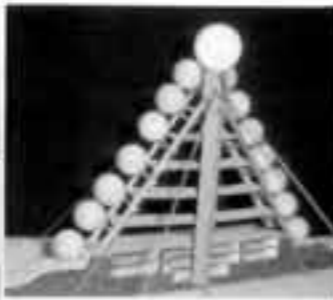
This first meeting with Bucky rekindled my interest in geometry. I soon found some intriguing regularities that I absolutely had to do research on. I am still working on them.

That led to my first book in 1977: "Nature's Forms", for which Bucky selected the title and also wrote the foreword. He came again to Iceland that year, and then once more for the last time in 1979.

That same year, I visited Bucky and Ann in California where they stayed the winter. I met up with him in Philadelphia, too, where he had his main office. I particularly remember Bucky cooking fish for us in the motel in Santa Monica where we all stayed.

Bucky was a delightful source of ideas, most of which were so sensible that they are still not considered acceptable into our culture, except as a side show."





"There are basically two different constructive methods for building geodesic domes. One is as a grid that has beams, connected at the ends in joints. The other has plates added together and connected along the edges. I designed my first "plate" geodesic dome in 1980. This was for the geothermal project at Krafla. Later others followed in Iceland, as an answer to the energy crisis of the mid-Seventies was to increase the use of geothermal energy.

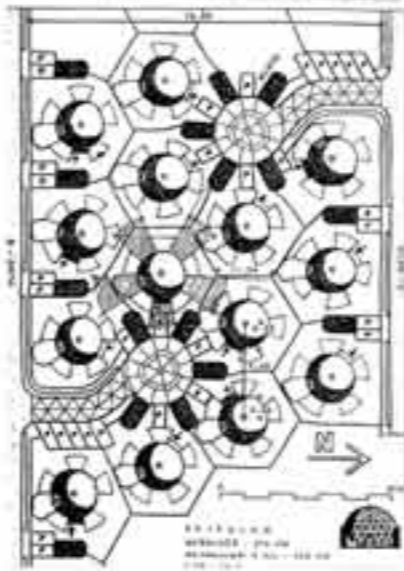
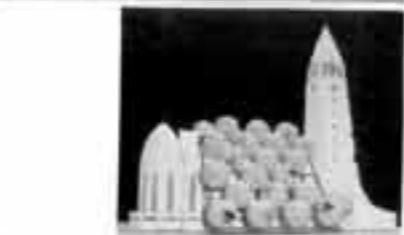
Those weather covers comprised over twenty years were small fiberglass domes of different sizes and of different detail design. As a whole, they consist of some 50 buildings. After that, some bigger aluminum domes were built as well, for the same purpose. These can be seen in some geothermal areas in Iceland.

An alternative use of the same structure was a radome for the airport at Akureyri in 1984 and a trekkers hut in the highlands near Myvatn lake.

Plate domes made of plywood followed this. They were for various uses: a summer-house, a garage and storage room.

The difference between the two materials is that the fiberglass elements can be pretty large, or sensibly up to 50 Sq Ft, whereas the plywood plates are usually much smaller.

No matter how large or small the building elements need be, the different frequencies possible for geodesic domes allows for any kind of material variation."



"The fiberglass dome that Olafur used for his art piece, that now has been sold to Brazil, is of this same type. A complete sphere is in the works as part of an art piece to be exhibited soon.

I have always had the opinion that a complete sphere is a more elegant form than a dome, besides the fact that it has a complete structural integrity. I started out my voyage into the world of geometric structures with my proposal for a "spherical house" in 1966 in Hannover.

Bucky's "flyeyes" dome of 1972 was also originally designed to be a whole spherical structure to behold a worldwide deliverable residential unit.

My second attempt at a spherical house was the Misawa competition proposal of 1970. After my return to Iceland in 1972, I rearranged the settings for this home unit and proposed to use them as apartments for theological students. The city site was then intended to be the Halgrims-church in Reykjavik. And in the style of past times I wanted them to be as close to the church as possible. So I proposed to add them on top of the church roof.

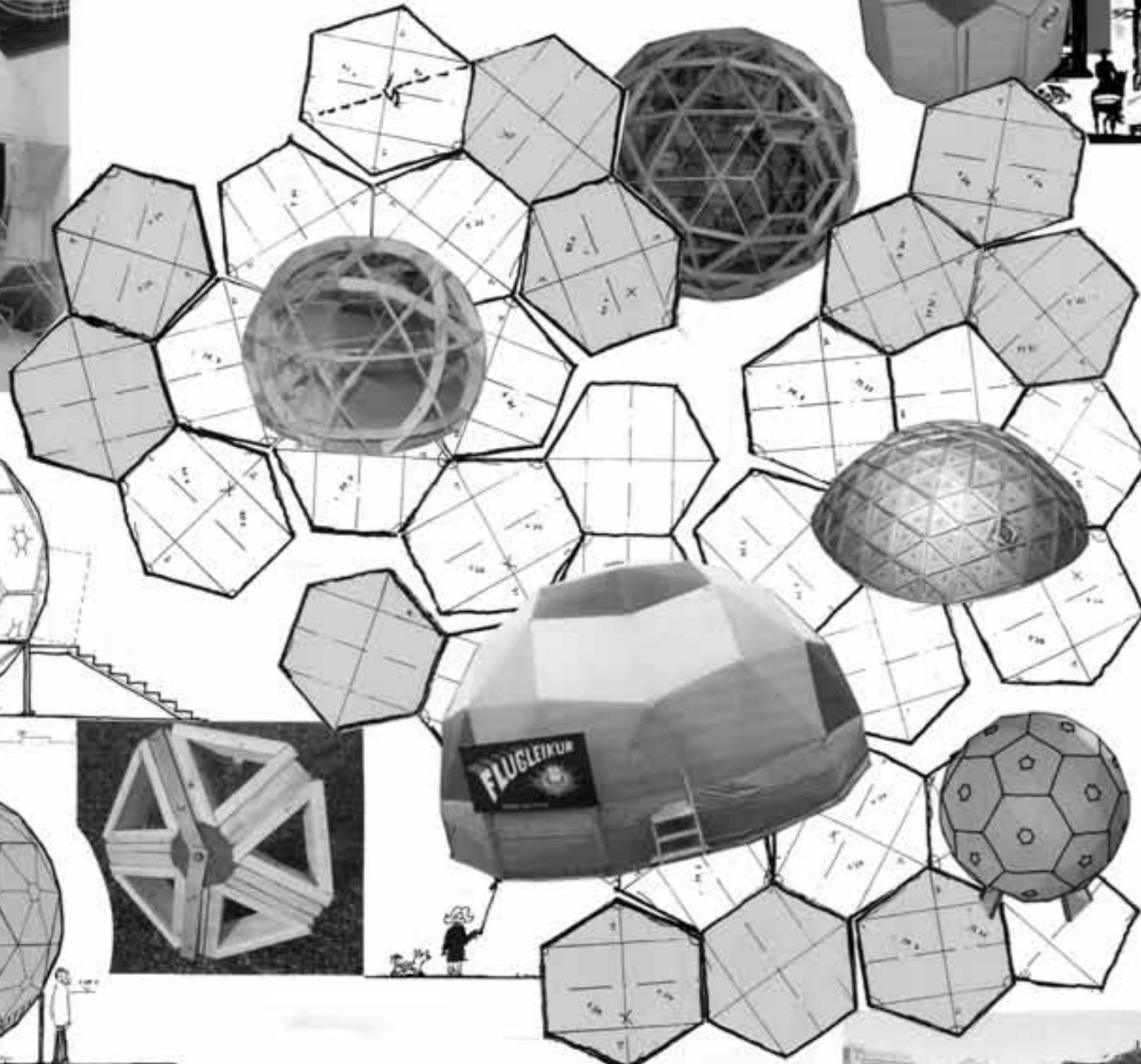
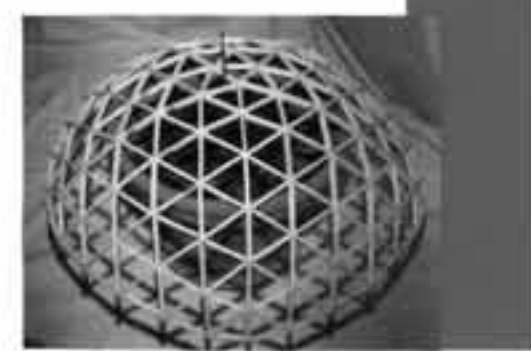
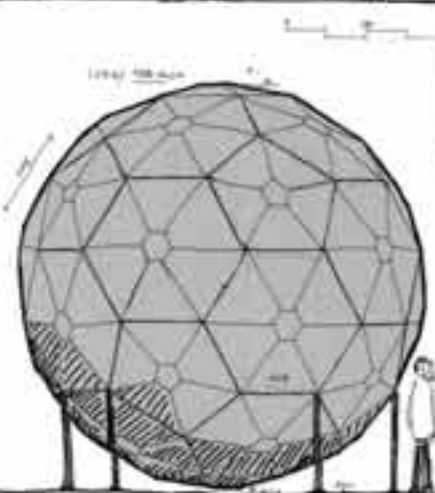
This was somehow misunderstood by the church authorities as disrespectful, but in fact, it was only logical. The church tower already had a fast moving elevator so it was ideal for the theological students to get into their apartments.

It is quite true, on the other hand, that I had at that time left the religion I was born into."

CAPSULE PREFABRIQUEE MISAWA
Einar Thorsteinson, architect



research for new projects



"One of the most important parts of my activity is research work. Whether it is in the area of structures and forms, or the phenomenal multidimensionality of things.

Of course the former is far easier to accomplish, though the latter is more interesting. Both are a never-ending enterprise.

It is not as though I have only been looking into geodesic domes. But this form was the first research commission I received from Olafur Eliasson and therefore we have started this book with it.

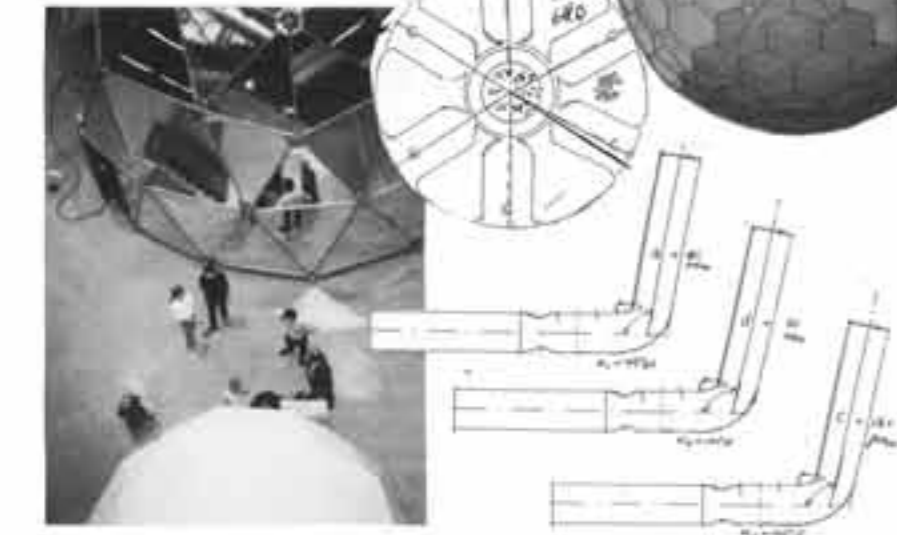
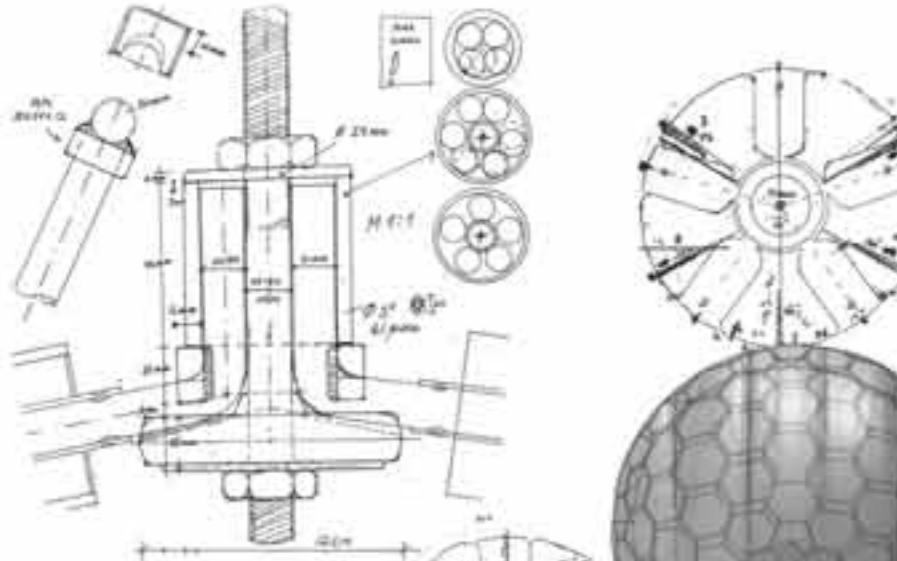
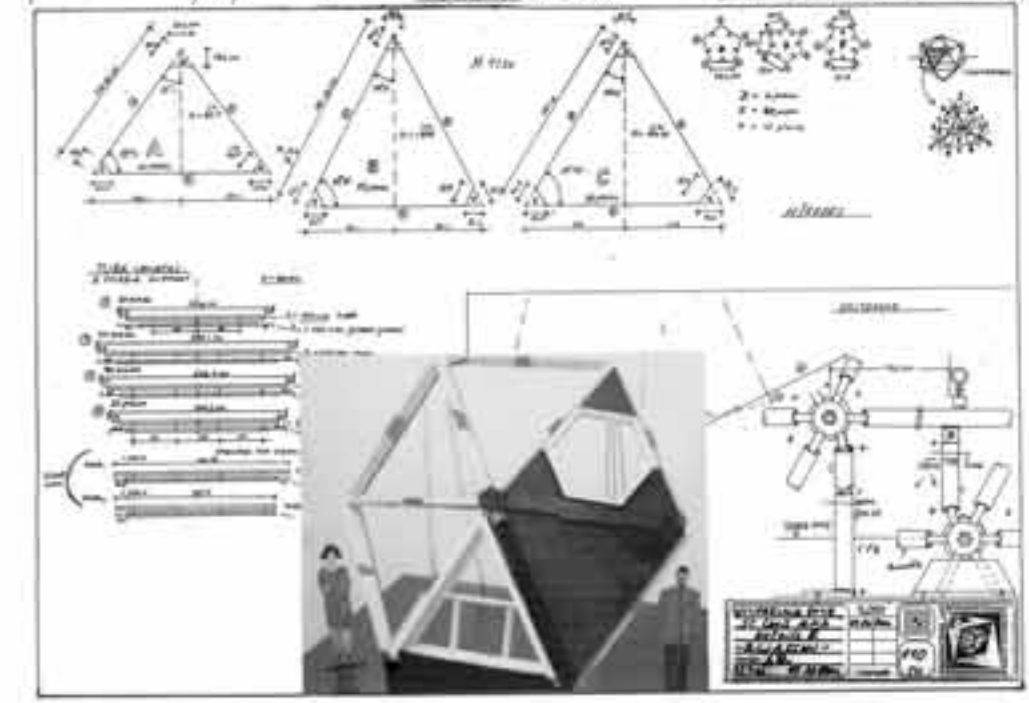
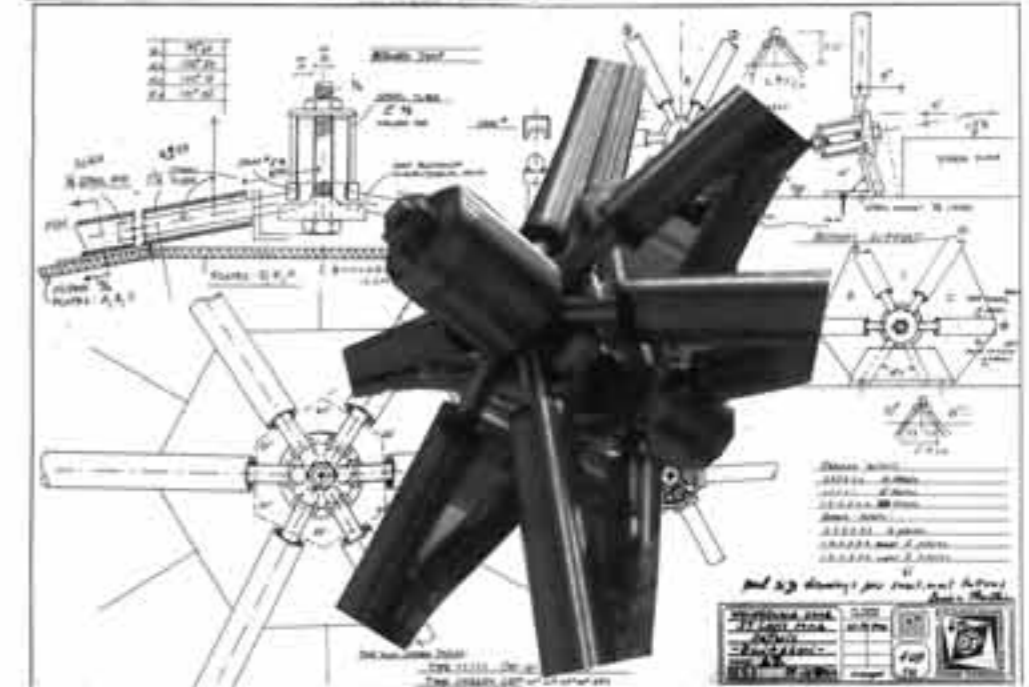
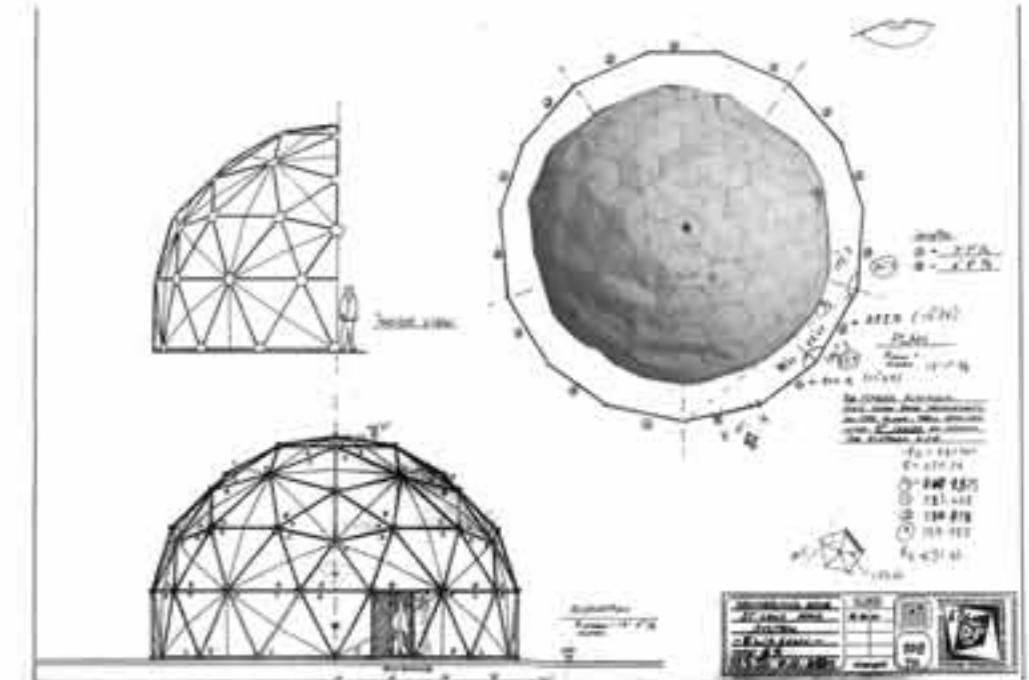
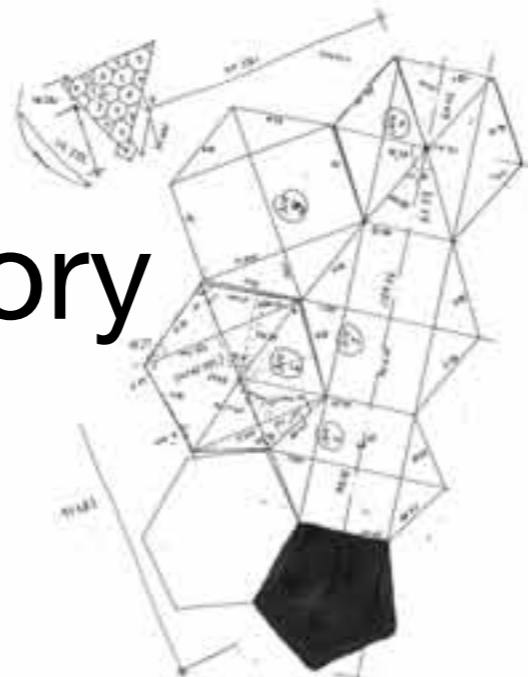
In the years from 1973 to 1979, I counted some 16 projects that all had an innovation aspect but became "branches that died off the tree" due to circumstances.

In my work for Olafur, there is steady research going on, both from his and my side and some will be introduced here. The spherical fiberglass dome is one such project already mentioned.

On this page some old research projects can be seen. They include two types of tent dome structures, a multi-functional dome joint for third world use, and another for the industrial world; two play domes for youthful players; and still one more spherical home, this time for the late Mike Driscoll of Houston Texas. There is a "walking on the water sphere" that the kids of my old school did and I had a hand in; a tensegrity "sculpture" of my students of the Icelandic Academy of Art in 1977; and a turf covered dome.

This last example is one of my contributions to sustainable architecture and turf, as well, is the traditional way of doing houses in Iceland."

the drop factory



"For the drop factory a major constructive step was taken in my structural co-work with Olafur. He needed for the piece a fairly large mirrored space for his strobe light raindrops.

A geodesic dome was in the discussion from the start. After looking into some alternative domes that fit in with the extremely expensive double mirrored plates, brand new on the market, we finally came to a 3-frequency solution. This one is what I like to call a flat-bottom type, but the Americans have some fancy technical name for it.

Other alternatives were a 9 FQ dome that is also shown here (next page). It was "in" for some time but then we came back to 3 FQ again.

When that was settled, I did a redevelopment job on an old technical solution for the joints that I proposed years ago. It was important to have a slim and exquisite joint to combine with the glassy plates. They are made of thin aluminum sheets glued both sides onto a plastic foam plate. I made a timber casting for the heart piece of the joint, an aluminum bracket that secures against the twisting around of the beam-ends, once they have been fastened together. Aluminum casts of those were then made in Hafnarfjoerdur in Iceland.

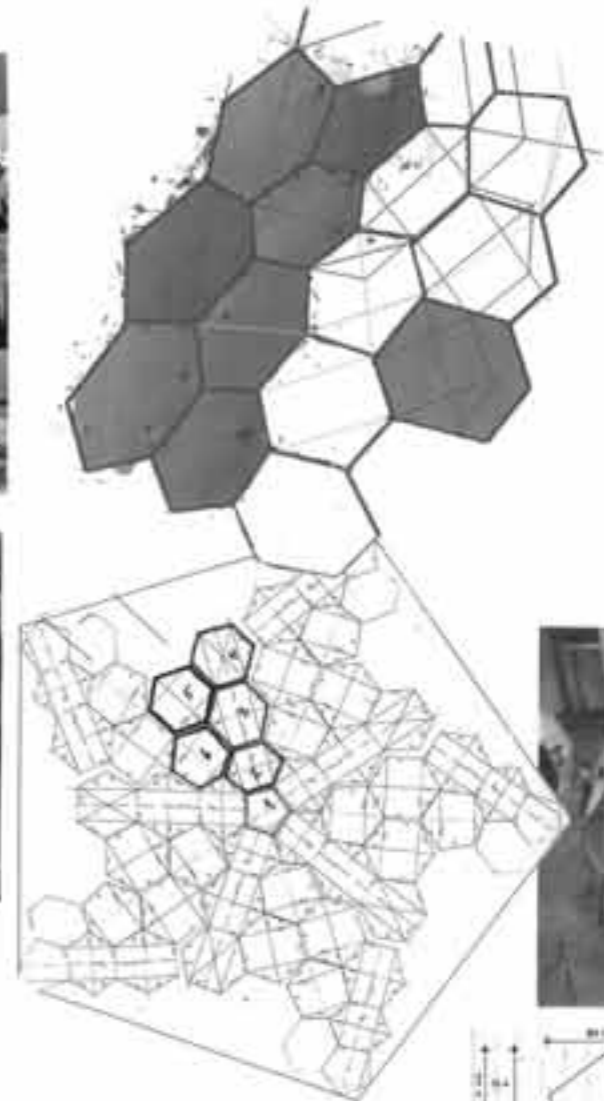
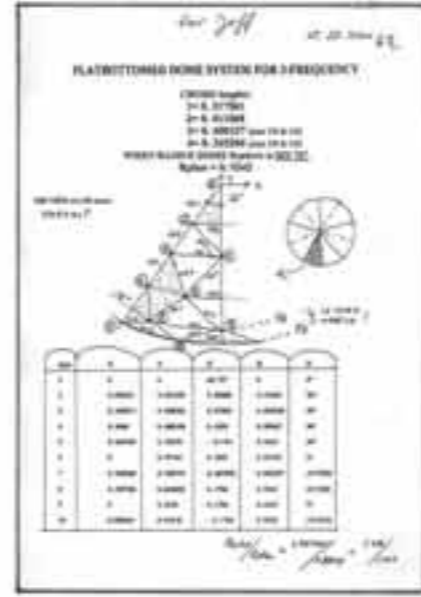
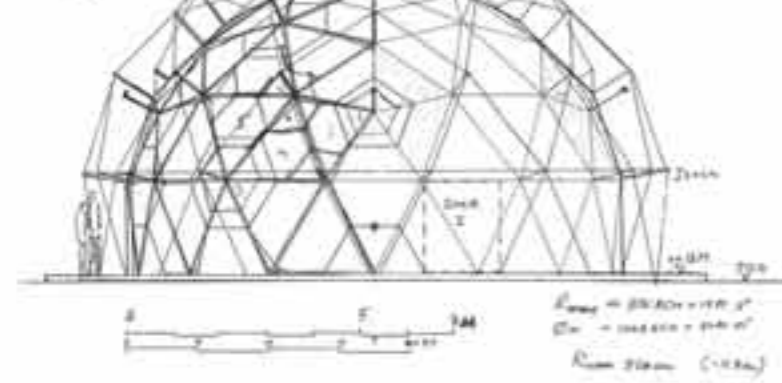
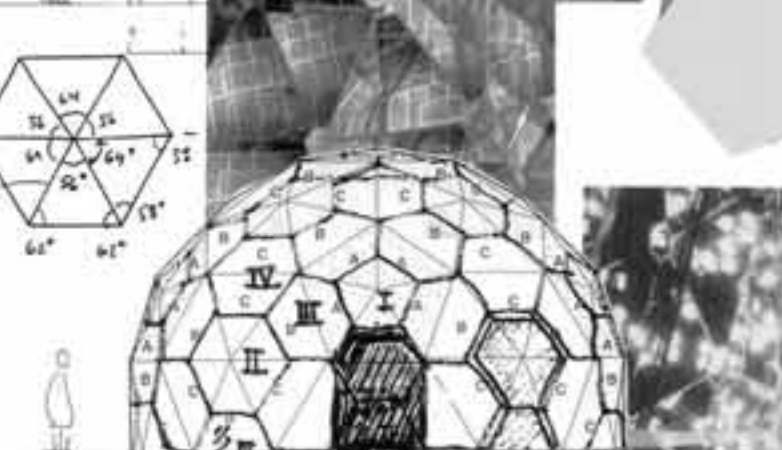
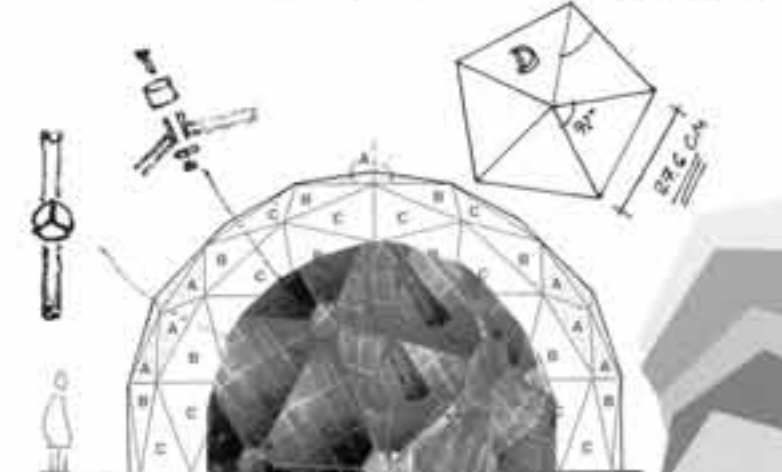
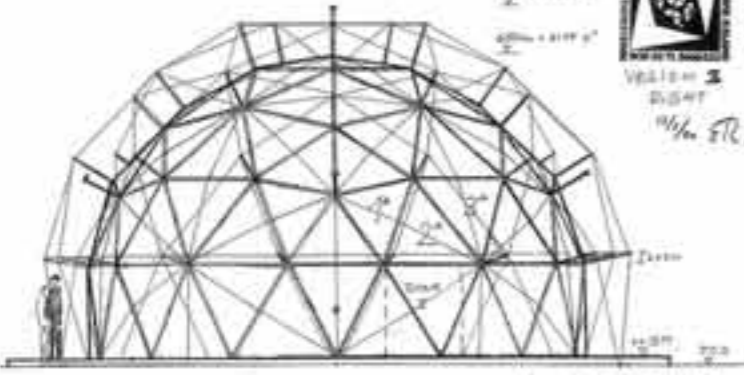
At first I wanted to do just one bracket that could take all three versions of the 3 FQ type joints. However, it turned out to be easier to do two versions; one for the two hexagons and an extra for the pentagons.

In a dome like this there are always six pentagonal and 40 to 55 hexagonal joints."



wonderland

WONDERLAND



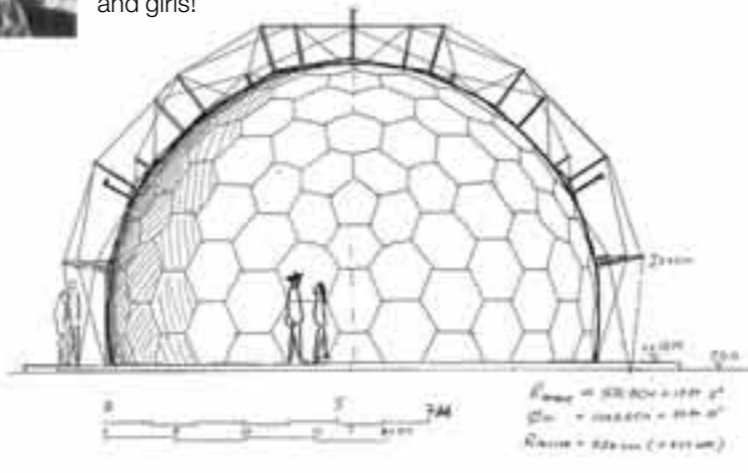
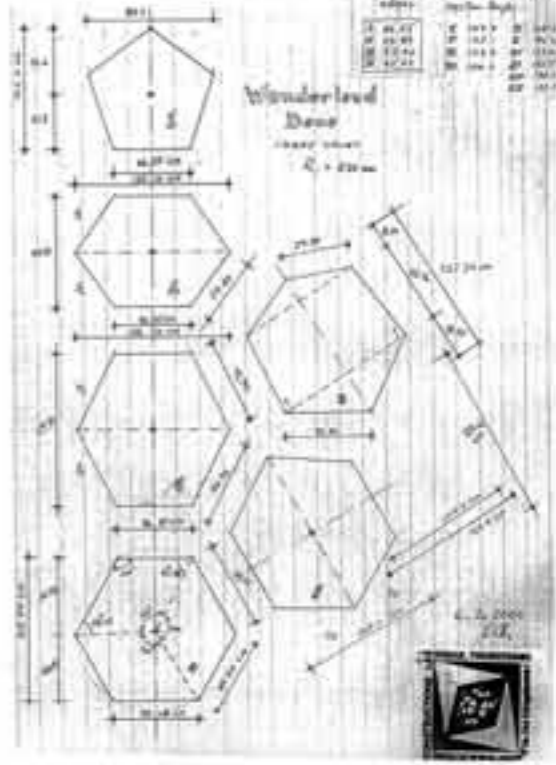
"The drop factory was first exhibited in the St. Louis Museum of Art in 2000 in the Wonderland show curated by Rochelle Steiner. Before that, we had just put it partially together at Bo Ewald's workshop in Hvidovre Denmark where it was manufactured. So we went over to St. Louis to erect this 5/8 35 Feet diameter flat-bottomed geodesic dome for the first time with some knowledgeable people.

Bo is the Danish metal specialist who manufactures most of the metal pieces for Olafur and faces ever more complicated geometric works without ever saying: "No. I can't do it." – Well until now. But we are working on it...

If the manufacturer of some piece here is not credited, be sure that Bo did it. There were of course all kinds of problems with the first erection in St. Louis, as with any prototype. For instance, the geometry of the mirrors had to fit exactly into the steel frame. Fortunately, the guys working for the museum had a keen eye for angles and a good workshop to do the necessary adjustment. Thank you guys and girls!

The next time the piece was shown, at the ZKM in Karlsruhe, it was much easier to erect, having figured out the best way to do it. However I want to use the opportunity here to say – as this is one of my children – that the new central column erection system for this dome, now on paper, should be ready the next time the piece is exhibited. Then it will just be a piece of cake to move this baby around.

I personally like this art piece very much, especially the mirrored surface area that gives it unlimited possibilities, depending on the surroundings in which it is erected. The more beautiful the surroundings, the more the dome will reflect it in a gemlike way. And the inside has very peculiar light effects that one does not expect in the least."





"In 1973, having returned to Iceland after nine years of work and study in Germany – including two years with Frei Otto, the father of tensile structures – I decided to go into building research with my own private institute: Constructions Lab.

At this time in Iceland it was of course an extremely optimistic enterprise on my behalf. But somehow I found a few customers who wanted to live in completely different houses than what was being built in Iceland at the time. In this way I slowly managed to build and develop many versions of geodesic domes and later, after 1986, I also built them with others in Denmark.

On top of that, I could use my experience in this field to sell information and knowledge of those houses to people all around the world. This was done first through my company, Kingdomes, in Houston Texas, founded there in 1987; and then on the Net, which I still do.

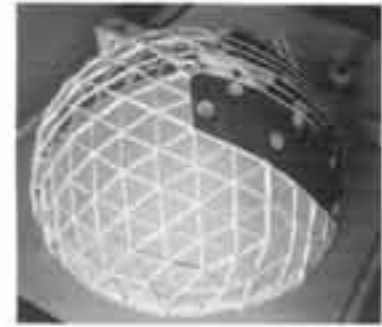
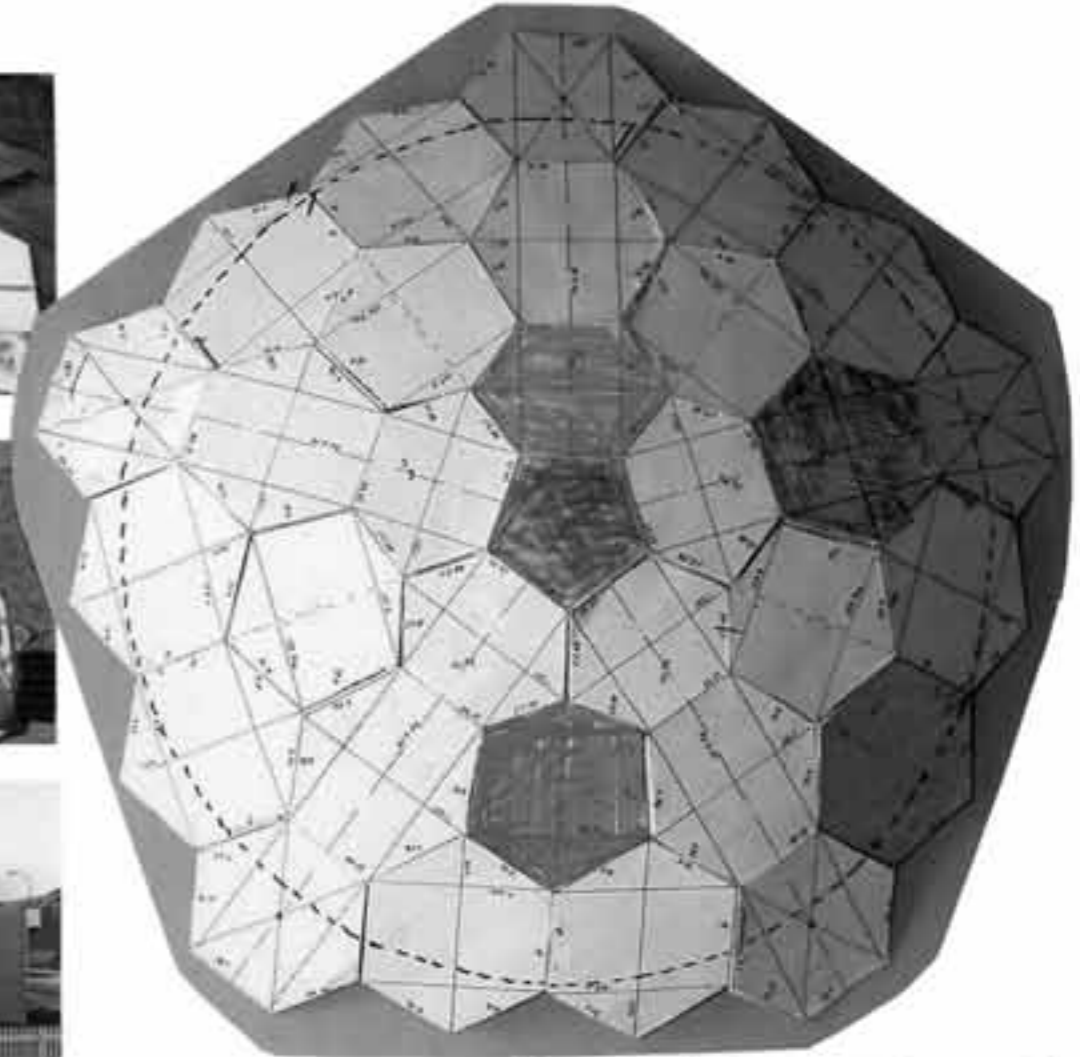
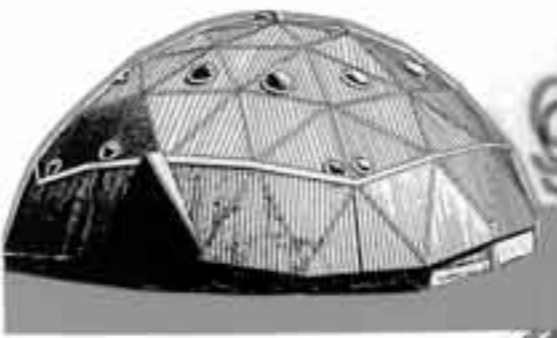
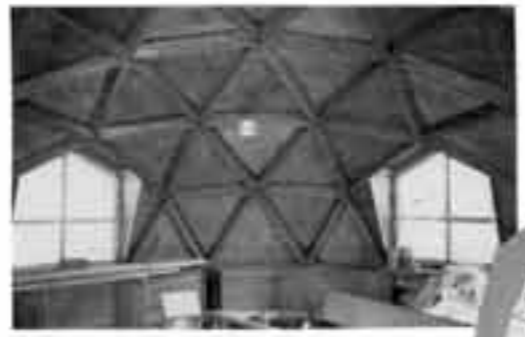
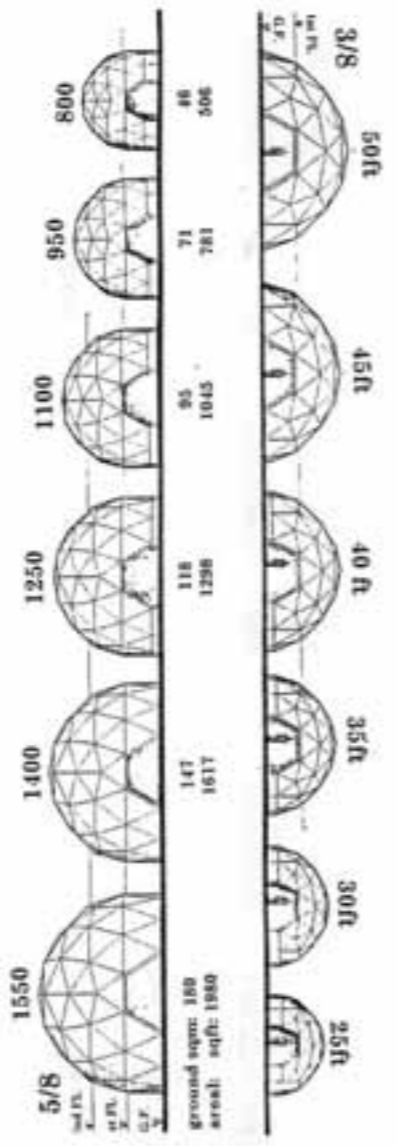
My philosophy at the beginning of this enterprise was to combine the feeling of the traditional Icelandic turf buildings with modern technology. Knowing my countrymen, I felt that this old way of building had prematurely been thrown out the window – in exchange for the "patent solution": "the mighty concrete". The final solution of building, they thought. Far away from it!

By doing this, I realized something we were not taught in the schools of architecture: that living in the mainstream architecture is like dressing up in a tailcoat.

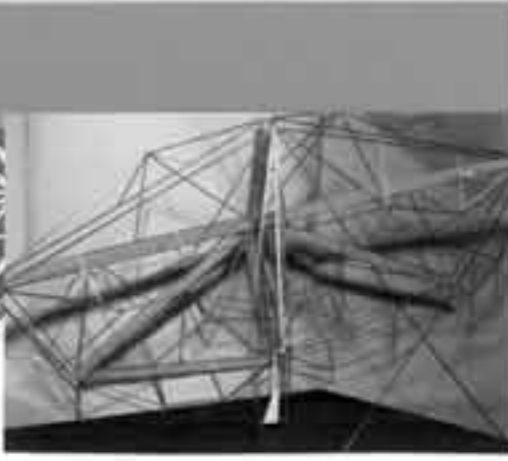
You are visualizing what you want others to think of you.

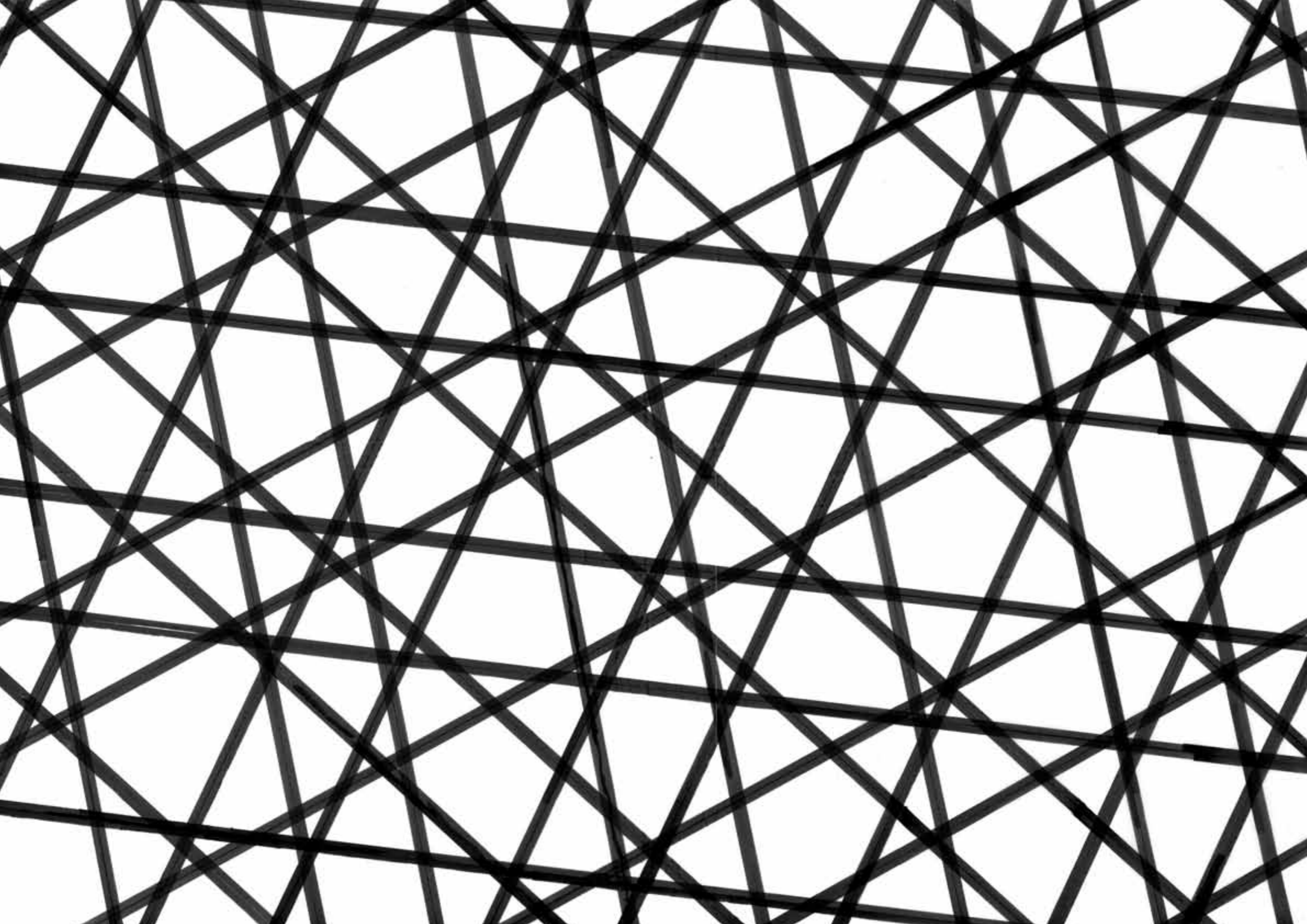
However, if you want your customers to feel good, then build "jeans-houses" for them. One may not even be able to photograph them elegantly but people will relax their total being in that kind of a house.

Bucky Fuller, a man born in the nineteenth century, showed me the way at the beginning. And I have always been thankful for his input into our modern day process of thought."



geodesic domes





fivefold symmetry pavilion on



"In 1998, Olafur received a commission to do a new piece in Holbæk in Denmark. Because of the setting in a beautiful garden on the north coast of Sjælland, he wanted to do a pavilion. This was his first in a series of pavilions.

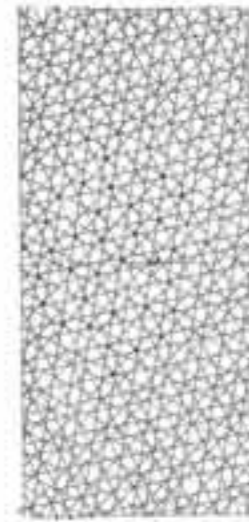
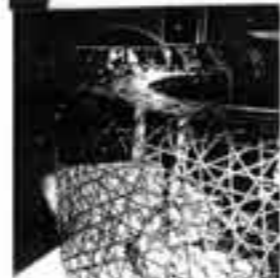
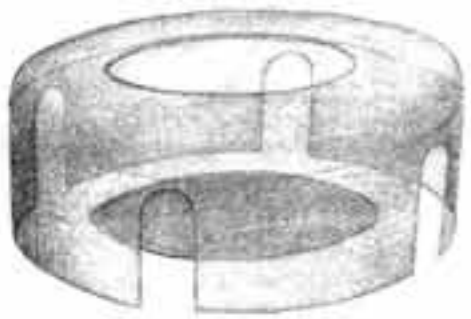
A pavilion is an idea of transparent architecture, and it is connected to his vision that the spectator has to become a part of the art. The spectator must find his own meaning, if not his own activity, in the work, or else the artist's work is futile.

Anyway, in this new territory it was important to find something with a real or natural meaning behind it that would constitute the texture of the piece; and as well, could be practically made in metal.

To find the form itself was less of a problem. But somehow form and texture had to get along.

Now, I make no secret of it that mathematics is one of my main interests, particularly 3D geometry. And in later years, to my satisfaction, more and more has been discovered through free thinking scientists that points to an underlying mathematical hyper-structure that is behind all of creation – some say, in the one-dimensional space that supports the regular three-dimensional one we all know.

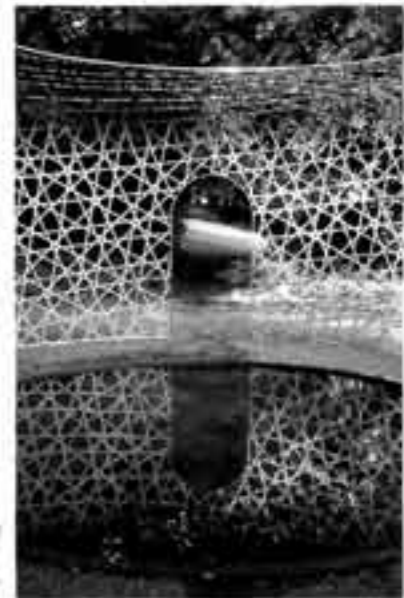
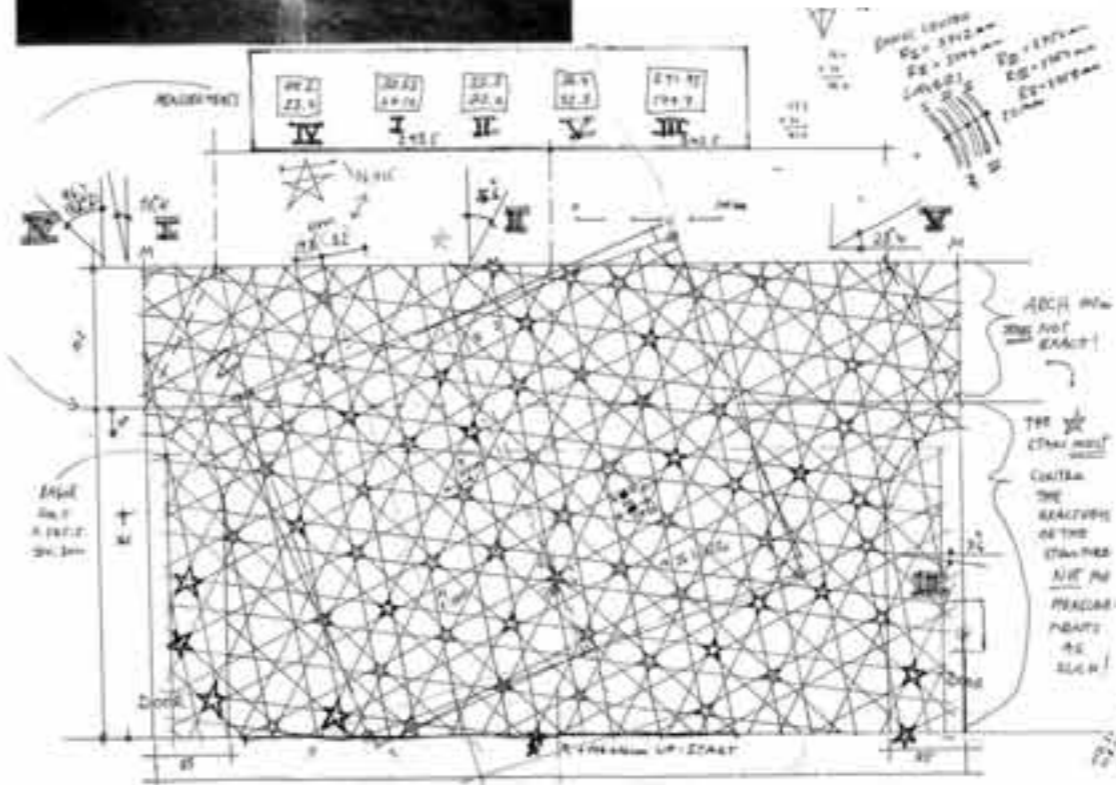
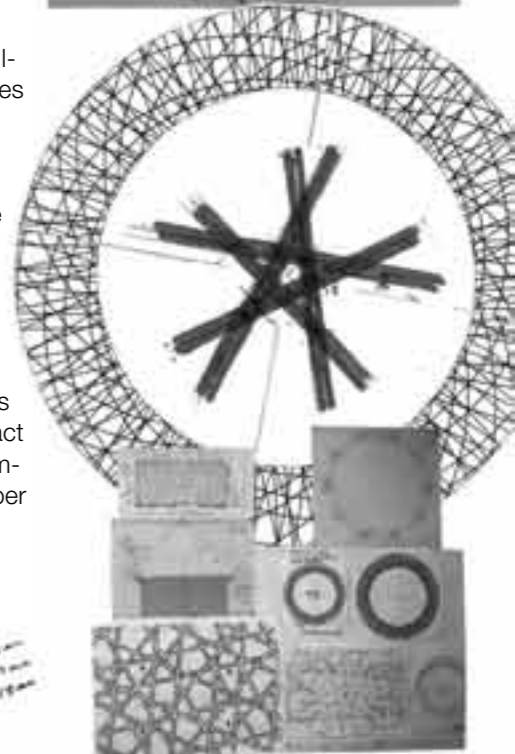
This is particularly interesting in view of the present day discussions about genetics on one hand, and the "Big-bang" on the other. Both are just "what seems to be so" in comparison to the mathematics that functions behind all there is.

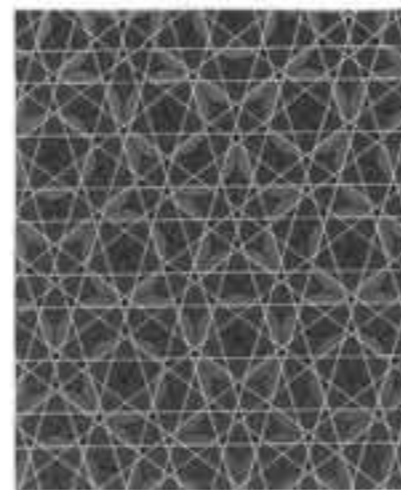
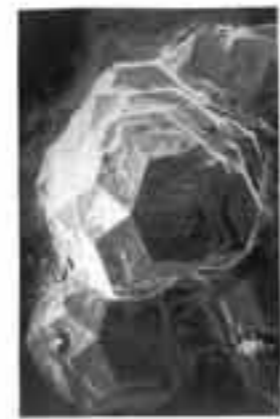
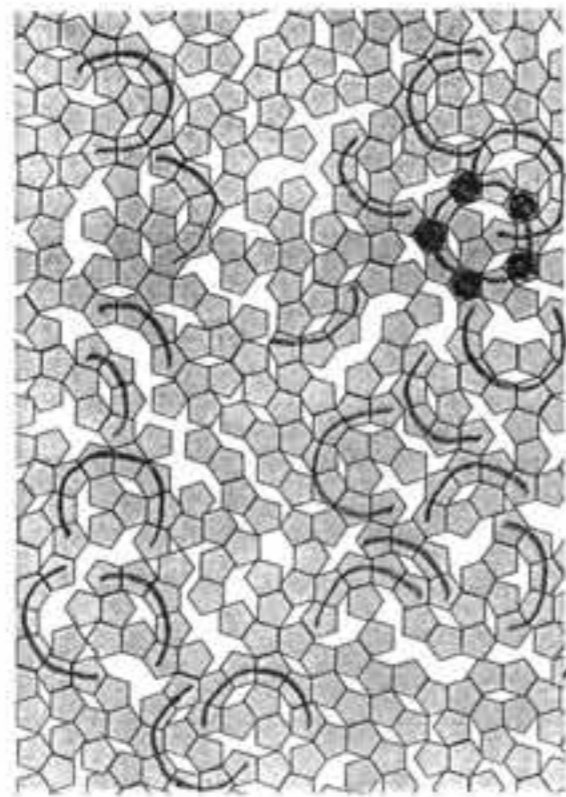


Without going too far into these matters, I want to point out new theories like "Global Scaling" and the part of mathematics in the forming of all life forms, to support my view.

To make a long story short, for the pavilion to be, we decided to use the Ammann lines discovered with X-ray spectroscopy in 1984 and serve as the very start of a new science called quasi-crystals that since then has been a subject of much research all over the globe.

On the following pages I will go into the peculiarities of this new science. But for the moment let me say that Ammann lines are five sets of lines crossing each other at $108^\circ/72^\circ$ degree angles. Each set of lines has a rhythmic distance between them in the exact ratios A B B A B. Where A stands for the number 1.000000000 and B stands for the number 1.618033988. I.e. they have a golden ratio, another theme frequently mentioned in this book."





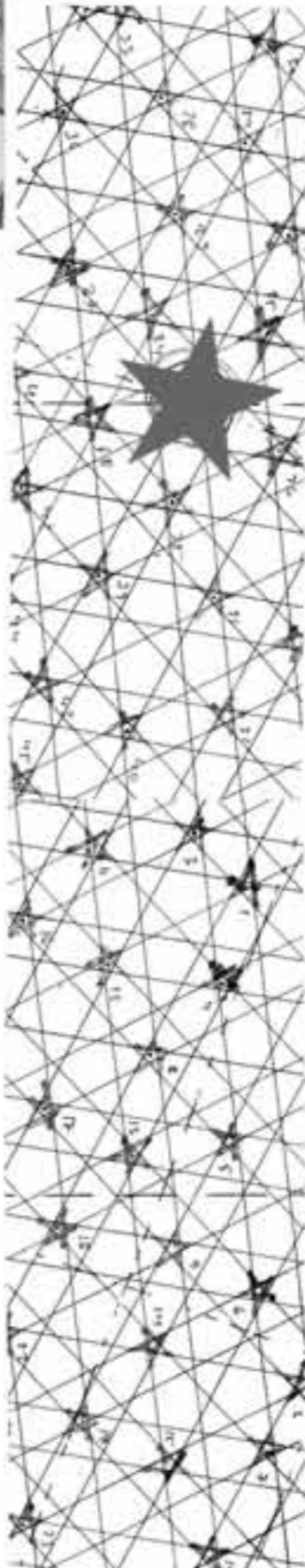
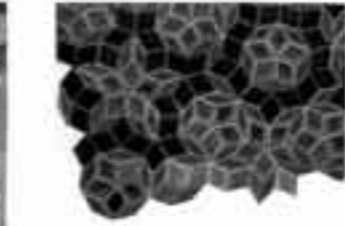
"The Holbæk pavilion is a round piece of architecture, 25 Feet in diameter and 10 Feet high. It has curved edges to the top, which to the passers-by makes it look like a dome. The pavilion has four doors open to the four main directions: North, South, East and West.

The main feature of the pavilion is the fivefold symmetry metal grid made of steel built on the Ammann lines. In the walls, the lines are quite regular but as the wall curves to the center it becomes more and more chaotic.

This was quite a challenge to solve – but only the beginning of more chaotic geometry in Olafur's work as we will be coming to.

In the pavilion's center is a circular pond that reflects the structure. But not only that, its shadows also fall on the water surface, as well. The reflections of the grid mix with the shadows.

A small waterway leads into the pond. There is a very fine Tao like tranquility to the whole setting."



"Now, you might already be thinking: What is the significance of fivefold symmetry? And what does it have to do with nature?"

Fivefold symmetry is one of the many symmetries that nature uses in structuring and therefore it is its law. One can find them for instance in living biological forms. To name an example of this natural structuring, there are crystalline forms that emerge through these laws – or should we call them mathematical rules – through so-called self-organization.

Until 1984, scientists were of the opinion that natural crystals – i.e. the way molecules "self-organize" in compact form – only existed in multiples of the number two: twofold, fourfold etc. symmetries, or in orders directly related to those.

But more than just crystals, most living entities are organized in very definite symmetries.

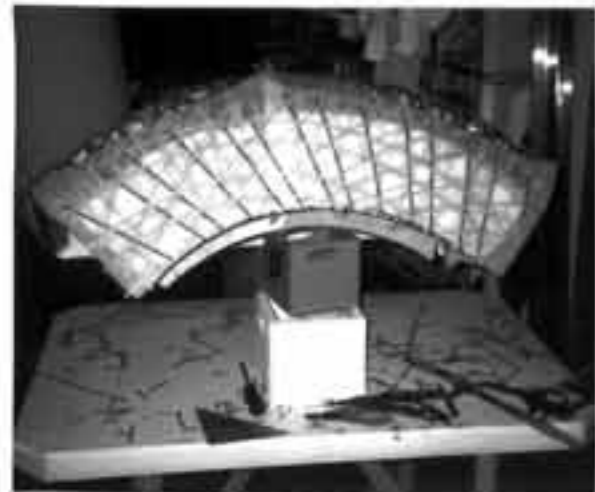
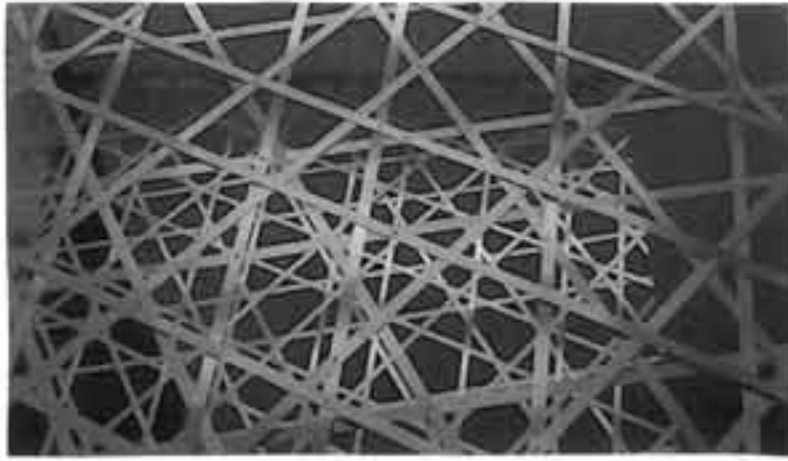
One example of twofold symmetry is the left and right part of the human body. An example of a fourfold symmetry is a square, or an eightfold a cube. Towards the end of the twentieth century the existence of odd numbers like fivefold symmetry were still unknown in "self-organizing" forms like crystals. But still they existed. They just remained undiscovered for 84% of the time span of the last century.

This all changed in the beginning of the eighties when the Israeli scientist Dan Stechman took it on himself to study more closely the stack of "unknowns" of the three now-famous X-ray picture stacks collected over many decades by scientists all over the world. The other two clearly being of crystals (periodic structures), and glass (non-periodic structures).

He finally discovered that this as yet undefined stack had spectral dots, or diffraction patterns, that were semi-periodic, or ordered in a rhythm that – not surprisingly – turned out to be the golden ratio pattern. This is the same as fivefold symmetry. The crystal forms related to these as yet undefined X-ray picture stacks were henceforth called quasicrystals, or 'almost crystals.'



fivefold wall



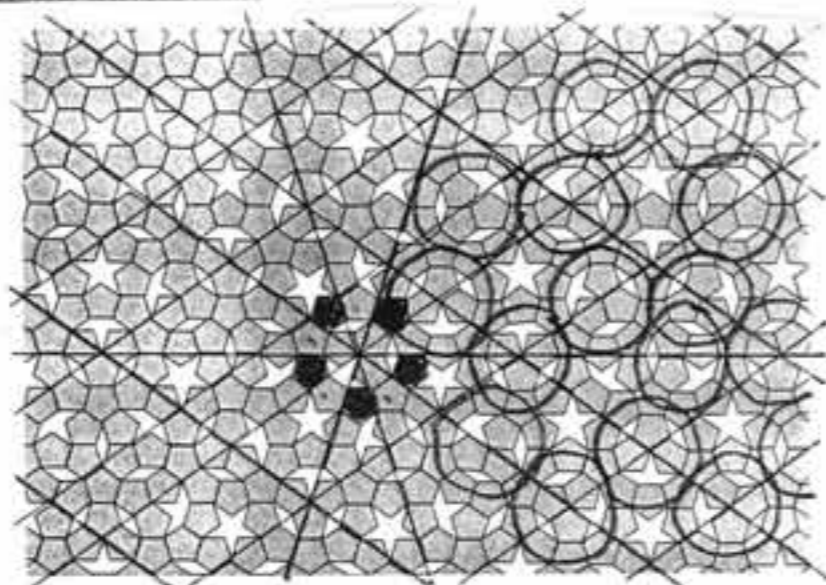
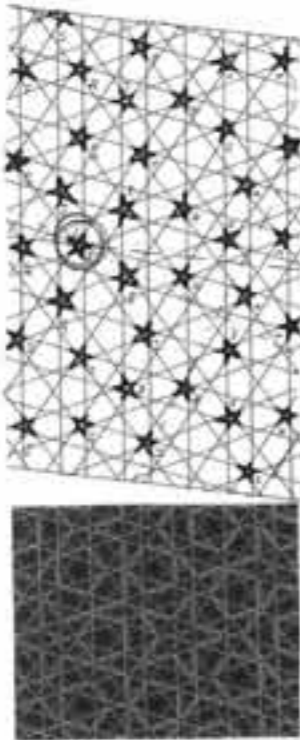
I remember listening to Stechman at a conference in 1995 in Alexandria, Virginia. He described to us how this all came about and then asked the audience: "How is it that nobody looked into this – as it seems so obvious – years before?" As an answer, I stood up and told the audience my theory that once science declares something cannot exist – no one bothers looking. The malls of science are full of merchandise but no one comes shopping. This proves that a scientist is generally a herd animal.

At about the same time, the scientists Steinhardt, Levine and Ammann collaborated to discover that the relationships in the semi-periodic diffraction patterns were of the golden ratio. From that we have the "Ammann"-lines.

Those fivefold symmetry lines can for instance lay on top of a flat surface corresponding to a fivefold symmetry Penrose tiles on the same surface. However the Penrose tiles must then have a very regular pattern. Generally they can be laid down in various, more or less chaotic patterns.

Now Penrose tiles are very well known no-gap space filling tiles of more than one geometric form. They will fill in a surface of any size with no holes left. They can for example be two rhombes that because of their built-in angles have – you guessed it – fivefold symmetry qualities.

Penrose tiles are rare but actual tiles named after the discoverer of the 2D "self-growth" natural system. And for those interested in geometry, it is worth mentioning that



the "older" Penrose proposed many things to his friend M.C. Escher, such as the optical trick of water running upwards, that Escher then made famous in his art work.

There also exists a 3D version of the Penrose tiles, the Thin one and the Fat one that we will be coming to discuss later.

The Ammann lines have the distance A-B-B-A-B-A between them as we have already mentioned. And B – which is longer – to A are in the golden ratio proportion – 1: 1,618033988749894848204586...

Of course, the five platonic solids Tetrahedron, Cube, Octahedron, Dodecahedron and Icosahedron have been very well known all along – it had just not been discovered until 1984 that nature uses all of them in crystals!

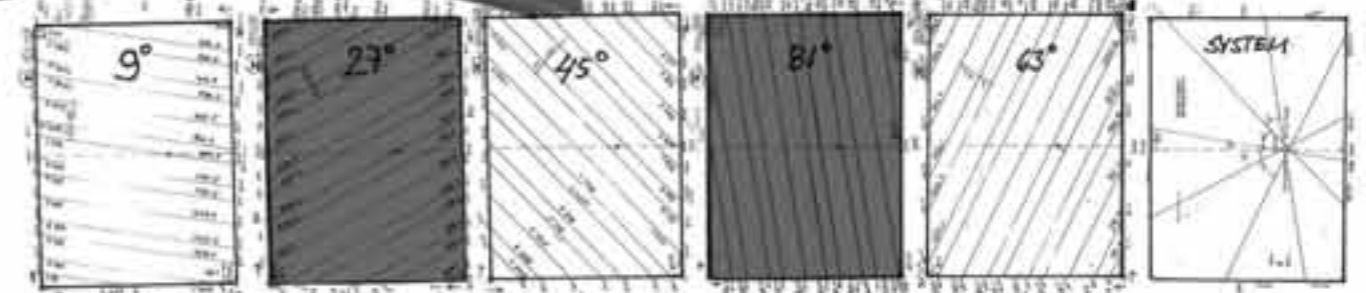
Such is the way of science: the most obvious is denied as long as no proof can be presented. And therefore in cases of non-provable phenomena material- science as a tool is not very useful...

Anyway, the next step for science is obviously to prove that the three symmetries of the Platonic solids are really just three versions of one symmetrical field. This is what the present discussion of fivefold symmetry and quasicrystals should be all about.

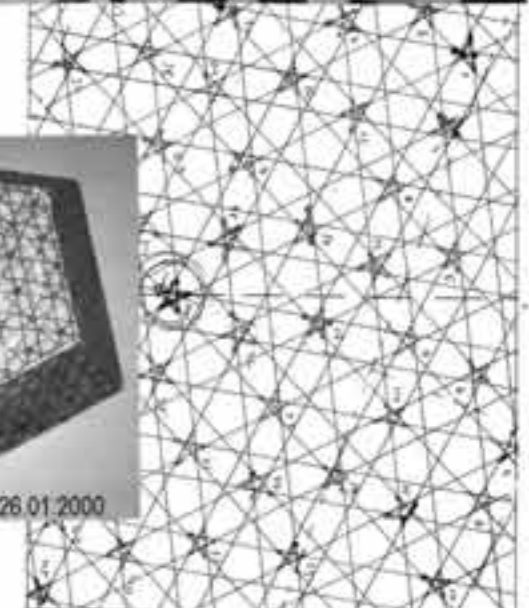
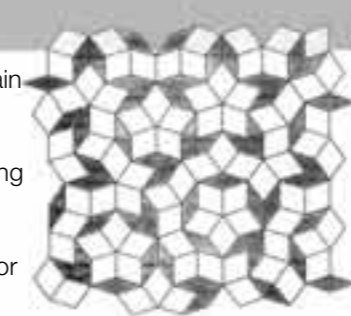
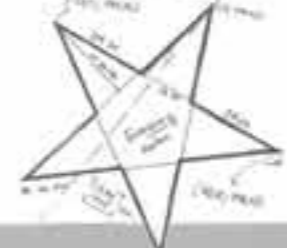
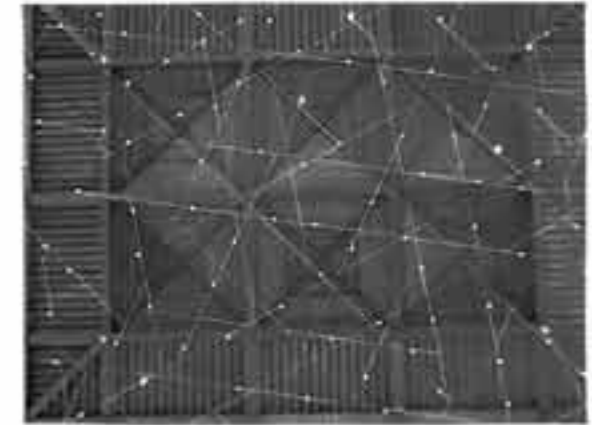
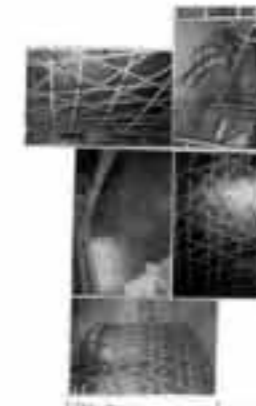
Because of this connection with "how things are", Olafur Eliasson has used some of this natural forming in his art pieces."

"The same fivefold theme was used again in 1998 in two small exhibitions in Leipzig and Freising; as an aluminum wall in Leipzig and as a tensional structure in a hall in Freising with lights attached.

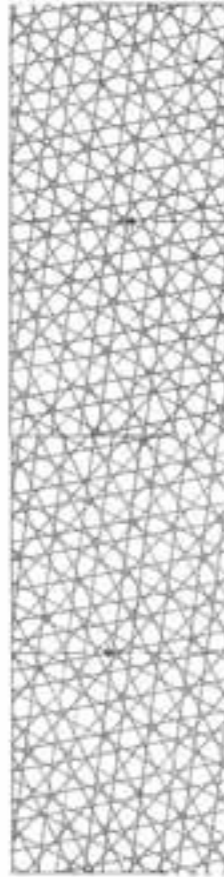
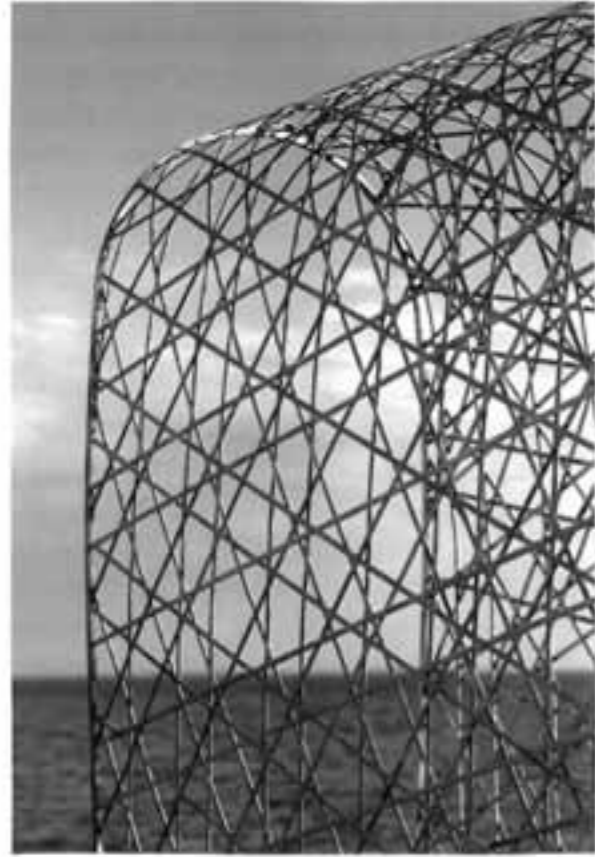
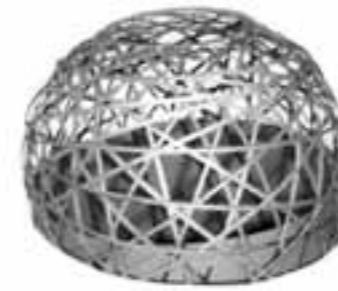
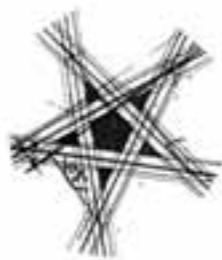
Both were a preparation for the next constructive step in 2000. At that time a major exhibition of Olafur's work was held in Graz in Austria and for the occasion a new piece was developed: the fivefold tunnel that follows on the next page."



five fold ceiling



fivefold symmetry tunnel



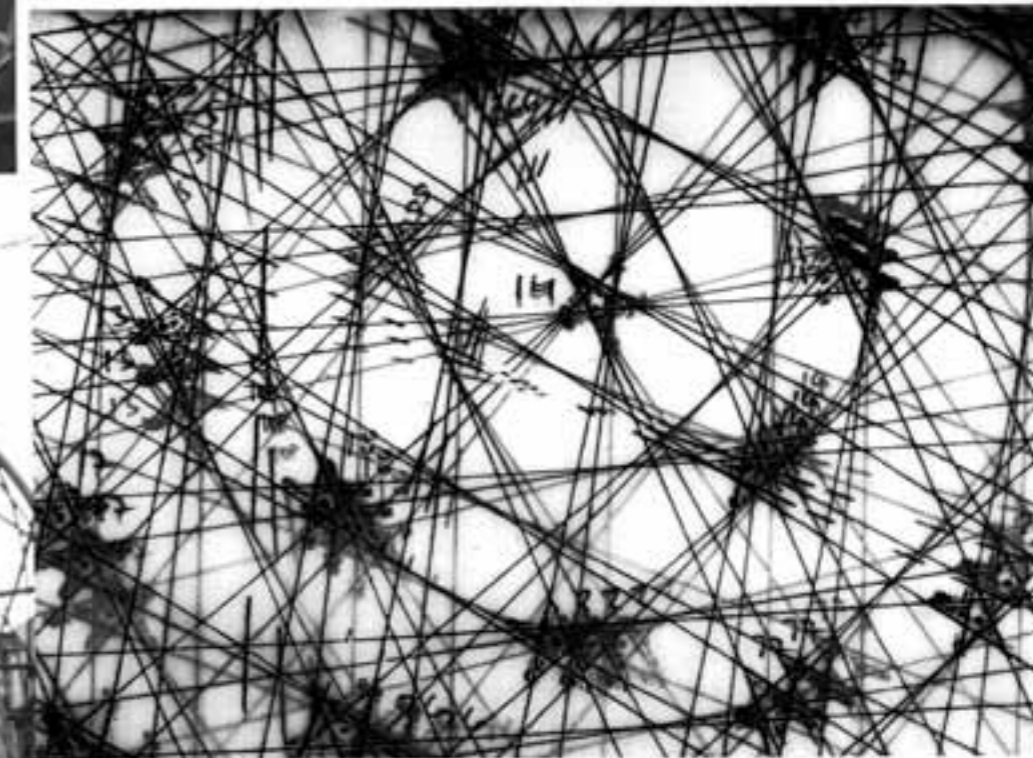
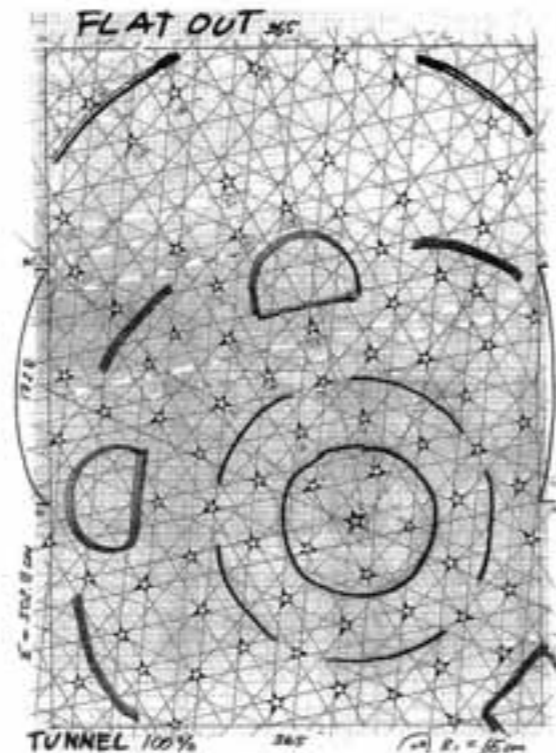
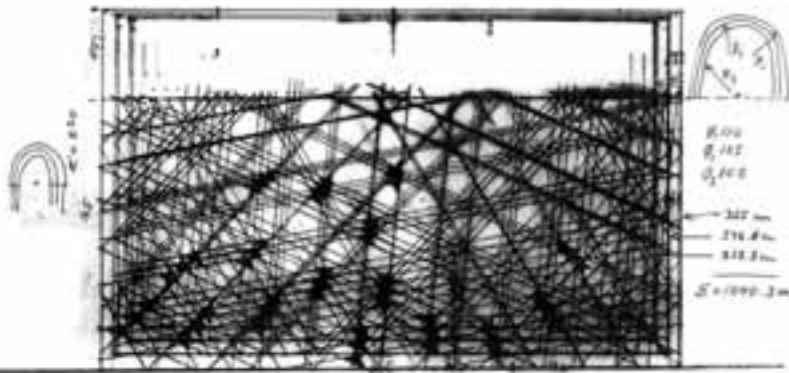
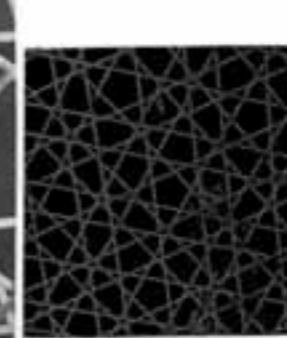
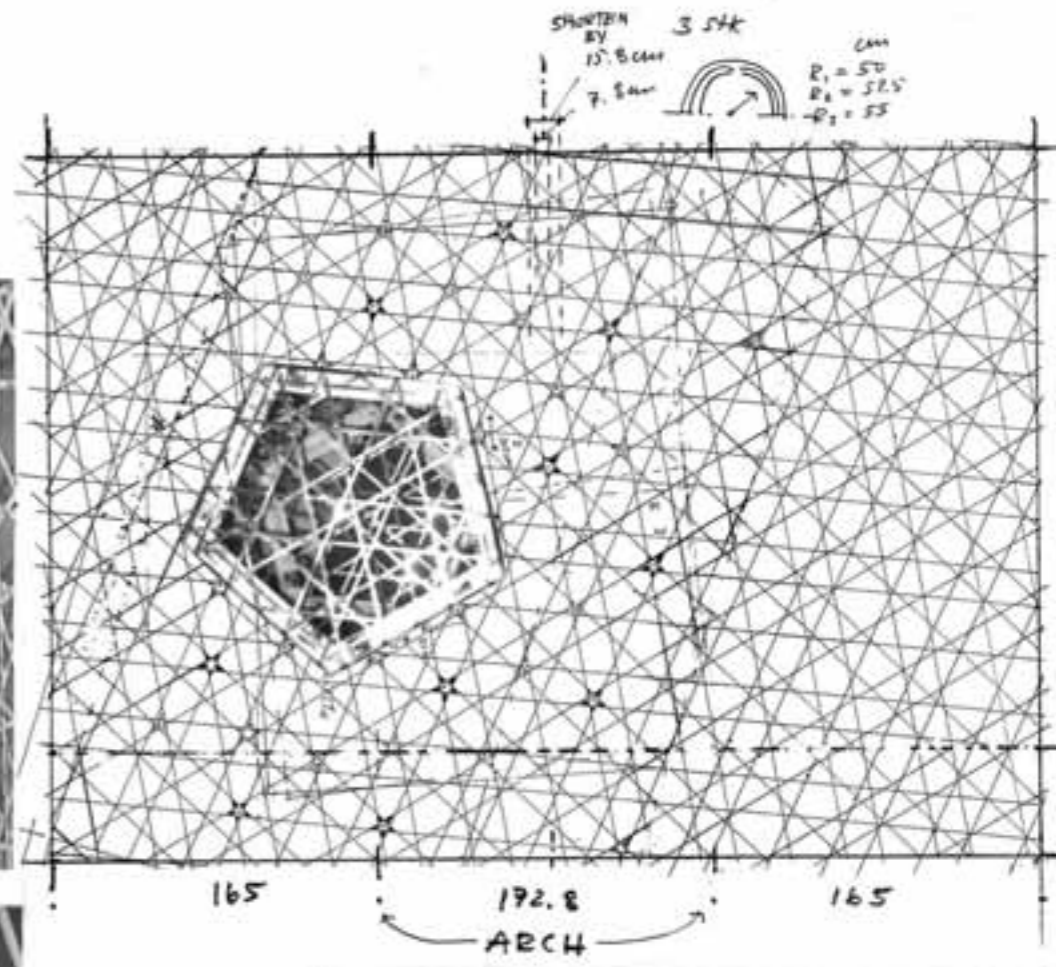
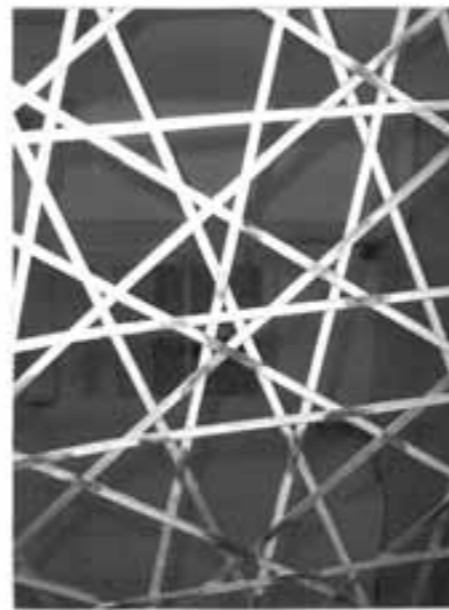
“The Fivefold Symmetry Tunnel was first made for an exhibition in Graz in Austria in the spring of 2000. It has a similar fivefold symmetry pattern structure in its three pieces. Each of them is twelve feet long and about eight feet high. They can either be put one inside the other – and still the lines will fit to an overall pattern. Or, they can be extended to form a 36 Feet long walk-trough art piece.

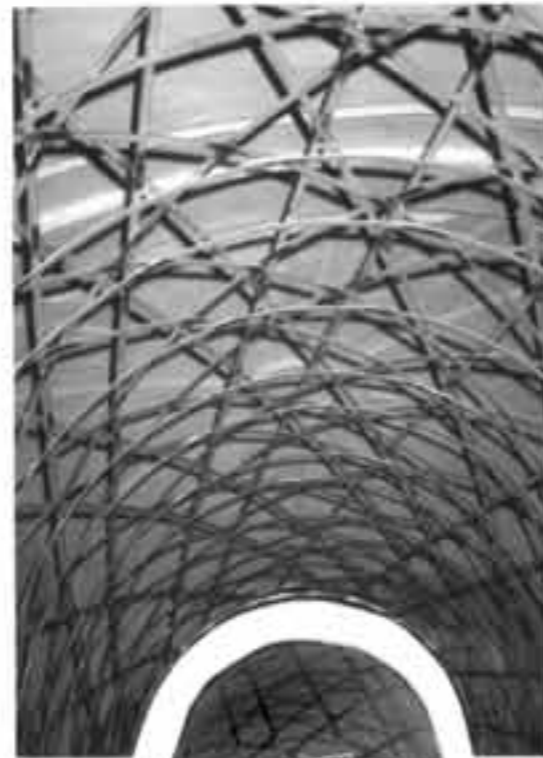
The geometry of the Ammann lines is a study all by itself. Although they look chaotic to the eye, they have a very special growth regularity and the patterns they form does not repeat itself similarly to triangular, hexagonal or square patterns.

One more interesting thing is that no matter how the placing of the lines ABBAB is started, they will always have one center-point. Where ever one starts, the pattern repeats itself in a circular form like waves on a water surface.

This can be seen by pentagonal “stars” that are formed by the lines, now and again. They are most numerous around the center point (or 25 types), but then occur rarely as one moves away from it.

The distance between each two stars is the same. By connecting them a decagon is most often formed. It is well known that the relationship of the radius of a decagon to its edge exhibits the golden ratio again: 1 to 1,6180339887...”





five fold eye



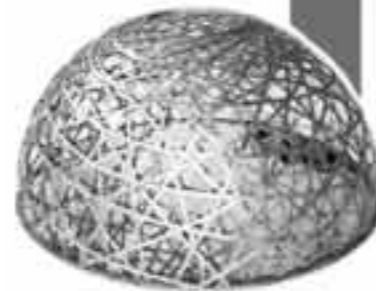
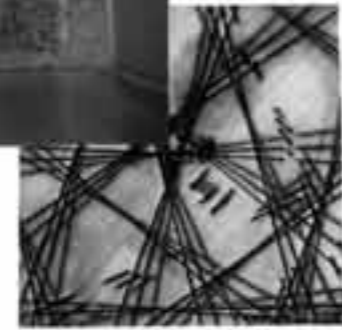
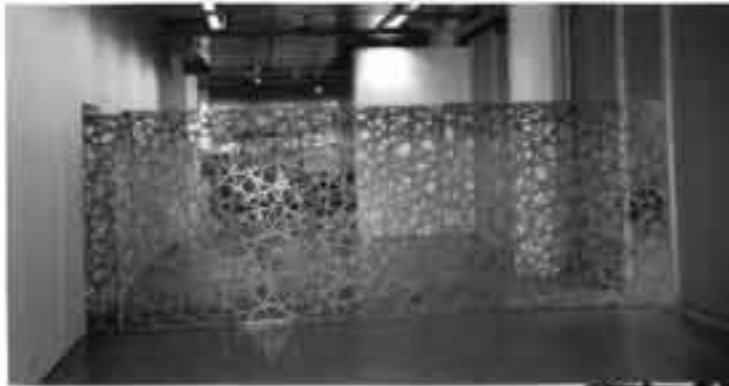
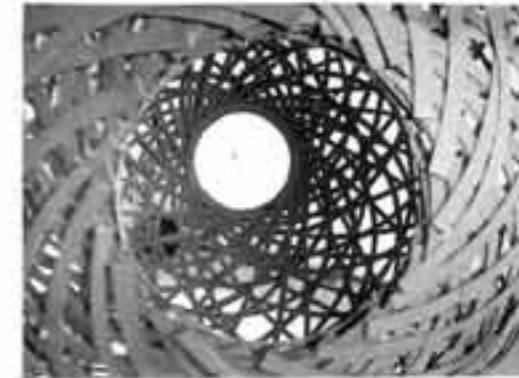
The roof parts of the Holbæk pavilion were just such a chaotic site and the solution had to be designed as it was not found in any natural mathematical self-organization. But the question of how would a round pavilion with a regular domed top fit to a fivefold surface pattern was raised.

To answer this question, the first small pavilions were made as models. But the chaotic domain itself had some essence to it, bringing us to the piece "Fivefold eye", shown here with a round mirror as a basis.

In the same category is the following step, a complete spherical version that we will be coming to.

If one is regarding at these chaotic looking domes and spheres one would never guess that beneath this pattern in a regular golden ratio pattern. Admittedly, only in the equator area of both.

Parallel to this development, another model study was made that described how the Ammann lines would fit naturally on a Pentagonal Dodecahedron. This piece has the working name "Fivefold Dodeca Net" as it has not been overworked and turned into an art piece. There is more than one way to do the patterning of a Dodecahedron, but as the lines have to flow from one surface to the next in mirror like waves the possibilities come in certain steps. Naturally the net on one pentagonal surface becomes ever more tight as it moves outwards from the center point of the system."

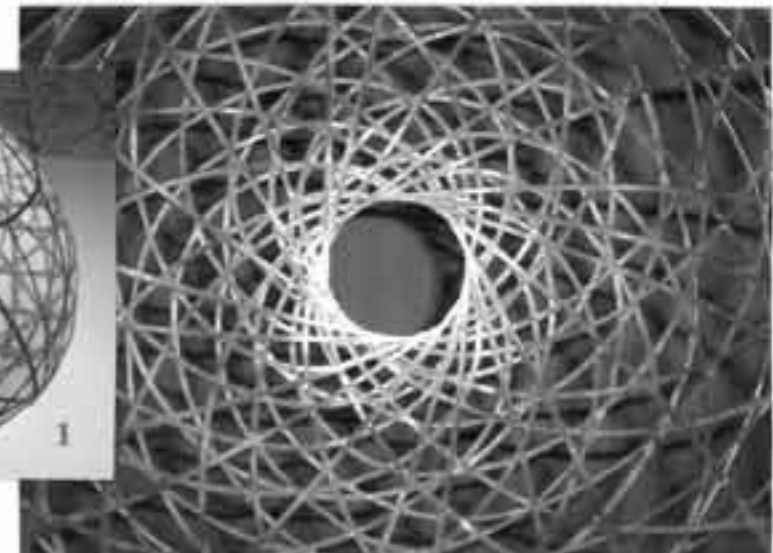
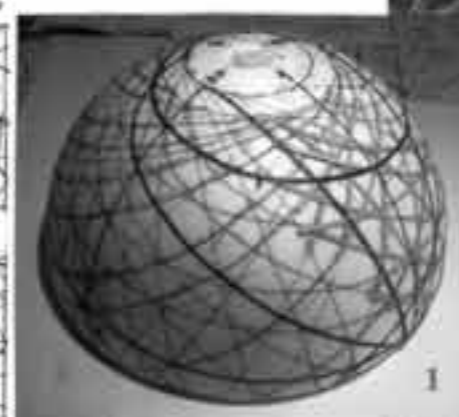
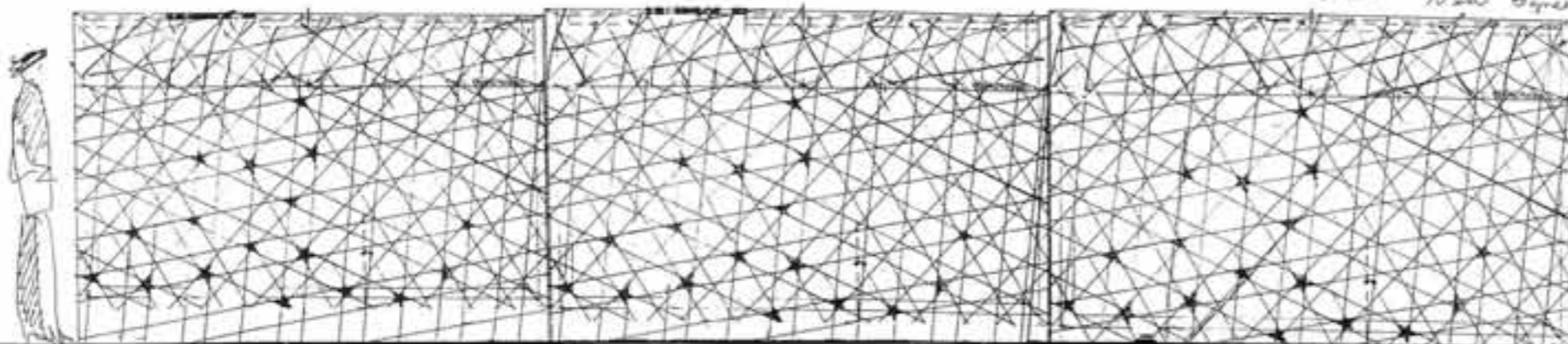


365 CM

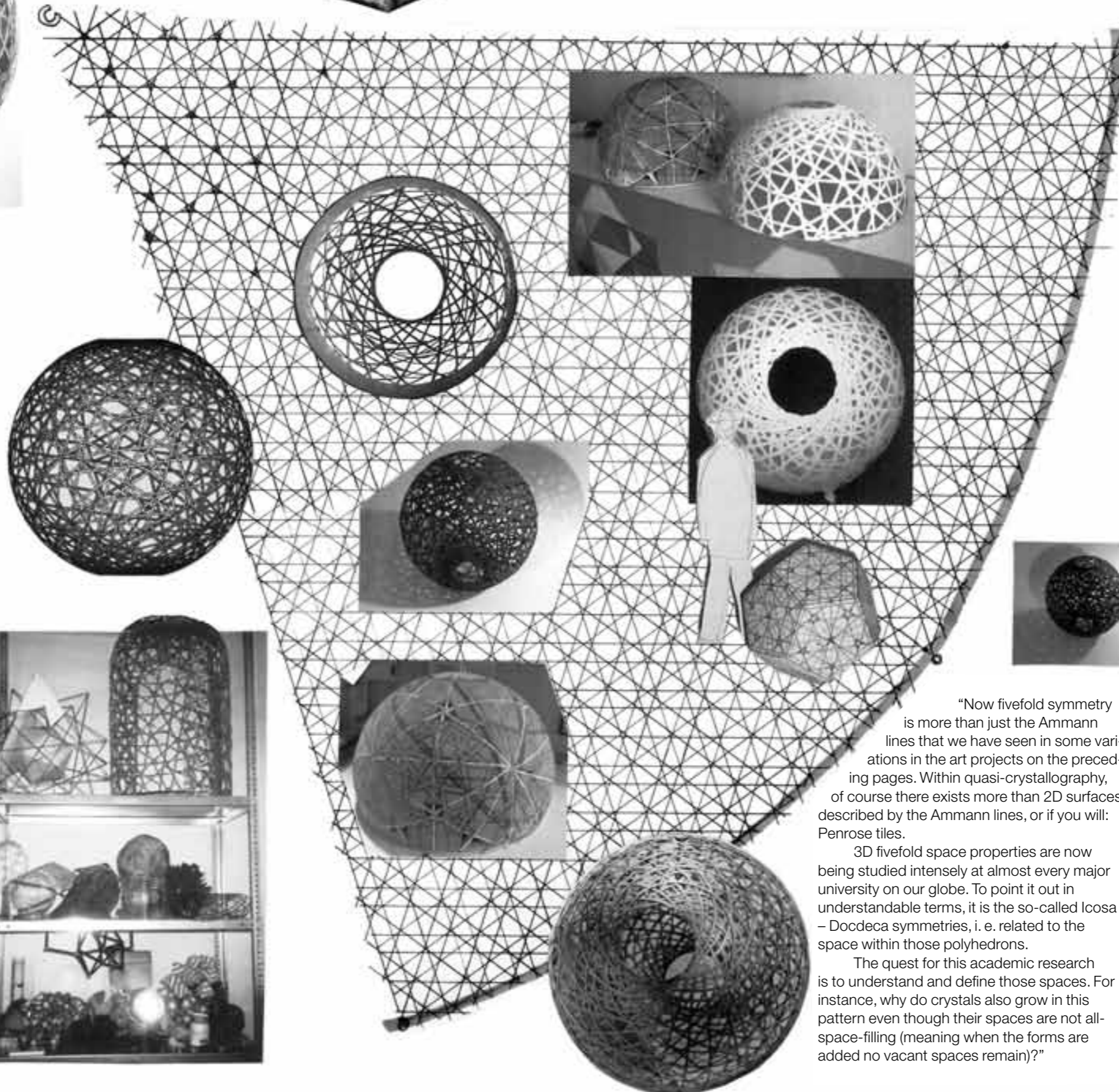
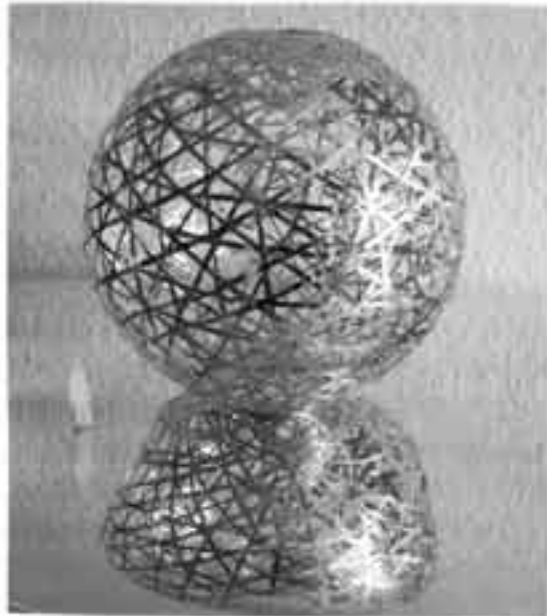
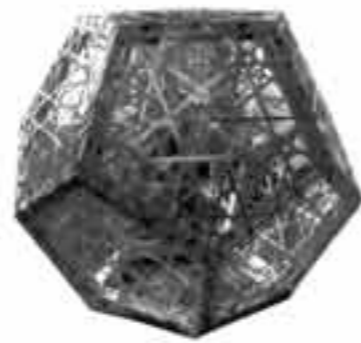
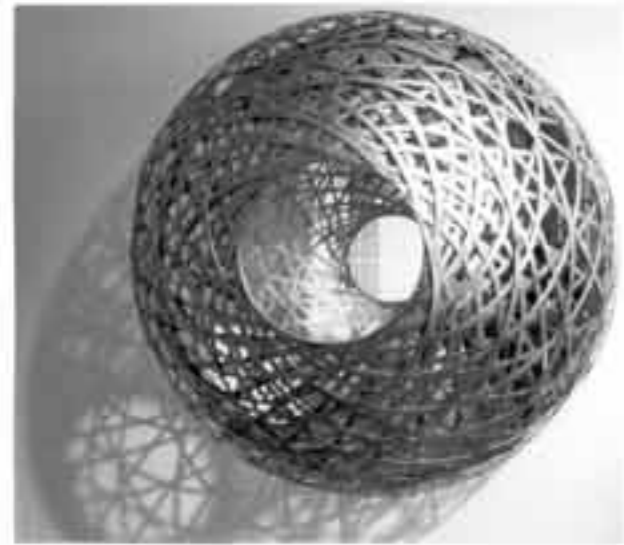
TUNNEL
NEW SYSTEM

"The next step on the way of development for the fivefold theme was a plan to do a smaller pavilion in 2000. A few model studies were made that still remain and have not been executed yet. But as a side step, the following developed.

Already in 1998 when the fivefold symmetry pavilion in Holbæk was in the planning stage we were confronted with the difference between a fivefold regularity in none to one directionally curved surfaces and then the total chaos in a double curved surface.



fivefold research projects



"Now fivefold symmetry is more than just the Ammann lines that we have seen in some variations in the art projects on the preceding pages. Within quasi-crystallography, of course there exists more than 2D surfaces described by the Ammann lines, or if you will: Penrose tiles.

3D fivefold space properties are now being studied intensely at almost every major university on our globe. To point it out in understandable terms, it is the so-called Icosa - Docdeca symmetries, i. e. related to the space within those polyhedrons.

The quest for this academic research is to understand and define those spaces. For instance, why do crystals also grow in this pattern even though their spaces are not all-space-filling (meaning when the forms are added no vacant spaces remain)?"



spiral sphere

"It was only logical to go next to a complete sphere with the same chaotic pattern. However, its lines are still built on fivefold symmetry and the golden ratio.

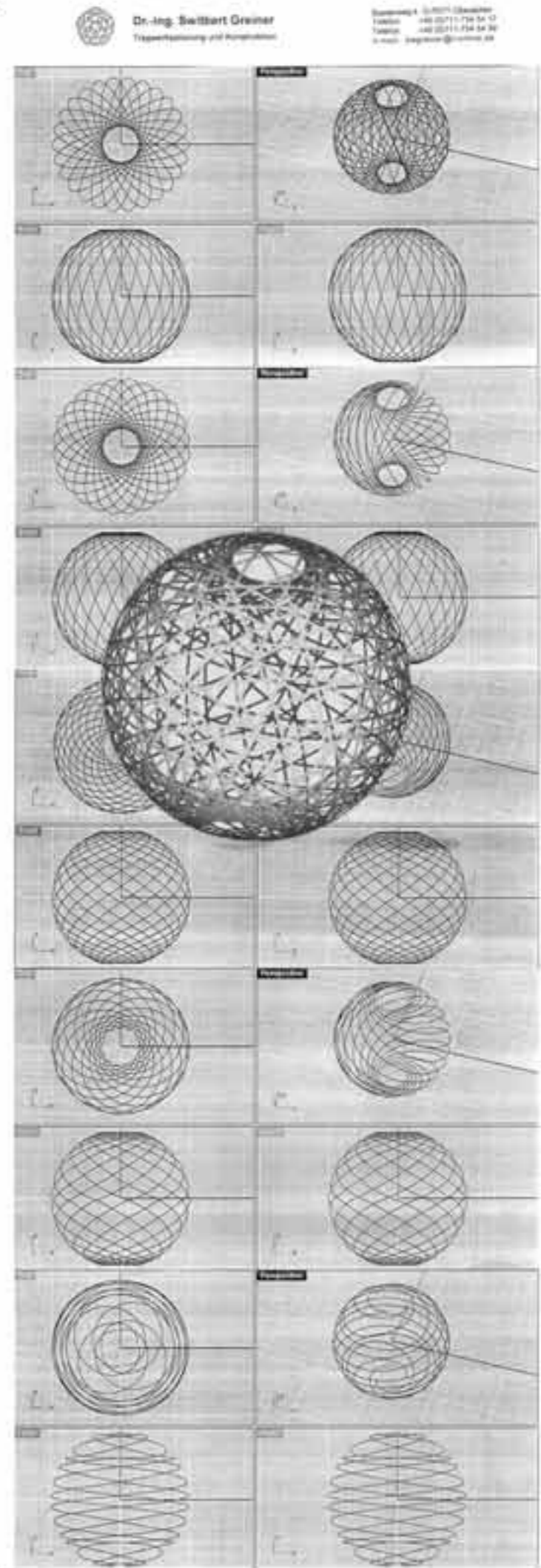
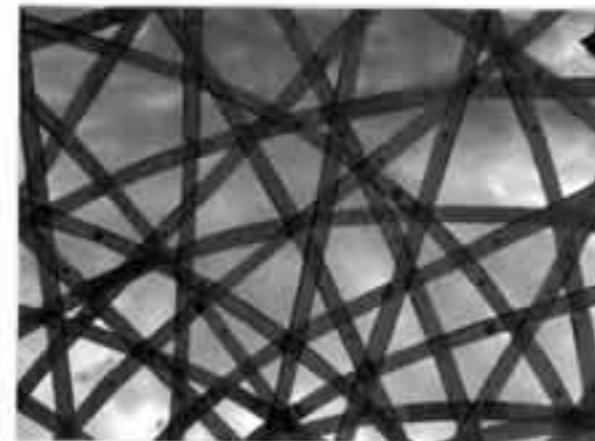
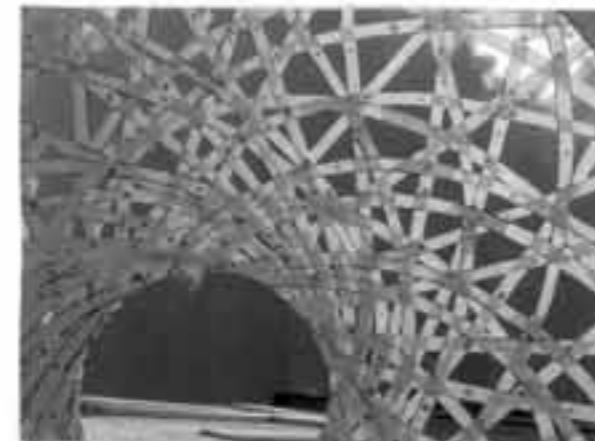
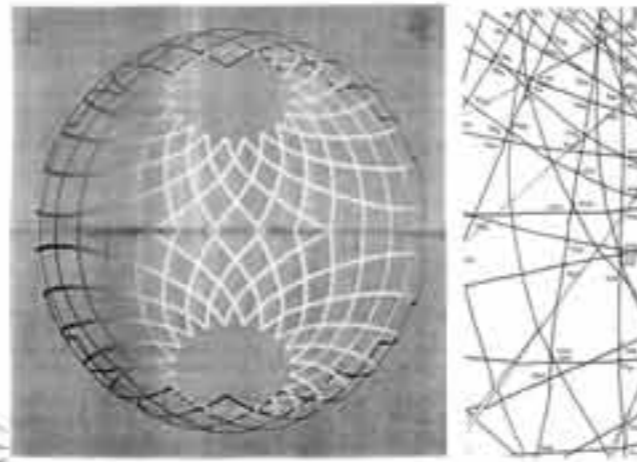
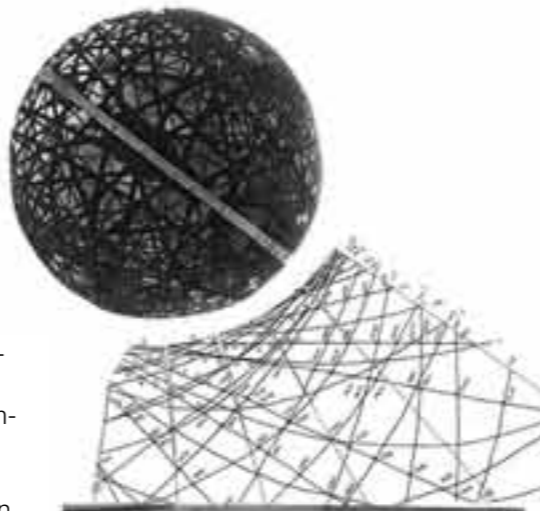
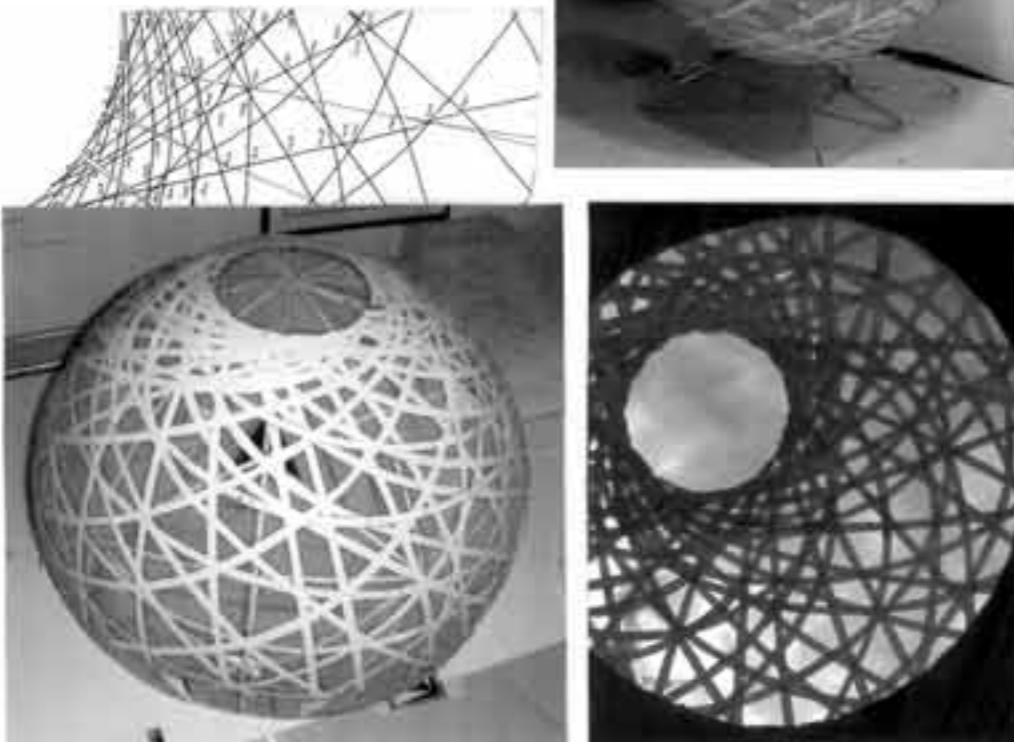
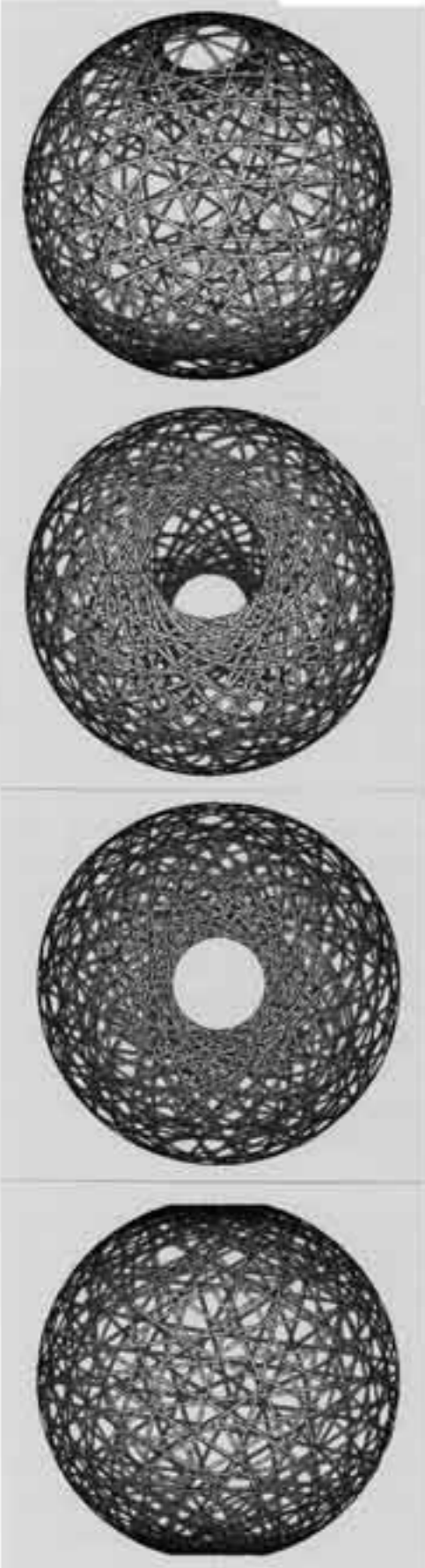
Right now there is work in progress for an art piece by Olafur to be built in downtown Munich, based on these principles. It is a 1000 CM diameter sphere that will be hung into a pentagonal backyard in the new main offices of a major German bank.

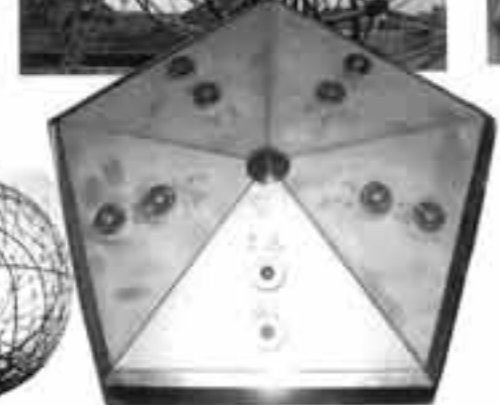
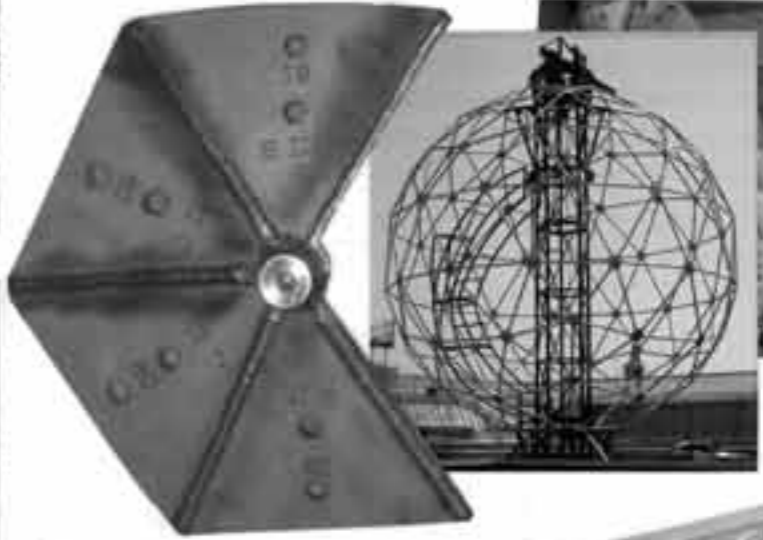
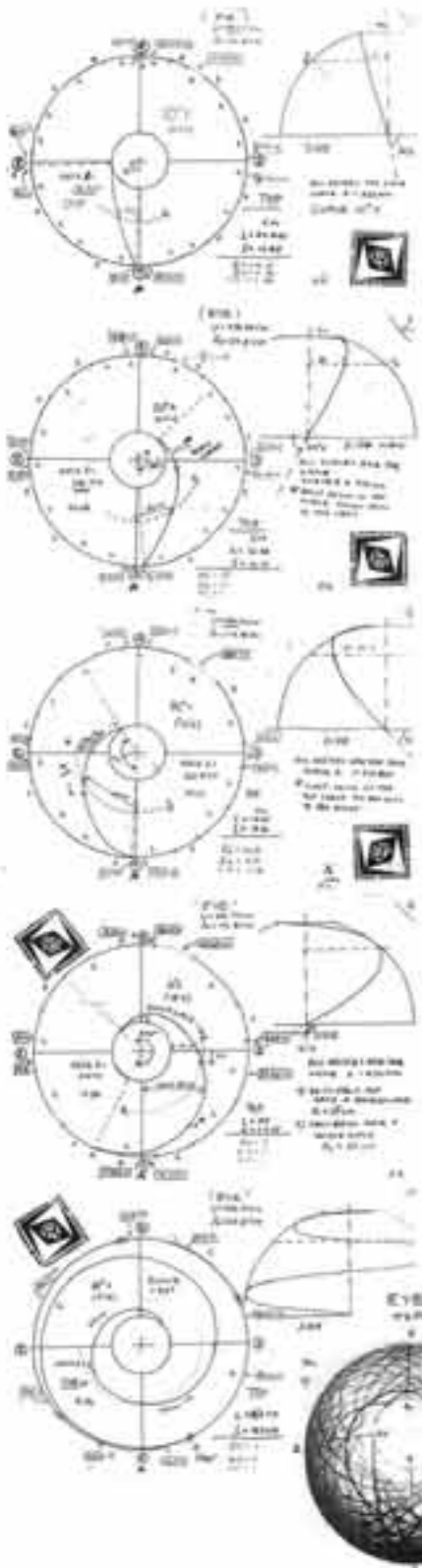
Of course, it takes considerable time and a group of specialists to complete such a task. But depending on the schedule of this book and the art project, we may be able to add two more pages to here on this project.

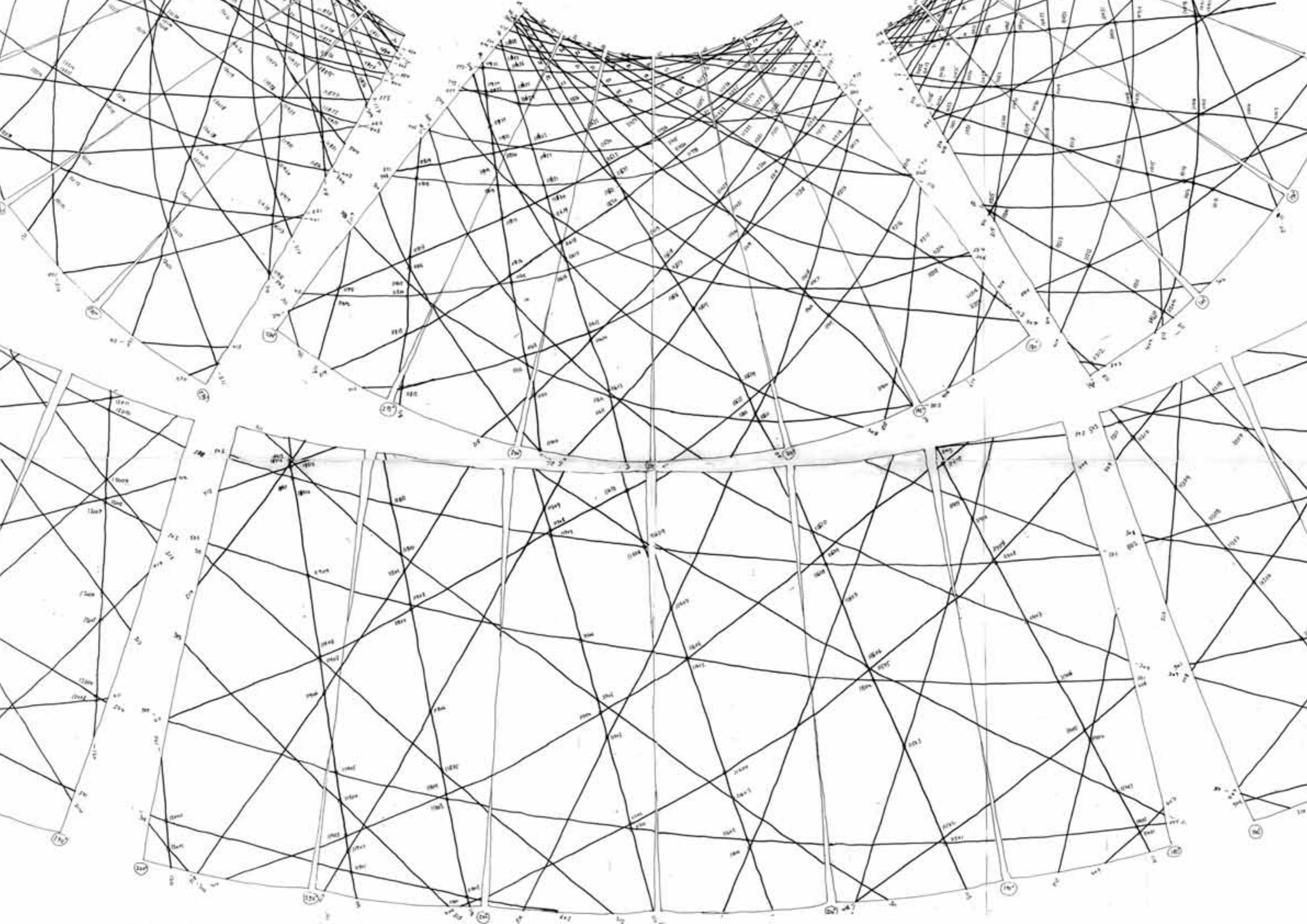
On these pages, model studies and some computer drawings of this piece are shown, now called the "Fivefold sphere" as a working title.

The art piece will be erected on the roof of the bank around a central scaffolding structure that happens to be a flat-bottomed 3 FQ geodesic sphere. This simultaneously secures the minimum material costs for the supporting structure, and gives as a bonus, two metal geodesic domes, one 3/8 and the other 5/8 when the art piece is finished – a recycling enterprise.

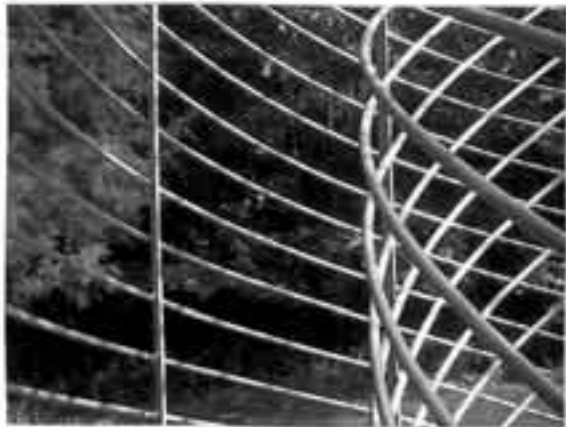
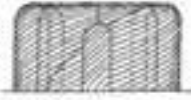
The five different layers forming the pattern are of 6" polished stainless steel "bands". They will be mounted on the geodesic sphere and then spot welded into one structure."







spiral pavilion



"Early in 1999 Olafur was invited to exhibit one major piece at the Venice Biennale. In the beginning he had a tensile tunnel in mind (and we will be coming to that proposal) but because of conditions at the site this was not possible. However, there was little time left.

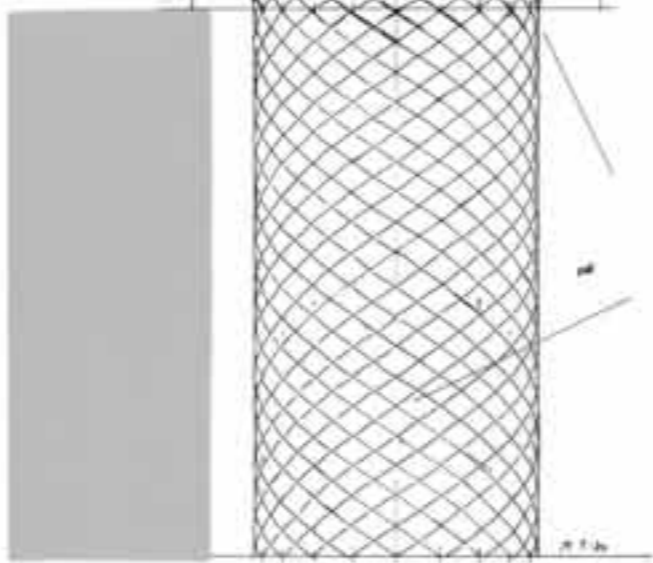
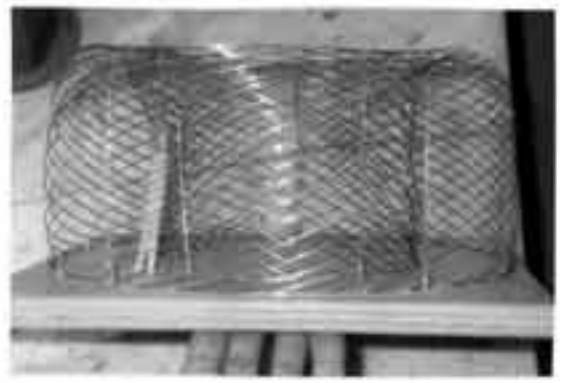
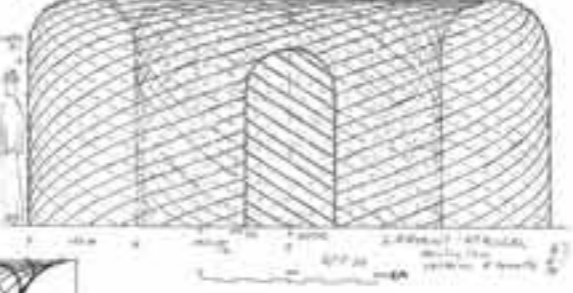
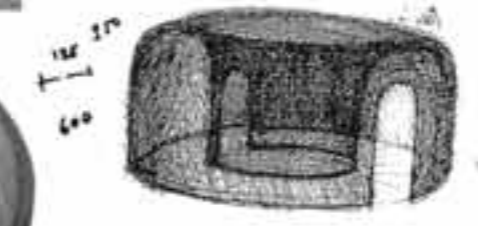
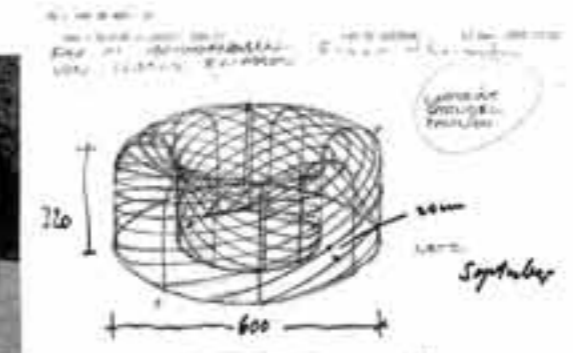
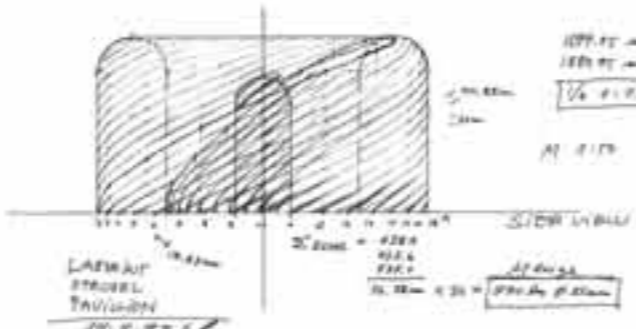
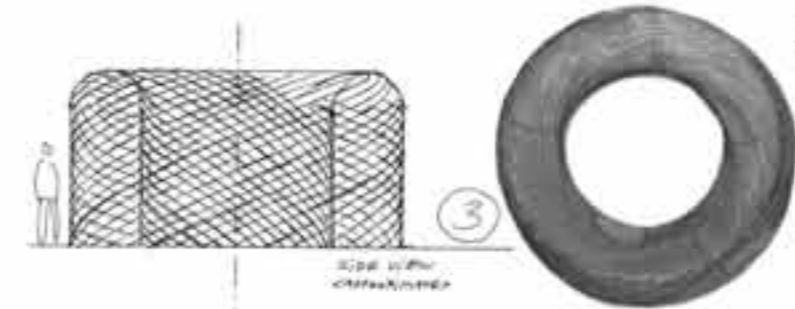
Just as I was beginning to think nothing would come of it, I received a fax from him to Bremerhaven. This fax is here on this page.

It was a new proposal for a pavilion made of spirals and little else. A very interesting piece and I set immediately to work on the kitchen table in my fiancée's home.

This then became The Spiral Pavilion that was first exhibited in Venice 1999 and is now in Bielefeld Germany. Later another "branch" on Olafur's art-tree developed from this unique geometry. And we will look into this on the next few pages.

The story of this art piece is not without irony. The first piece executed and exhibited was so badly damaged on the way to Venice that a new one had to be made after it was sold. However the insurance company insisted that the first be destroyed. Consequently, it is now exhibited only for divers and fish at the bottom of the sea outside Venice.

The Spiral Pavilion is a round walk-in art piece or installation – made of two parallel circular walls that are covered with an arch between them. They form a round never-ending tunnel enclosing an inner uncovered space. There are two doors into the tunnel: one into the outer wall and the other opposite to that, in the inner wall. The latter emerges into the inner, uncovered space.



spiral tower

"The Spiral Tower is a smaller piece of similar idea. It had a long development period but was made in record time. It has an outer diameter of 11 Feet, an inner diameter of 5,5 Feet and a height of 14 Feet. The walls and arches of the Spiral Tower are made of spiral tubes also that start on the outside with an 18° degree angle, climb up to the top of the arch and then going on to the bottom of the inner wall. In doing so, each tube has now covered two and a half circles of the pavilion periphery. – This art piece is now in a private collection in New York."

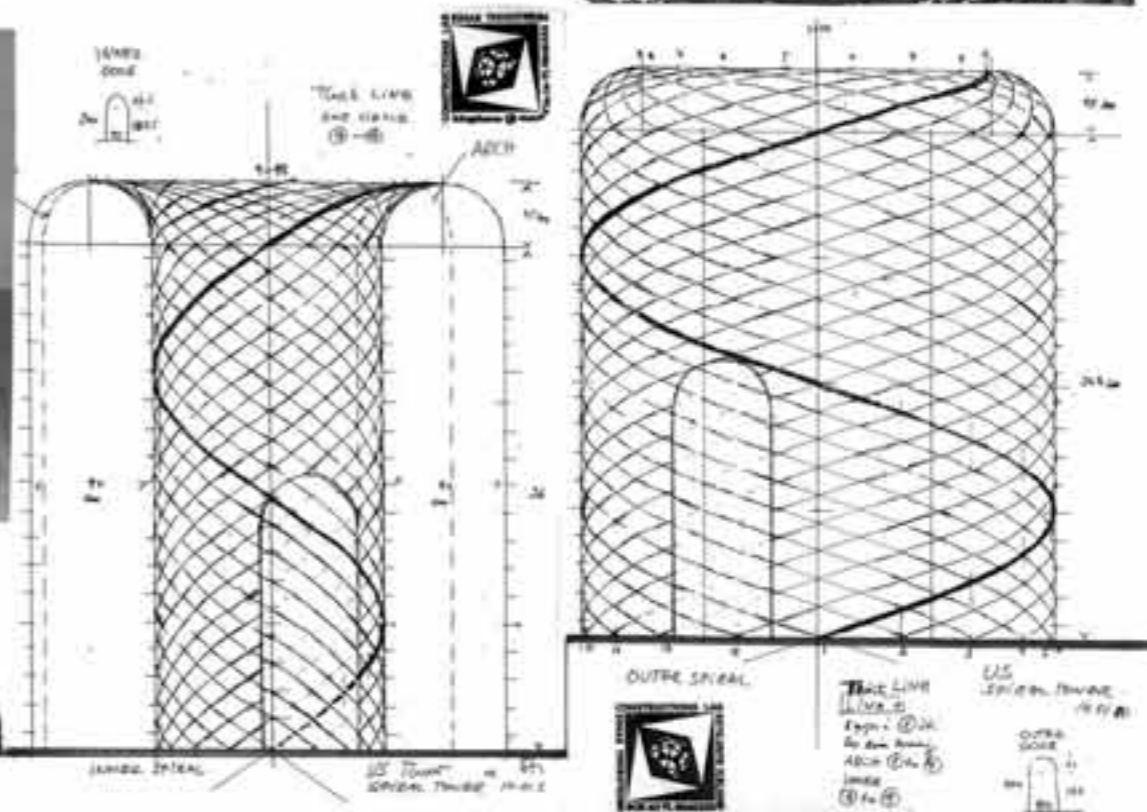
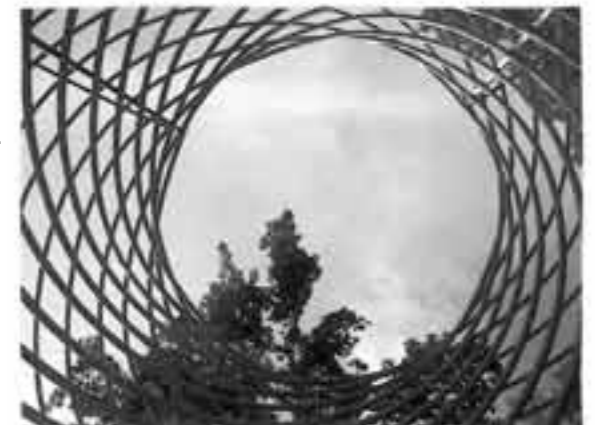
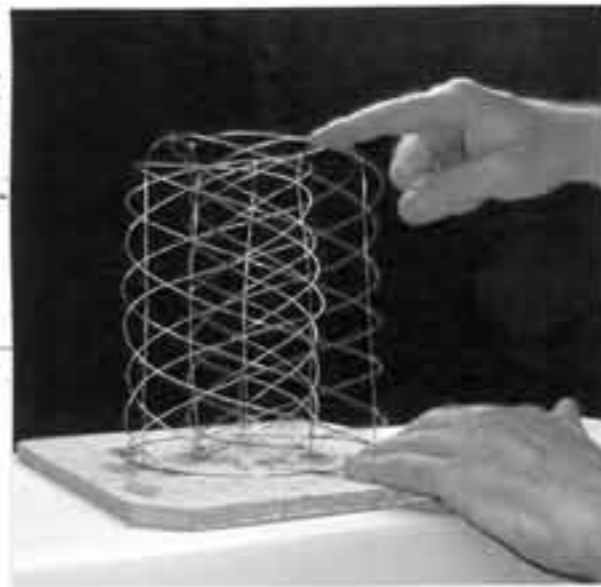
"As one can see when looking at the top of the spiral pavilion models, from here it looks just like a doughnut.

The idea also soon emerged after we received a book on the mathematics behind the structures of living creatures, to do a doughnut version of the piece.

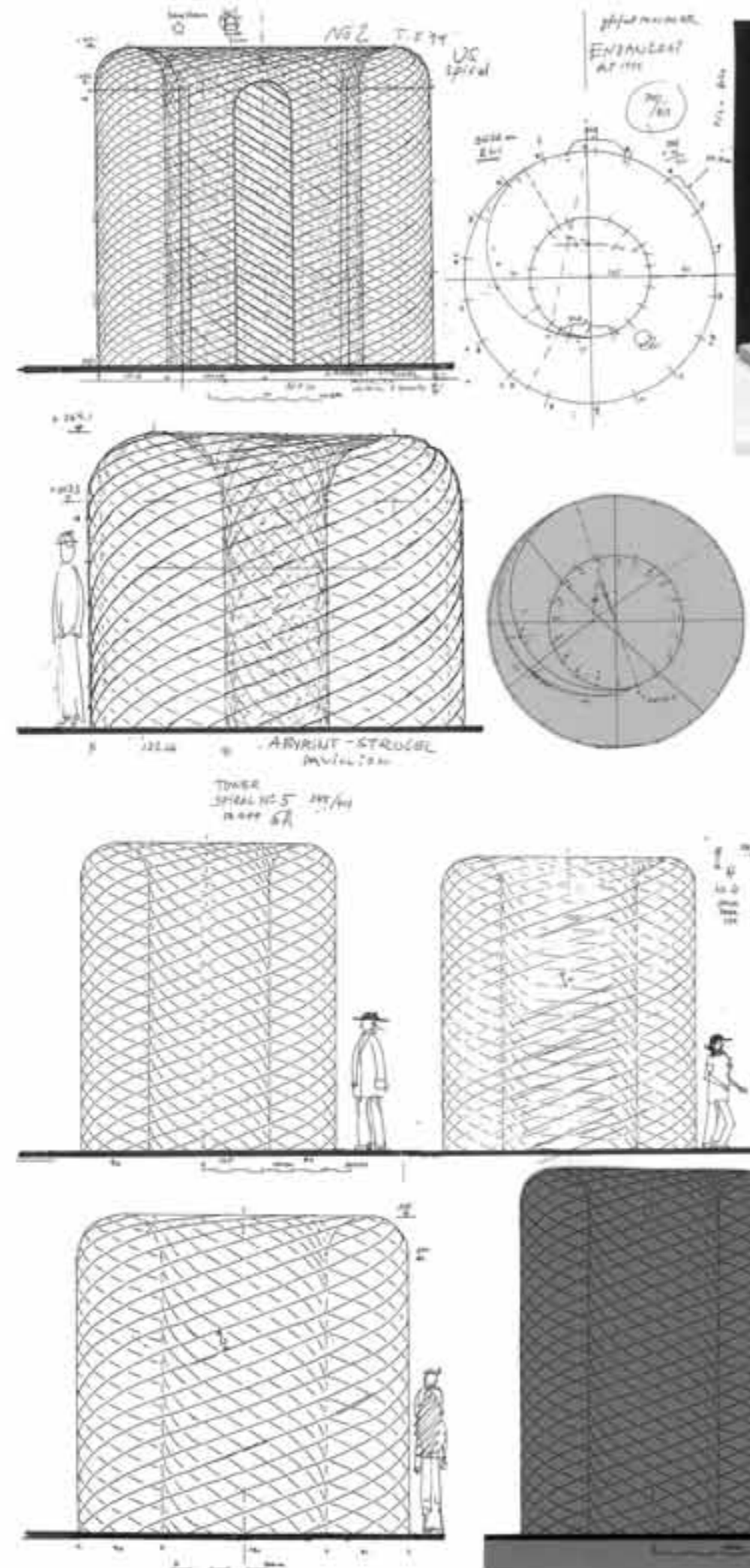
The first was done for an exhibition in Graz in 2000. And as it sometimes happens, two variations of the doughnuts emerged: one made of separate rings added to a doughnut and then another that is made of one complete spiral.

Now, what drew my interest to the doughnut, or torus knot, is the fact that they exist in nature with these geometric properties.

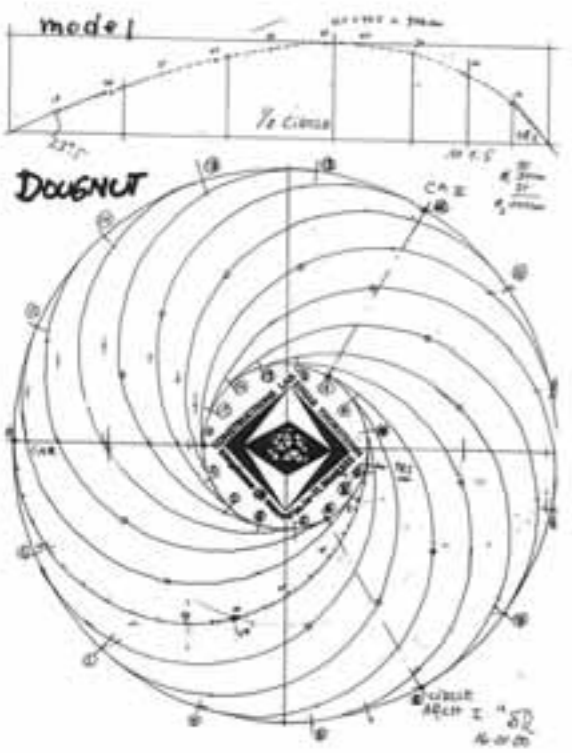
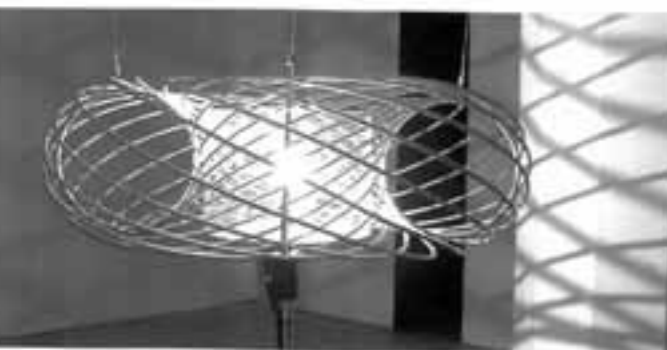
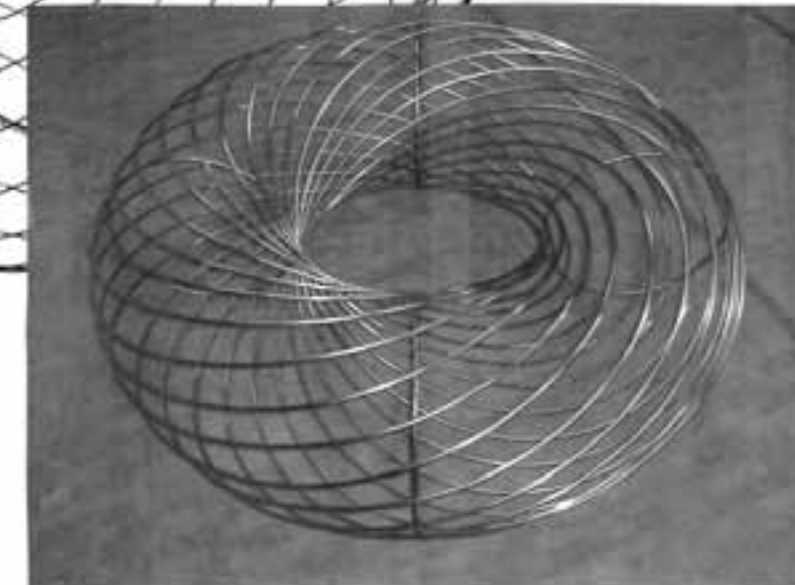
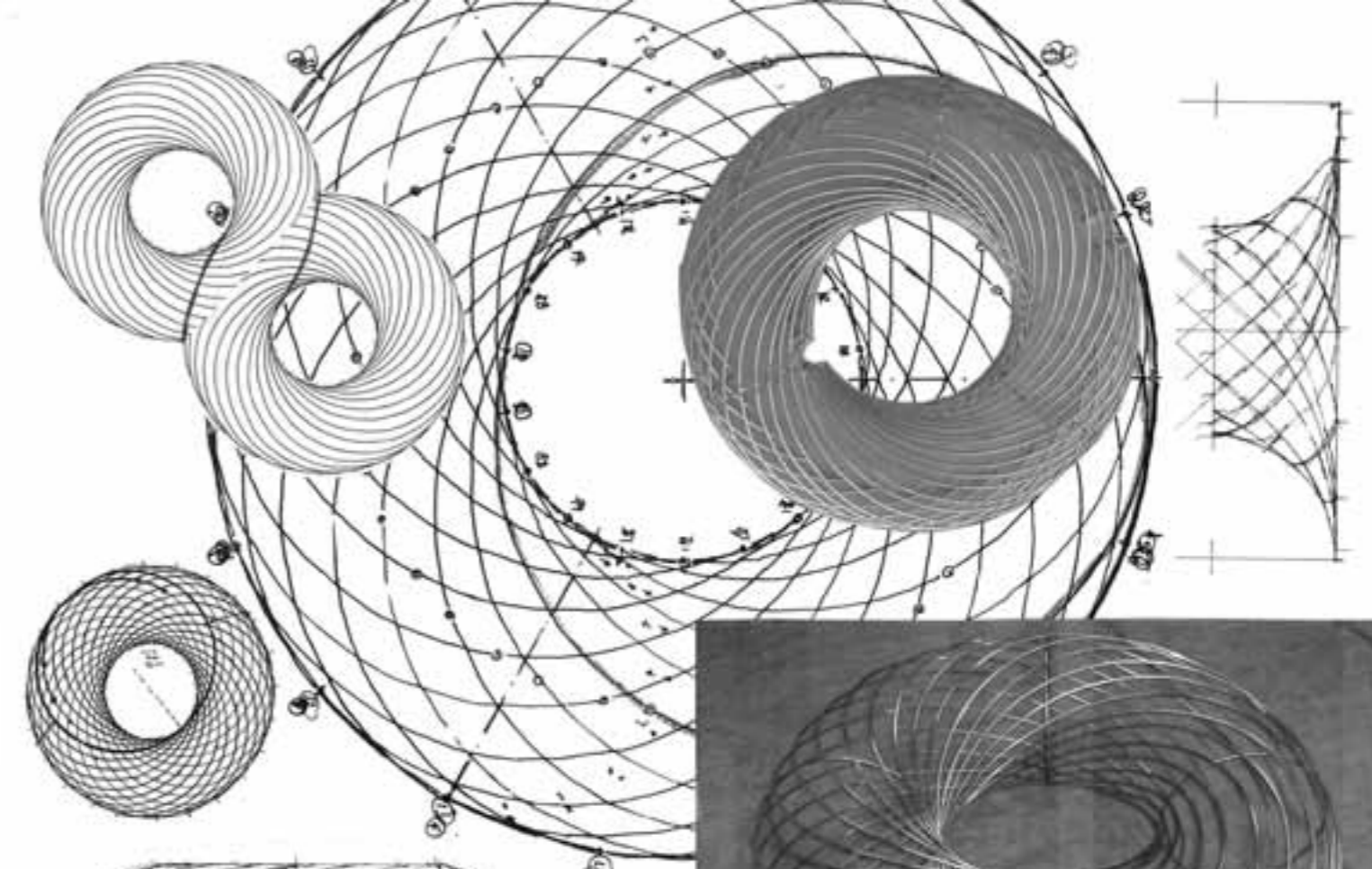
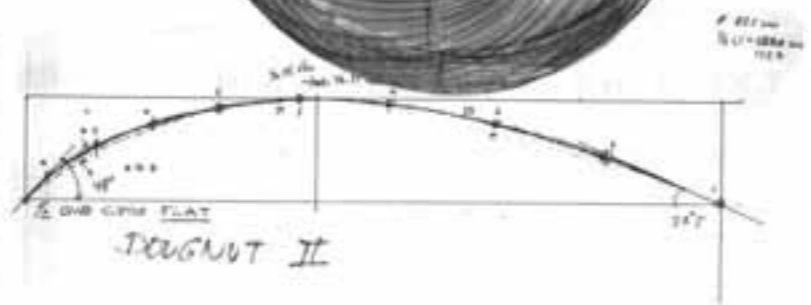
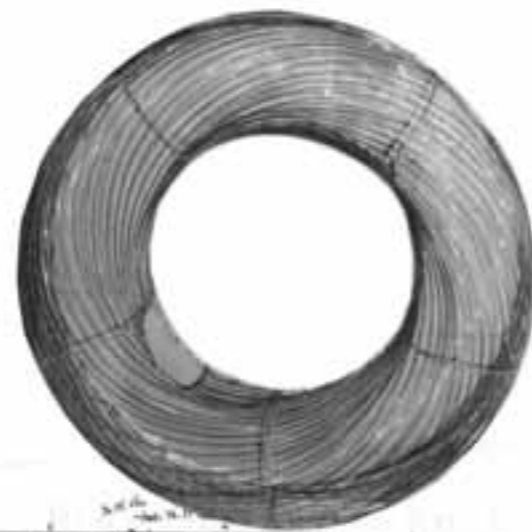
In the fascinating book *Life's Other Secret – The New Mathematics of the Living World* – by Ian Stewart, there is a chapter named: The Frozen Accident, a reference to Francis Crick's theory of the same name from 1968. Ian Stewart however implies with his "frozen accident" that Crick may be wrong, which is quite another matter. I guess it is simply



The Spiral Pavilion has an outer diameter of 20 Feet, an inner diameter of 12 Feet and a height of 11 Feet. All the walls and arches are made of spiral tubes that start on the outside with a 20° degree angle climb up to the top of the arch and then go on to the bottom of the inner wall. In doing so, the tube has covered exactly one circle of the pavilion."



doughnuts

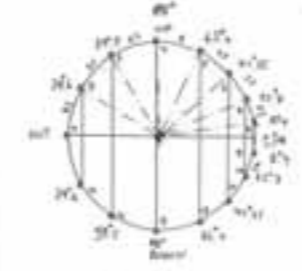
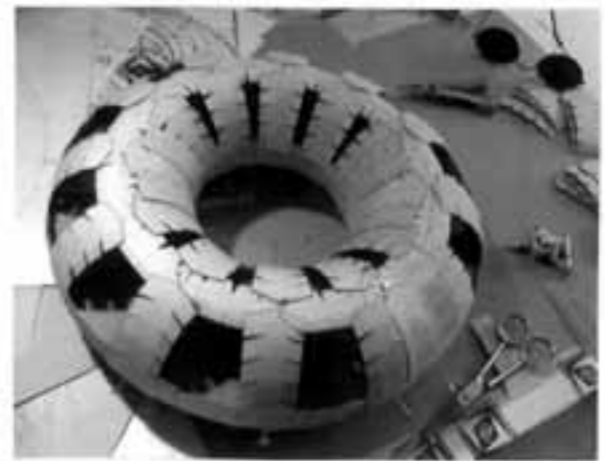
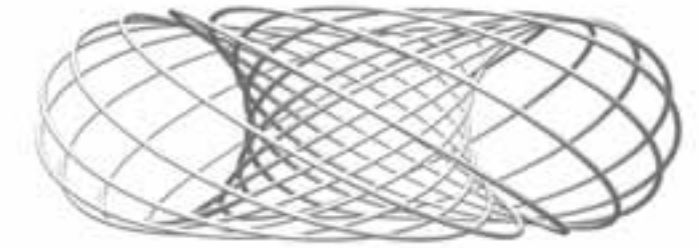
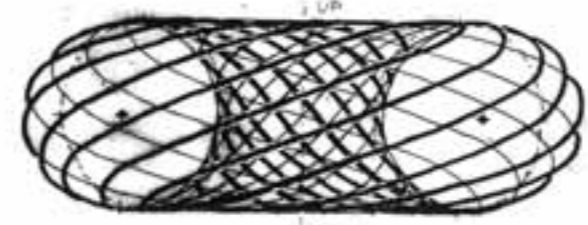
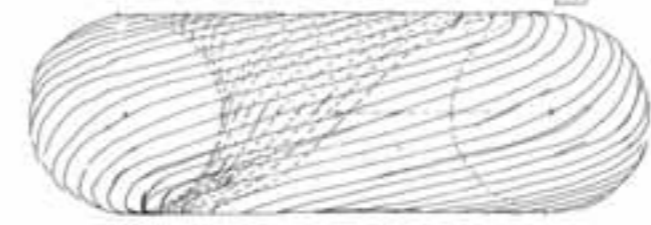
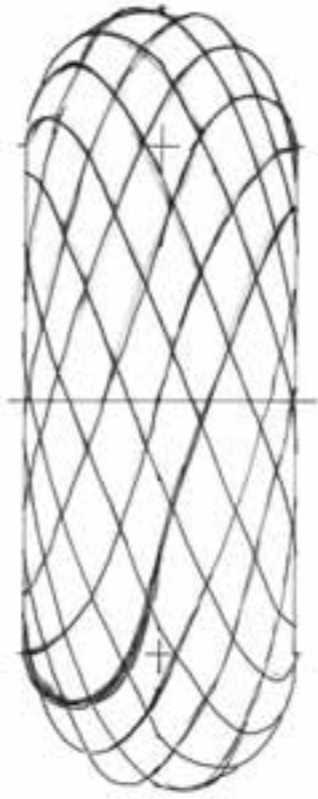


a matter of mathematics versus genetics as an explanation of biological life that is the issue here.

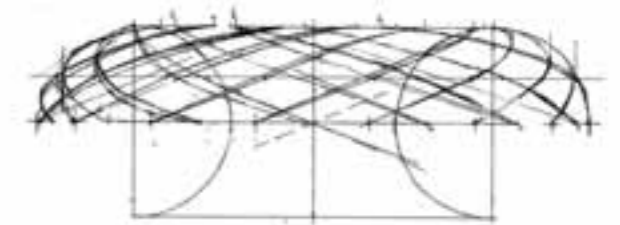
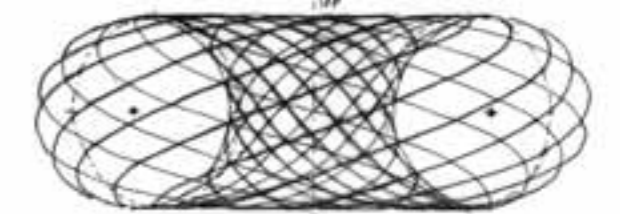
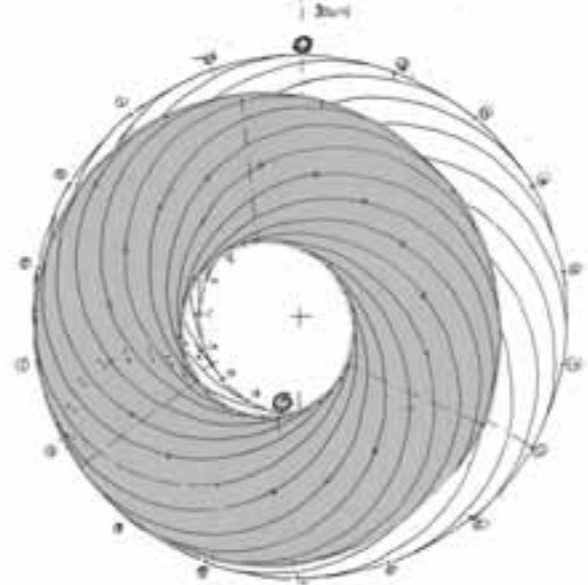
The chapter is all about the problems of finding a solution to the DNA biochemistry. For instance, one objective is to find the shape of DNA strands when in solution and not in crystalline form, as is usually required. There is a great difference between the real form of a DNA strand and what will show when it is pressed between two glass plates under a microscope!

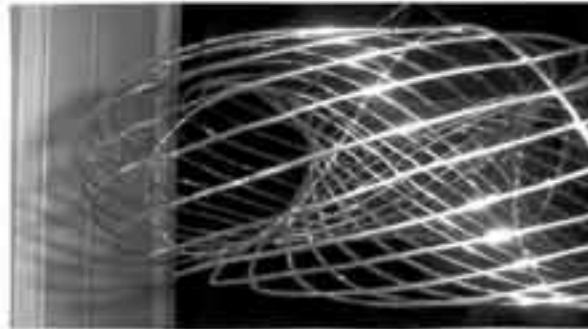
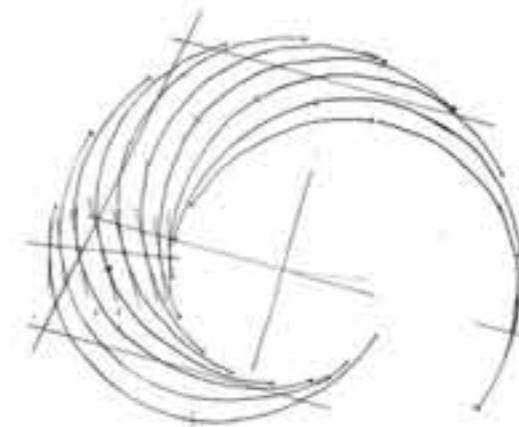
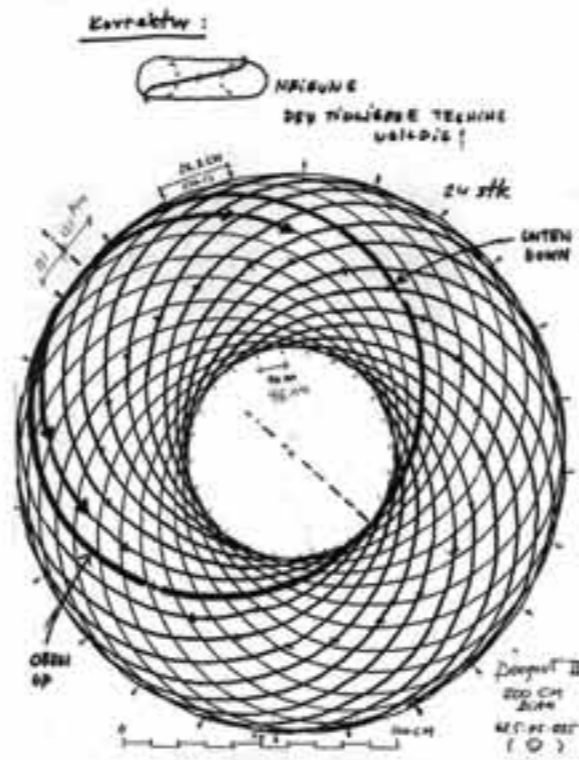
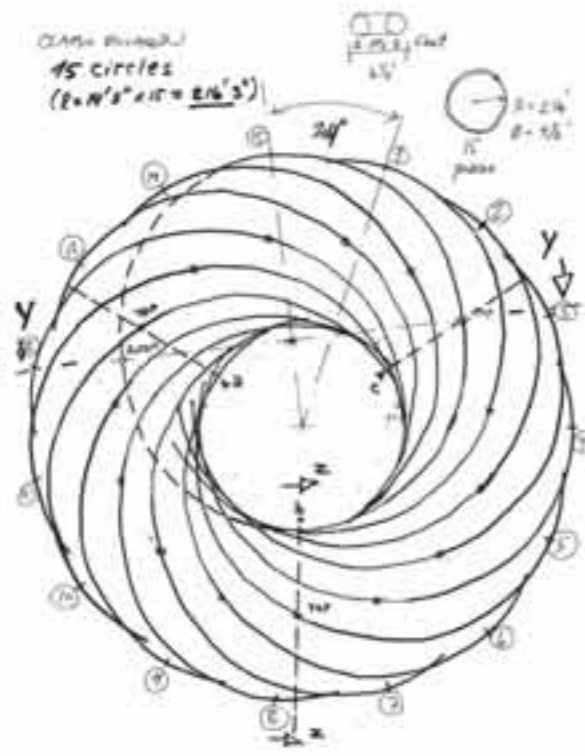
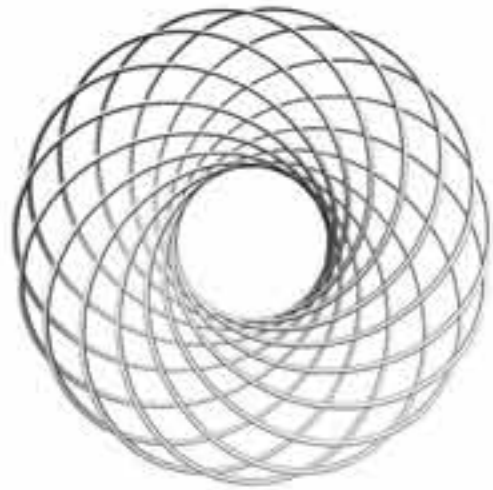
Stewart says here: "As we know the DNA double helix is made of two intertwined strands. When enzymes cut and then rejoin the molecule, the resulting strands form tangled knots and links. A fundamental problem is to work out which knot or link you are seeing; your interpretation of the experiment depends upon doing so."

Lots of the DNA knots have 13 crossings even if only single strands, i.e. they then intertwine each other 13 times. But any other number can be geometrically acquired. A single strand of that type can be a TORUS KNOT. In a geometrically cleaned version it would look like a doughnut formed by a string that has been winded around and around through the center hole until its ends again fit together.



3pi/2
ARCH
CIRCLE
R = 2cm

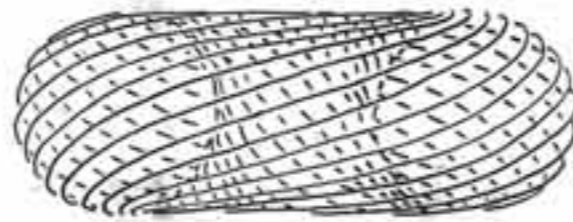




Through studying the topology of such knots in the method of the "Jones polynomials" (as discovered in 1984 by a New Zealander of the same name) and how they can "change when cut and rejoined, biologists and mathematicians are now beginning to unravel the secrets of DNA enzyme activity".

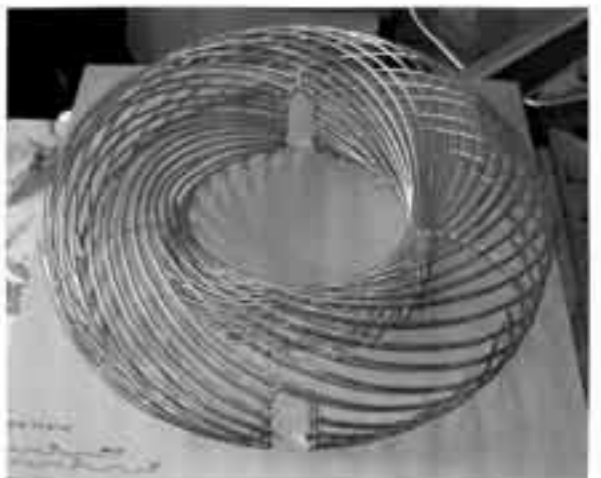
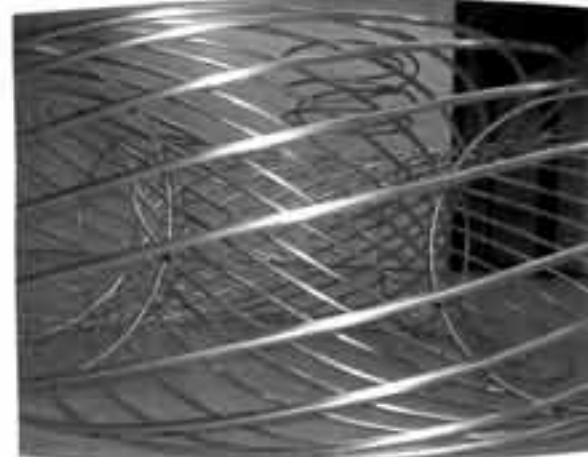
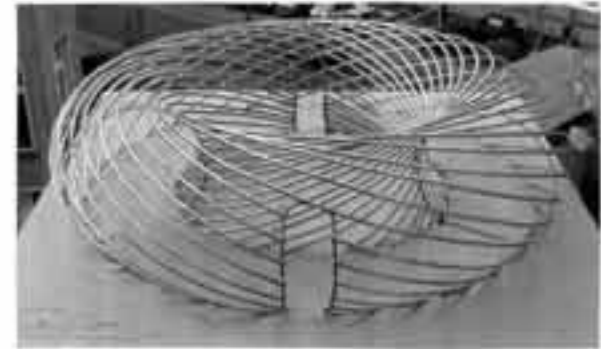
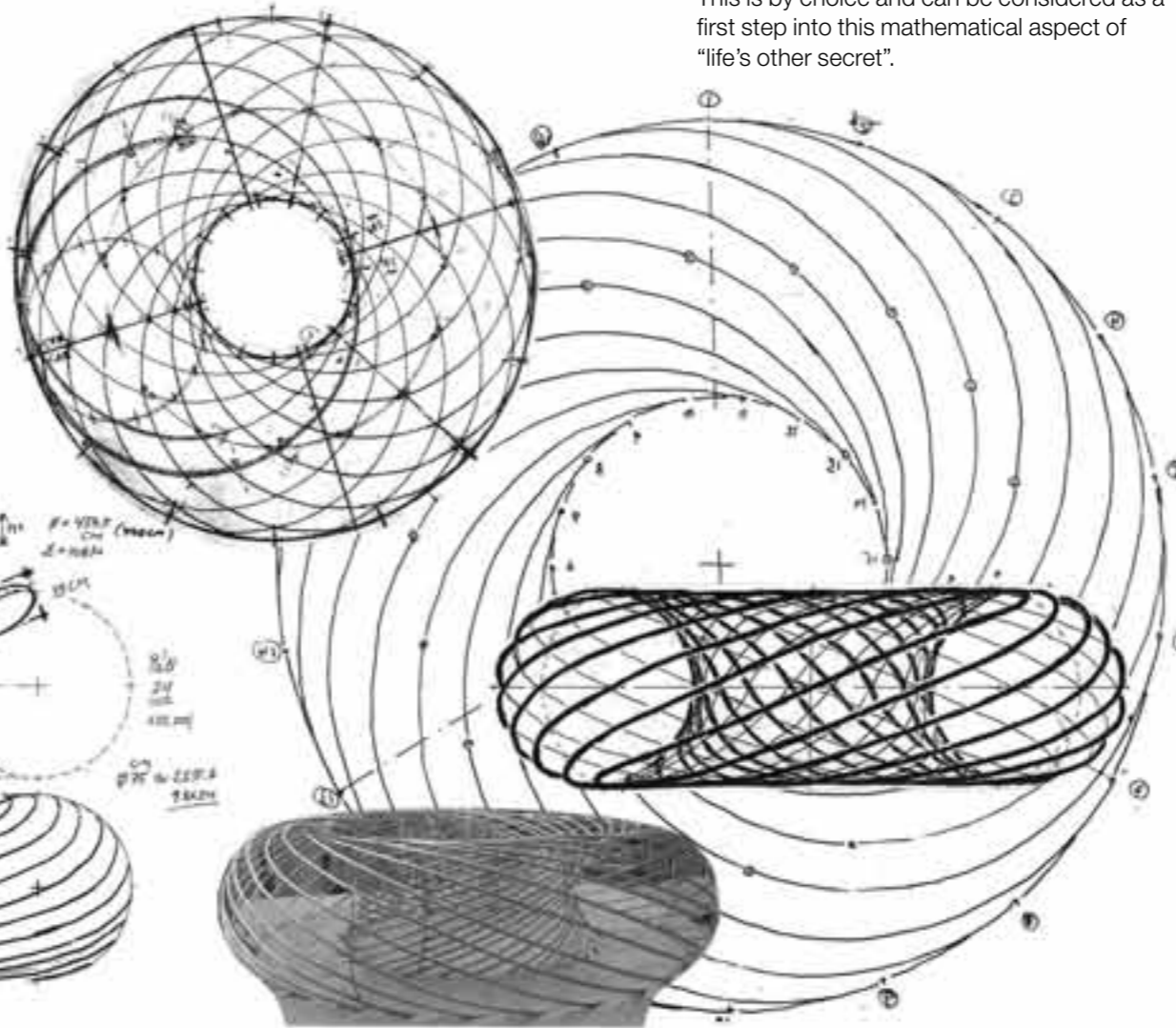
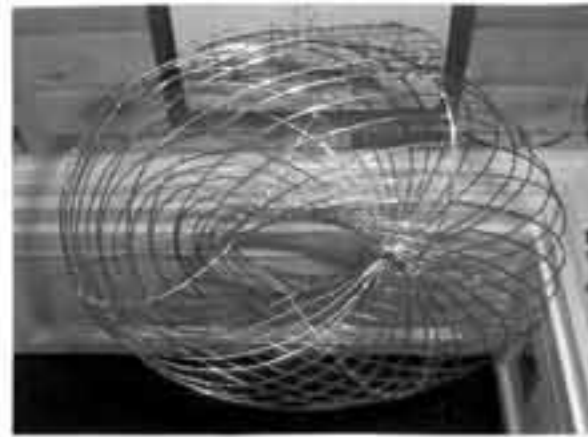
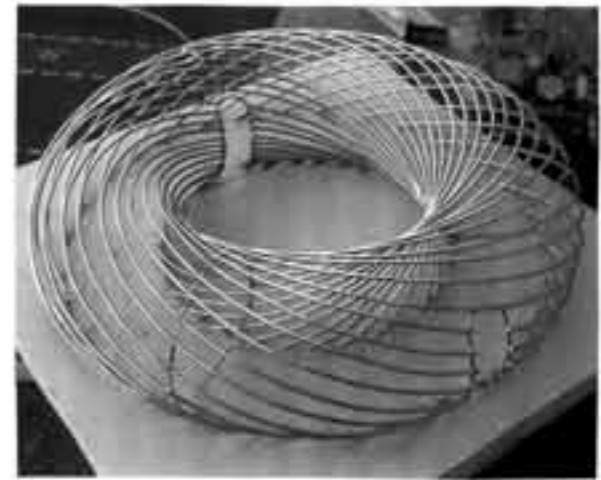
Exactly at this point we have a reference to the doughnuts series by Olafur Eliasson on this page. Geometrically, they are torus knots and have in my personal opinion to do with "the nature of things"; a reference to the overlap between mathematics and genetics.

The doughnut series, which started in Eliasson's Studio in December 1999, is again related to the Spiral Pavilion in Bielefeld – first exhibited in Venice in the spring of 1999. To date, three different medium-sized steel doughnuts have been executed and exhibited. There is one more proposal for a "walk through" doughnut pavilion of steel. And two doughnuts of neon lights have been exhibited: the Red and Blue ones. The former has a built-in timer that let's the light "move" in circles.



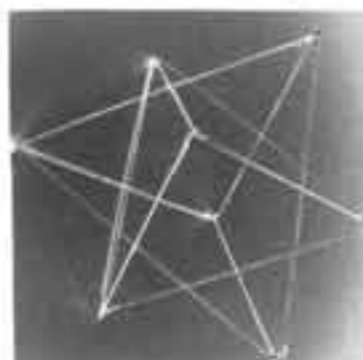
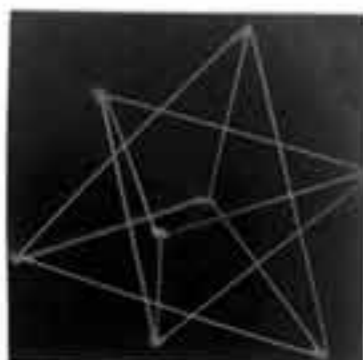
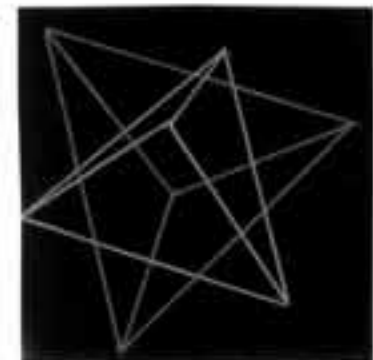
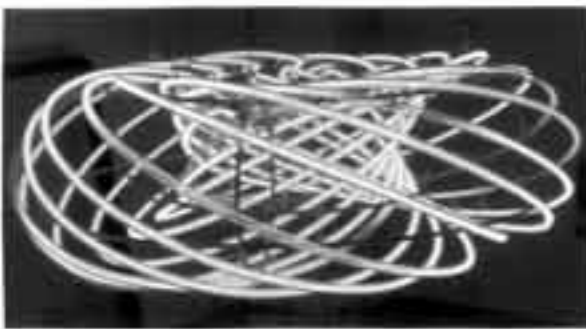
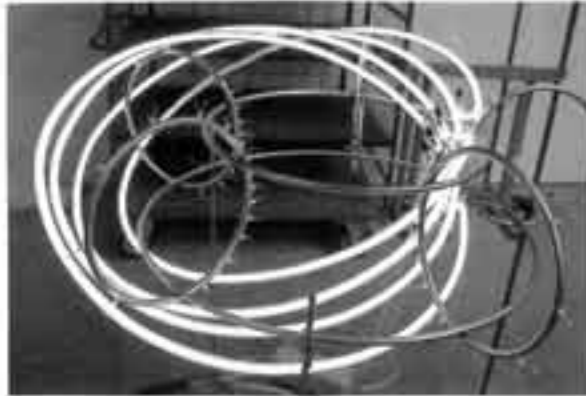
The Double Doughnut is still another proposal not yet executed. Others in the works are the Tetra Helix Doughnut, the Double Moebius Doughnut and the Folded Doughnut. Model studies of those can be seen here.

Of the first Doughnuts, all are made of exact circles except one – Doughnut II – which is similar to a DNA strand: it has an endless loop. Geometrically the circles of the executed doughnuts run 90° degree to the strand of a regular biological torus knot. They are held in place by three doughnut section-circles. This is by choice and can be considered as a first step into this mathematical aspect of "life's other secret".





neon doughnut



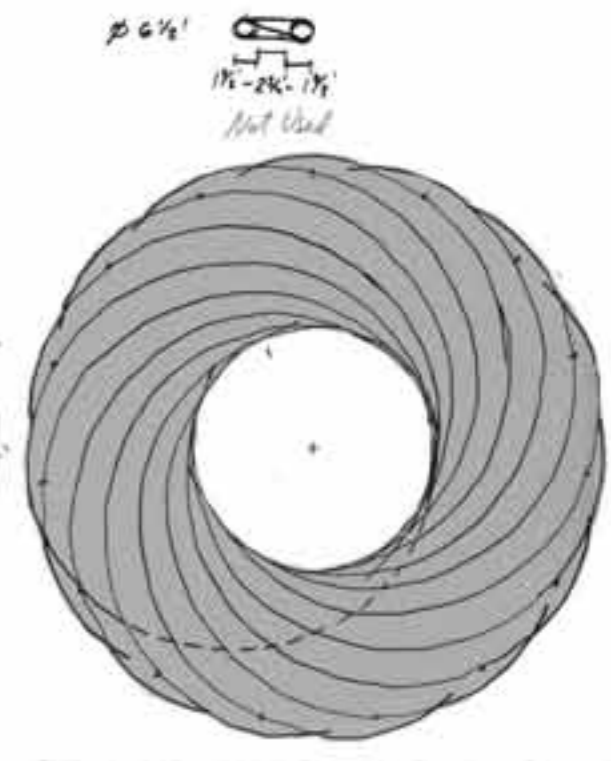
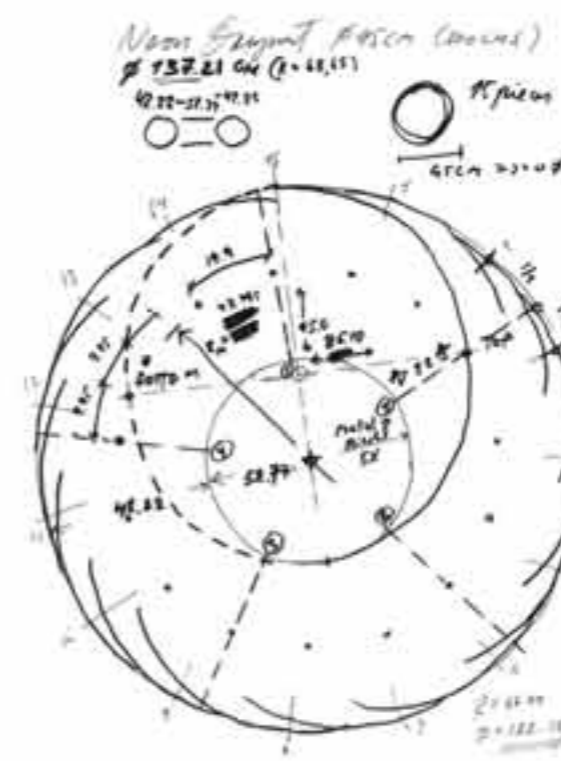
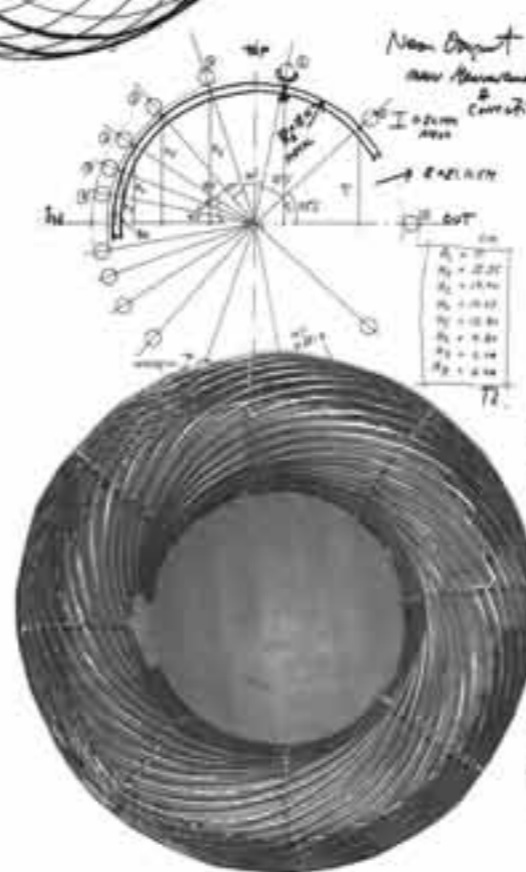
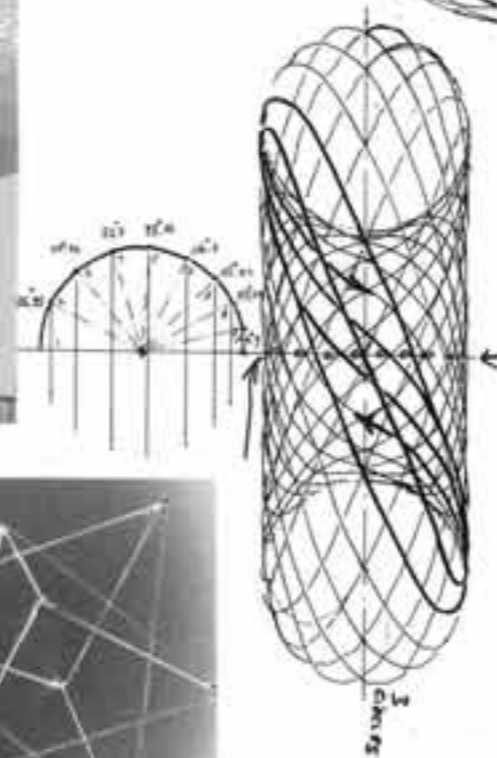
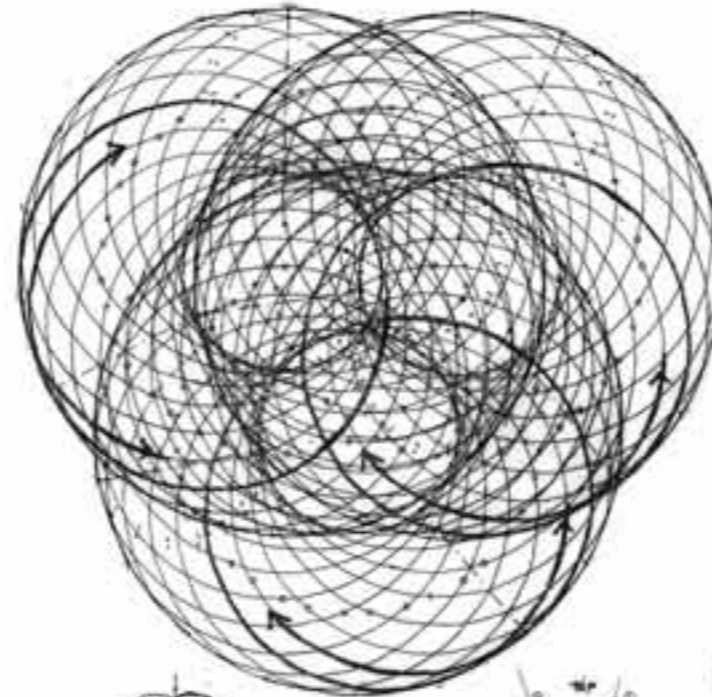
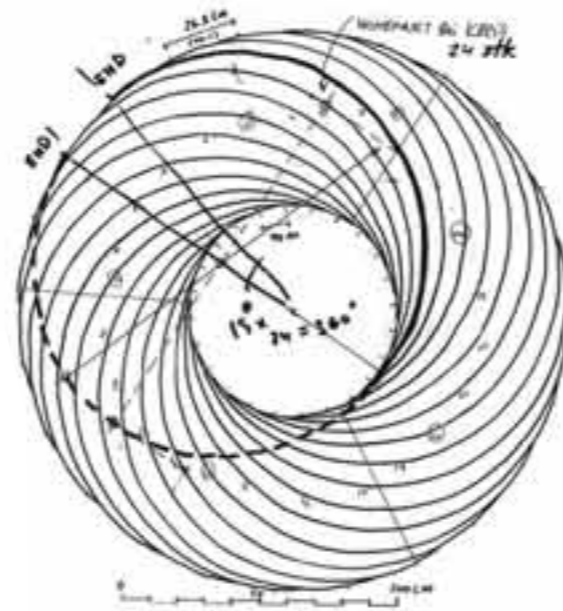
"Here on these pages is a mixture of all the doughnut studies and art pieces in the doughnut series.

Although I call it a "series", for a lack of a better word, every one of the proposed and exhibited art pieces are different.

Basically they all have to do with spirals, the way water moves in a natural way when it is not pressed into tubes or straight waterways.

Here our inspiration is the work of Walter Schauberg of prewar Austria who studied the nature of water better than anyone has since. One of the things he found out was that if water is allowed to move inside spiraling tubes the resistance at the tubes wall goes down to zero for the right spiral form.

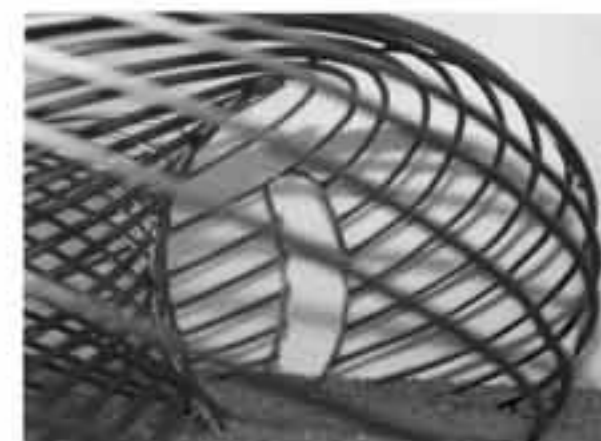
Another friend of mine, Walter Baumgartner in the USA, developed new tubes in this fashion. They had a straight form on the outside but had spiraling walls inside. This worked fine for transportation of fluids. However, the industry was not interested - who really wants to save energy?

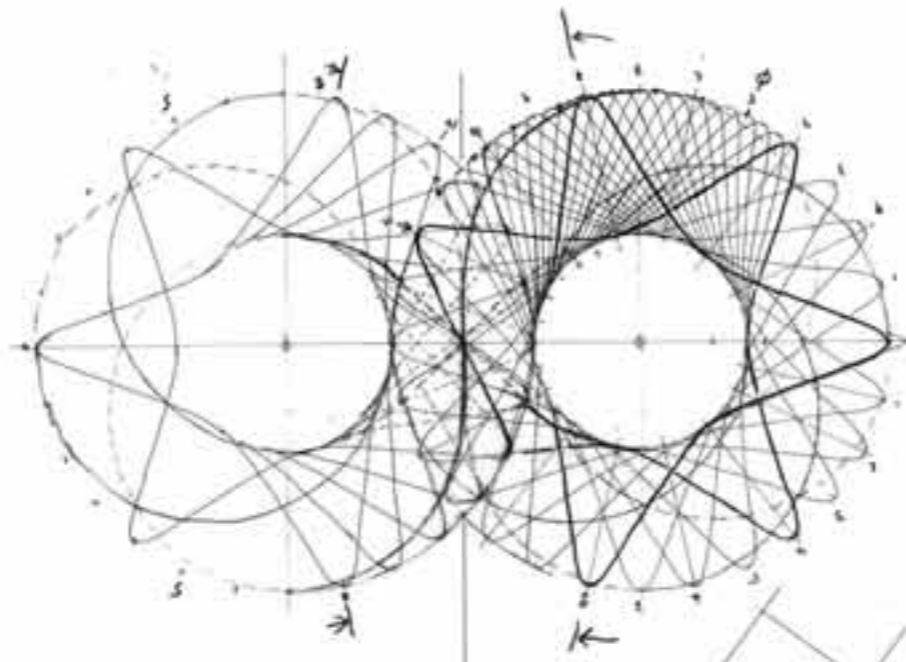


The Neon Doughnuts Blue and Red were a combination of two projects. First the plan was to do some experimenting with 3D neon geometry. It came to a double Tetrahedron "wedding" or a Tetra - Star but that got stuck in the tubes. The follow up was then the Neon Doughnut.

As mentioned before, there are a number of doughnut studies in the works: The Double Doughnut, which follows on the next foldout. Others are the Tetra Helix Doughnut, the Double Moebius Doughnut and the Folded Doughnut.

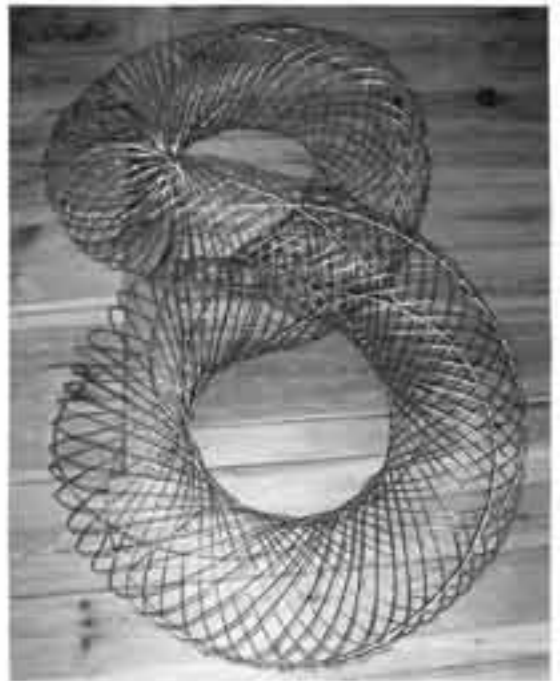
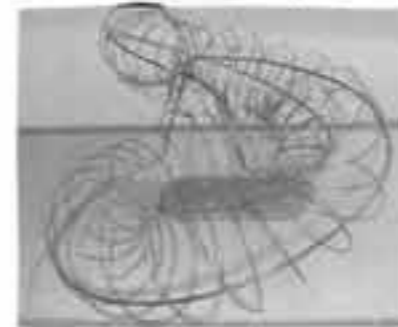
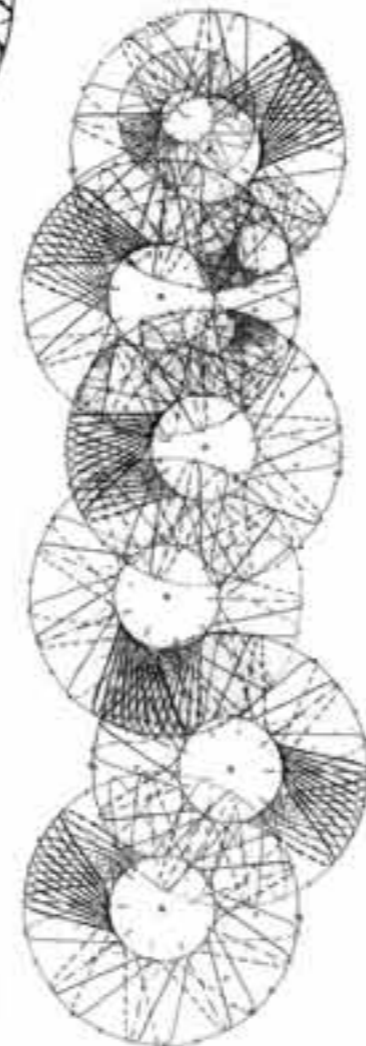
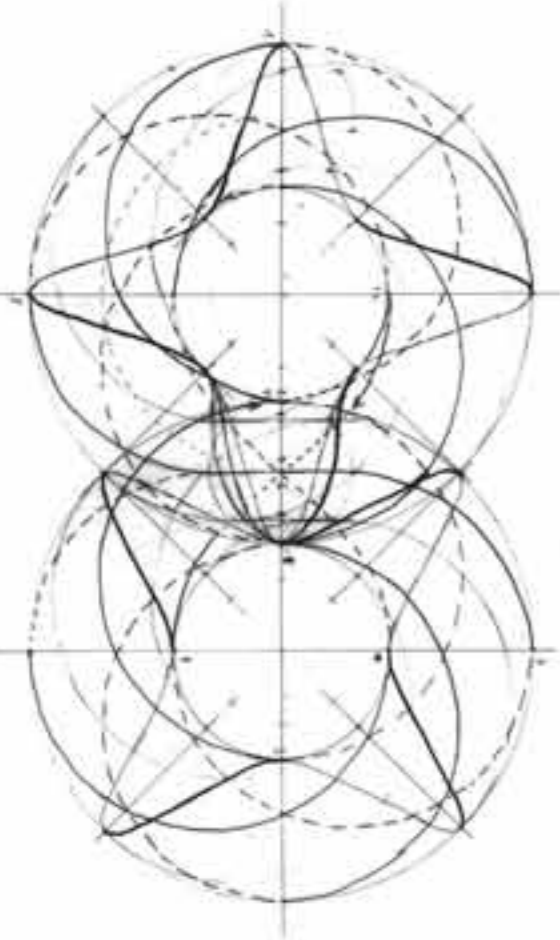
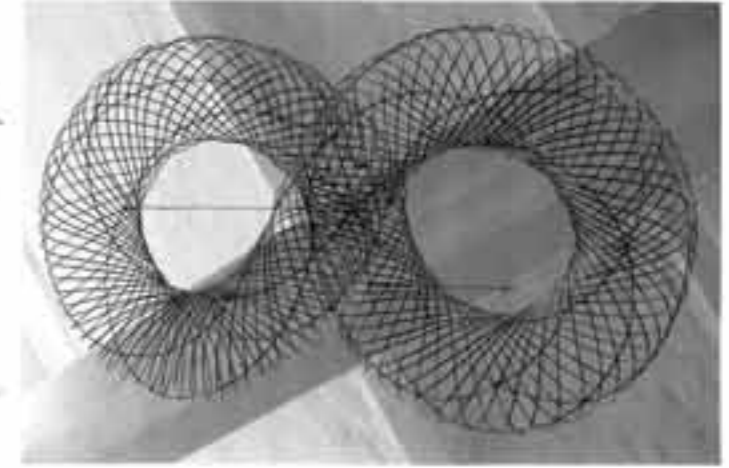
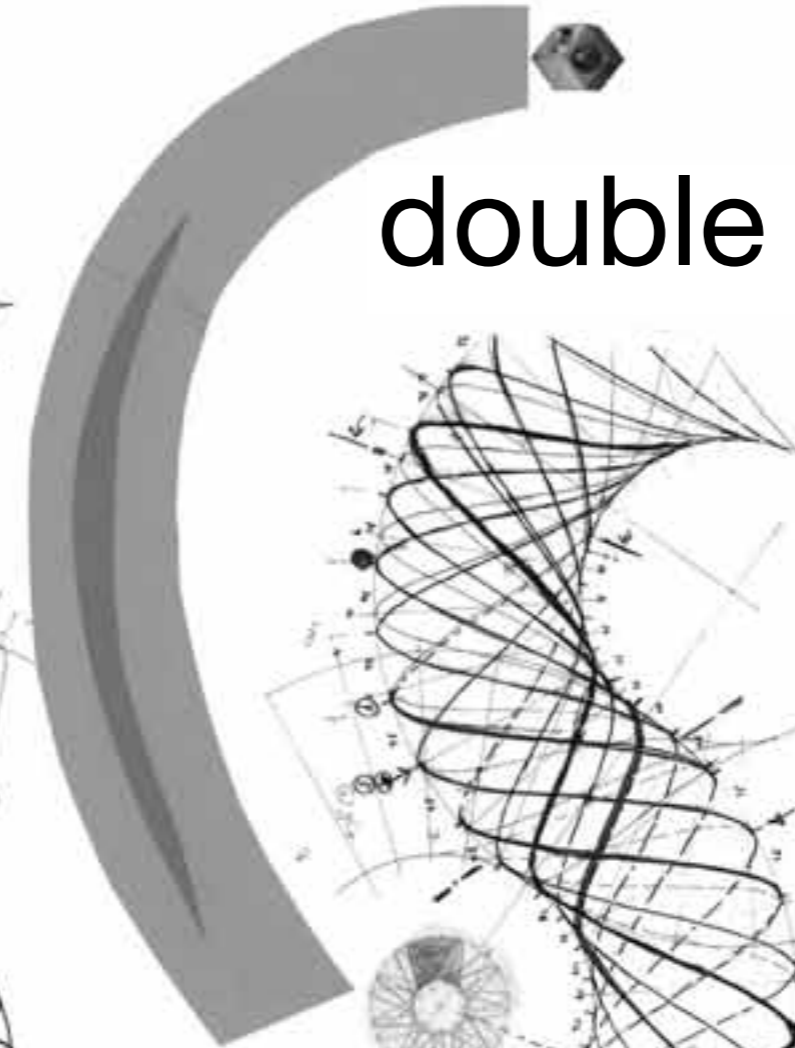
Then some variations on the fixtures of the spirals can be seen on these pages."

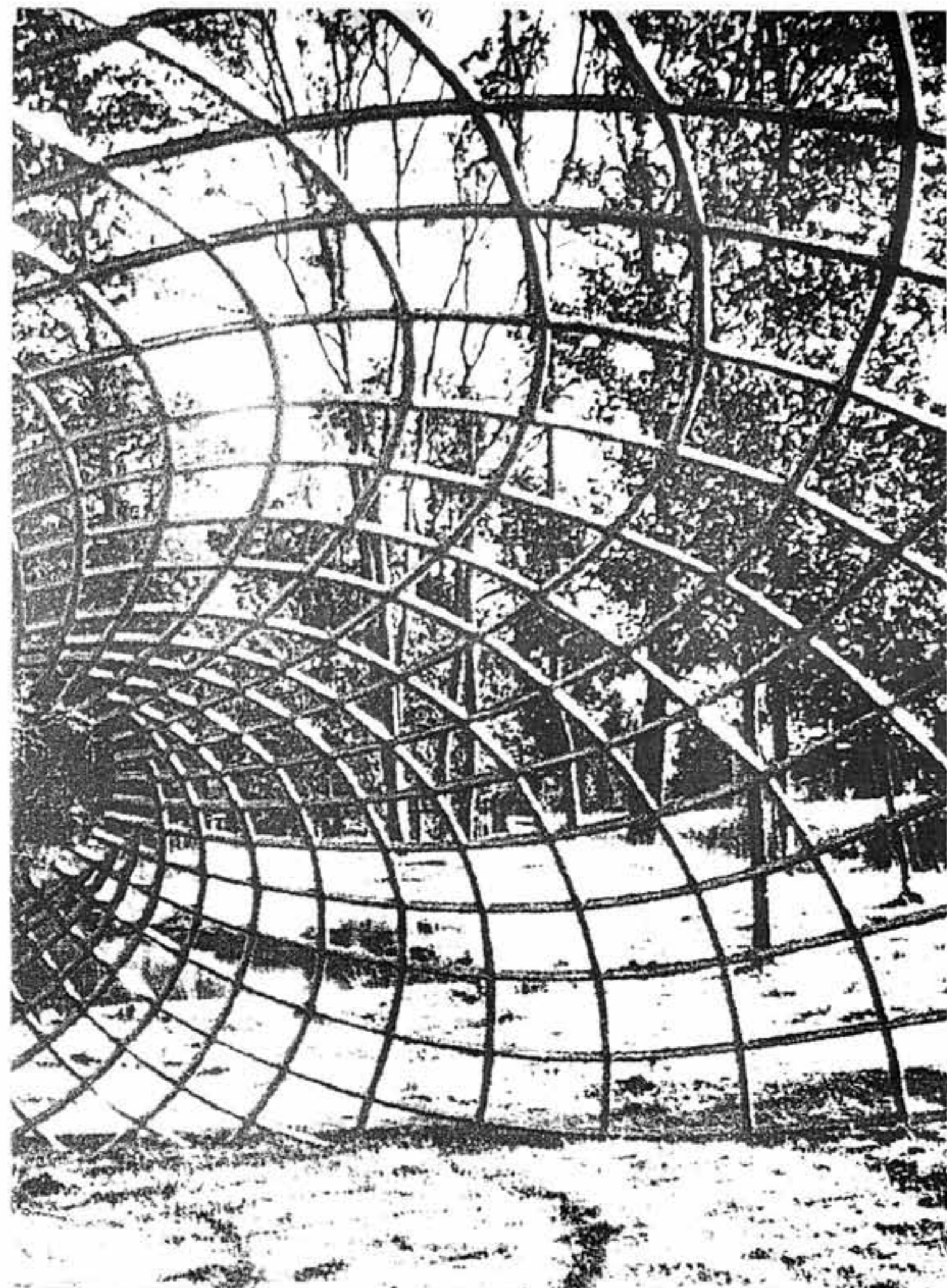
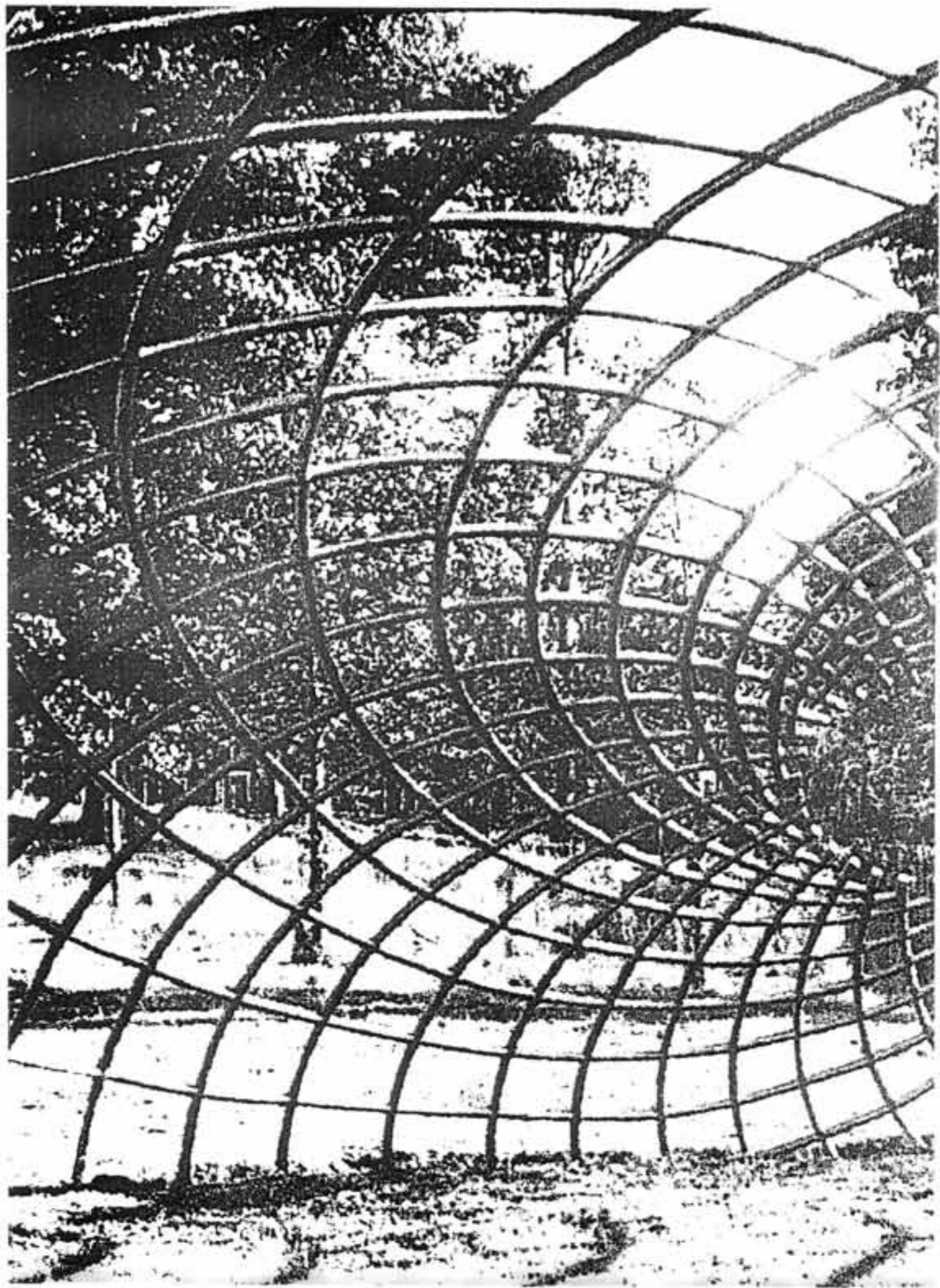




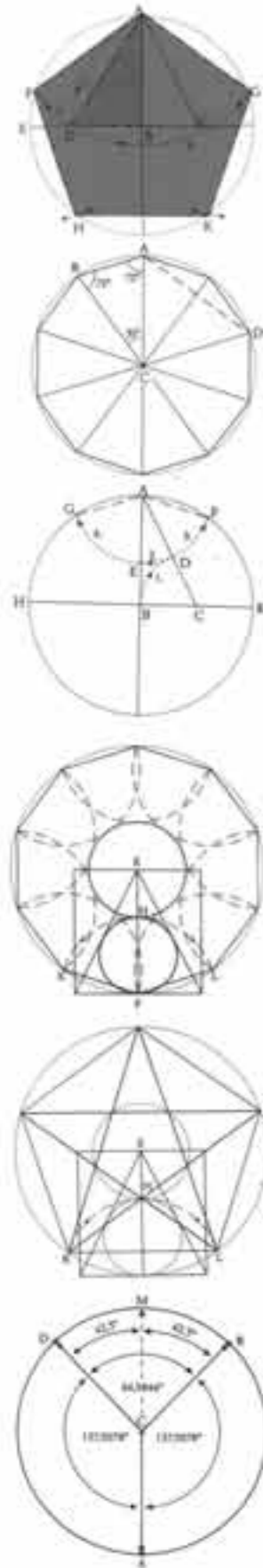
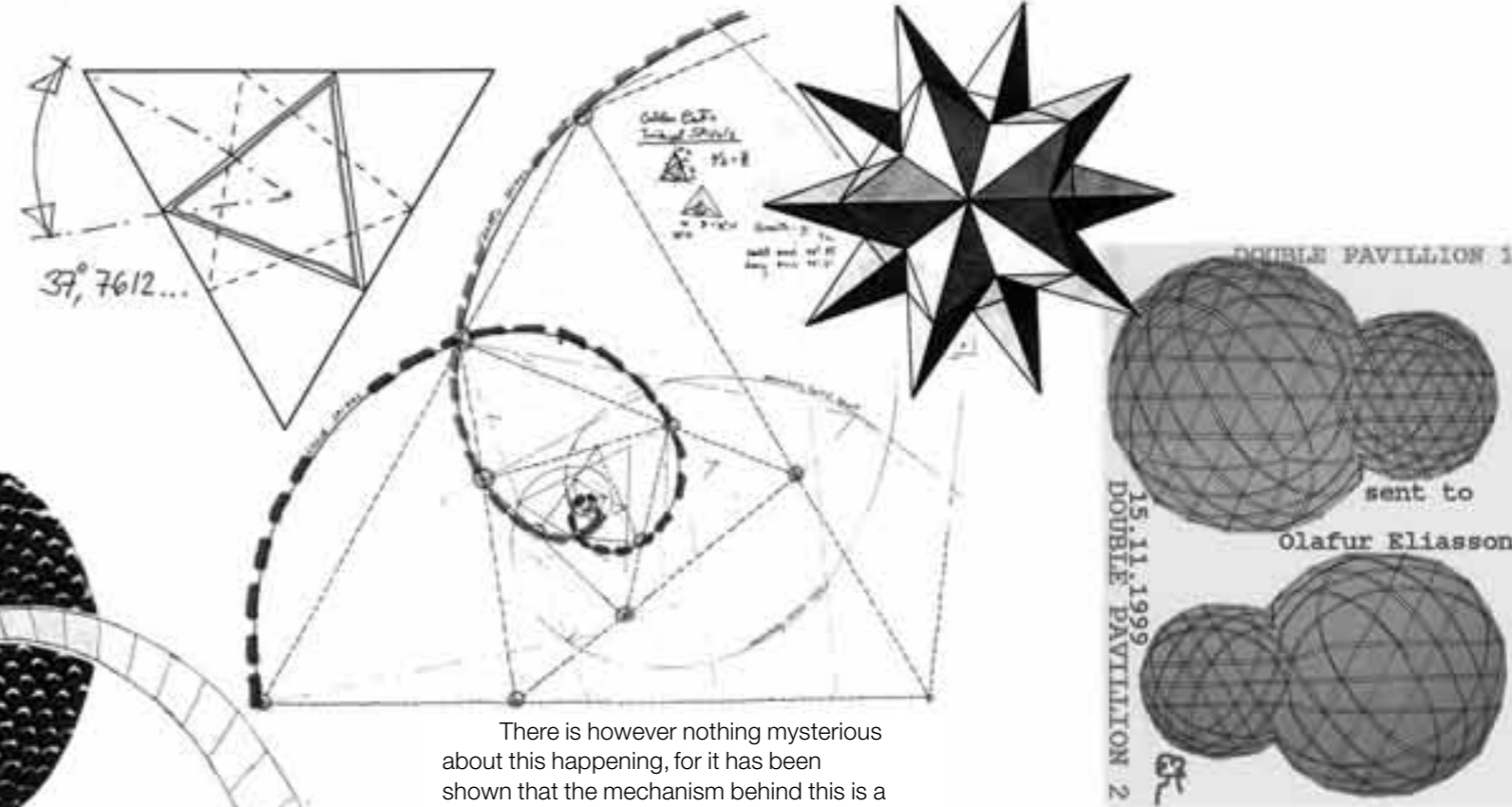
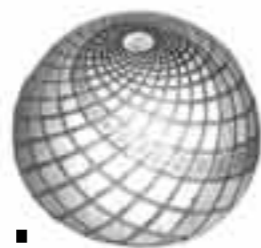
double doughnut

"The Double Doughnut is still a model study but has some promises to become a "walk-through" piece of art. That would then have to be a rather large piece. The way that spiral doughnuts can be connected together is a "next to impossible" kind of geometry. But it is here one finds out why every torus knot in nature has both a left/right design and two possibilities for "vector lines". I prefer to call it the 90° degree crossing of two different but natural spirals."





golden ratio pavilion



"We are now moving slowly to a point where we exit torus knots geometry but come into contact with some basic geometric options in the way structures can be executed – basic in the sense that it is very much a part of nature's mathematics.

Of course the structure of geodesic domes, that we have already mentioned, are very near to the polyhedral 3D world and the fivefold symmetry part of it. Therefore they are also related to basic geometry and to the golden ratio.

No matter how we try to avoid it the golden ratio is one of the landmarks of natural structures.

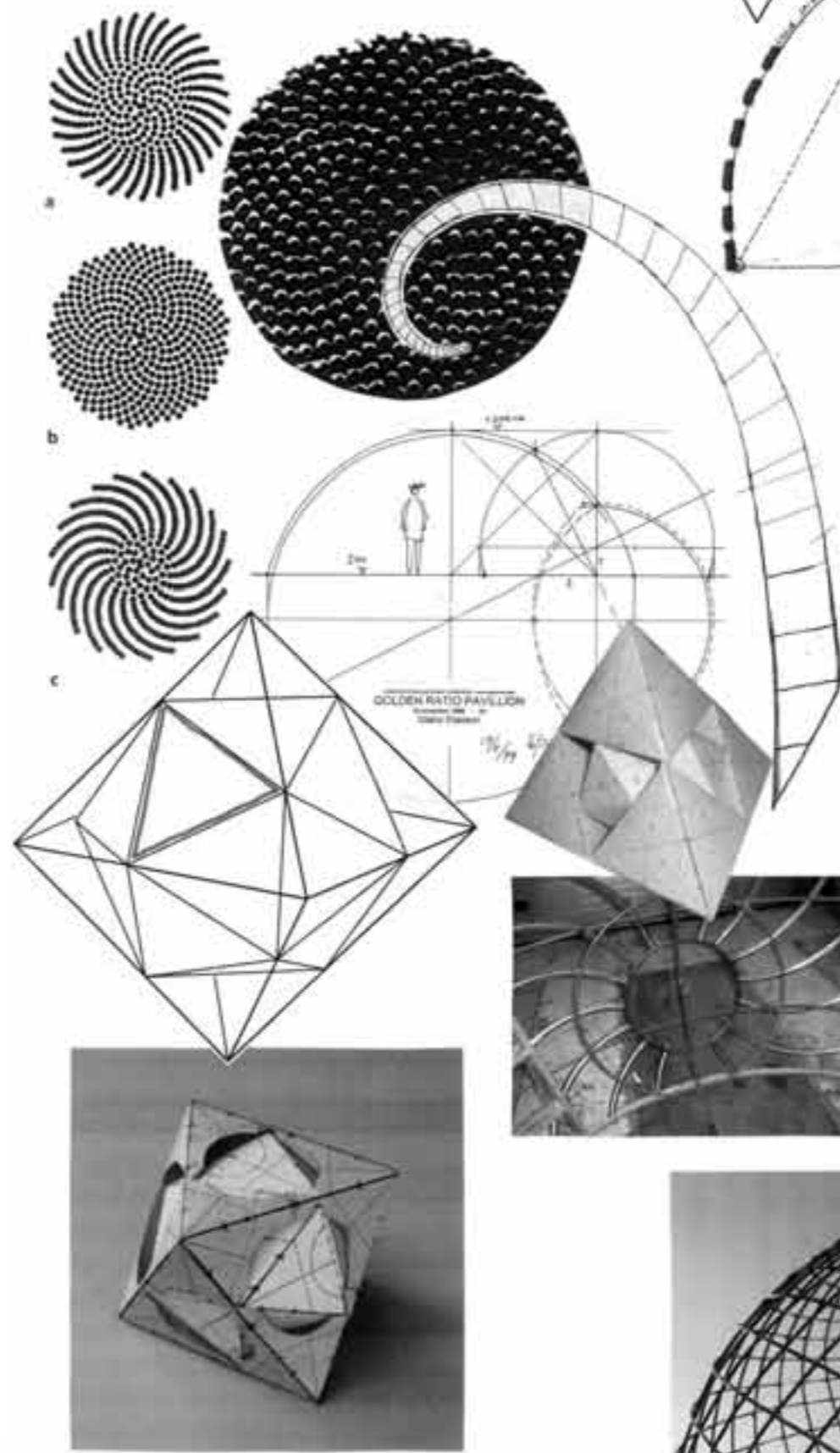
Now, everyone has probably heard that term before, but few may still understand the significance of it.

So, before we reveal the background of the Golden Ratio Pavilion, a few words about the golden ratio.

The term has admittedly a romantic flair to it, probably because its use became very popular again way back in the Renaissance. And it seems that everyone from artists to architects and alchemists to mystics made use of it to prove different points. Today the biologists have joined this group by studying the mathematics of growing / living forms and observing the golden ratio all over again.

In his book: "Life's Other Secret", Ian Stewart has a chapter on this specific ratio and explains with the example of flower casing – i.e. how a flower's growth patterns self organize, as in the spacing of primordia in a bud. An efficient casing is not just a good idea for a flower to use but also sensible. A spiral pattern of this kind with the divergence angle of $137,50776$ degrees has the most efficient packing. This angle is the one between each of two buds forming the spiral. This is shown here under (b). However only a small difference of $137,3$ (a) or $137,6$ degrees (c) gives far less efficiency and produces gaps between the buds. The precise natural divergence angle is found by dividing 360° in the golden ratio: $222,49223$ and $137,50776$.

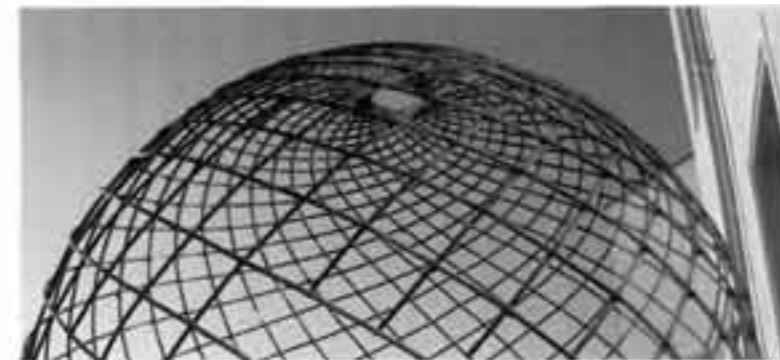
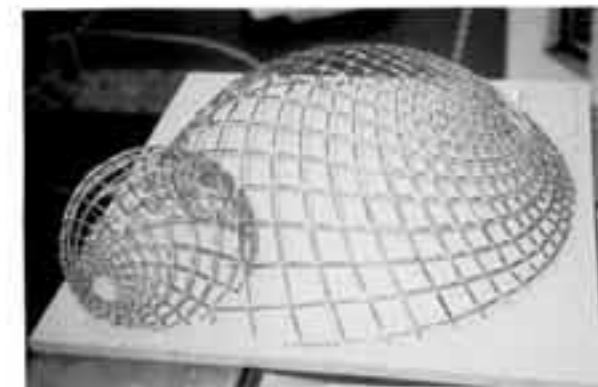
But in a bud there are of course two sets of spirals forming: one going in clockwise direction and the other counter-clockwise. Both are golden ratio spirals. But in order to have both spirals, no other angle than the $137,5/222,5$ is possible.

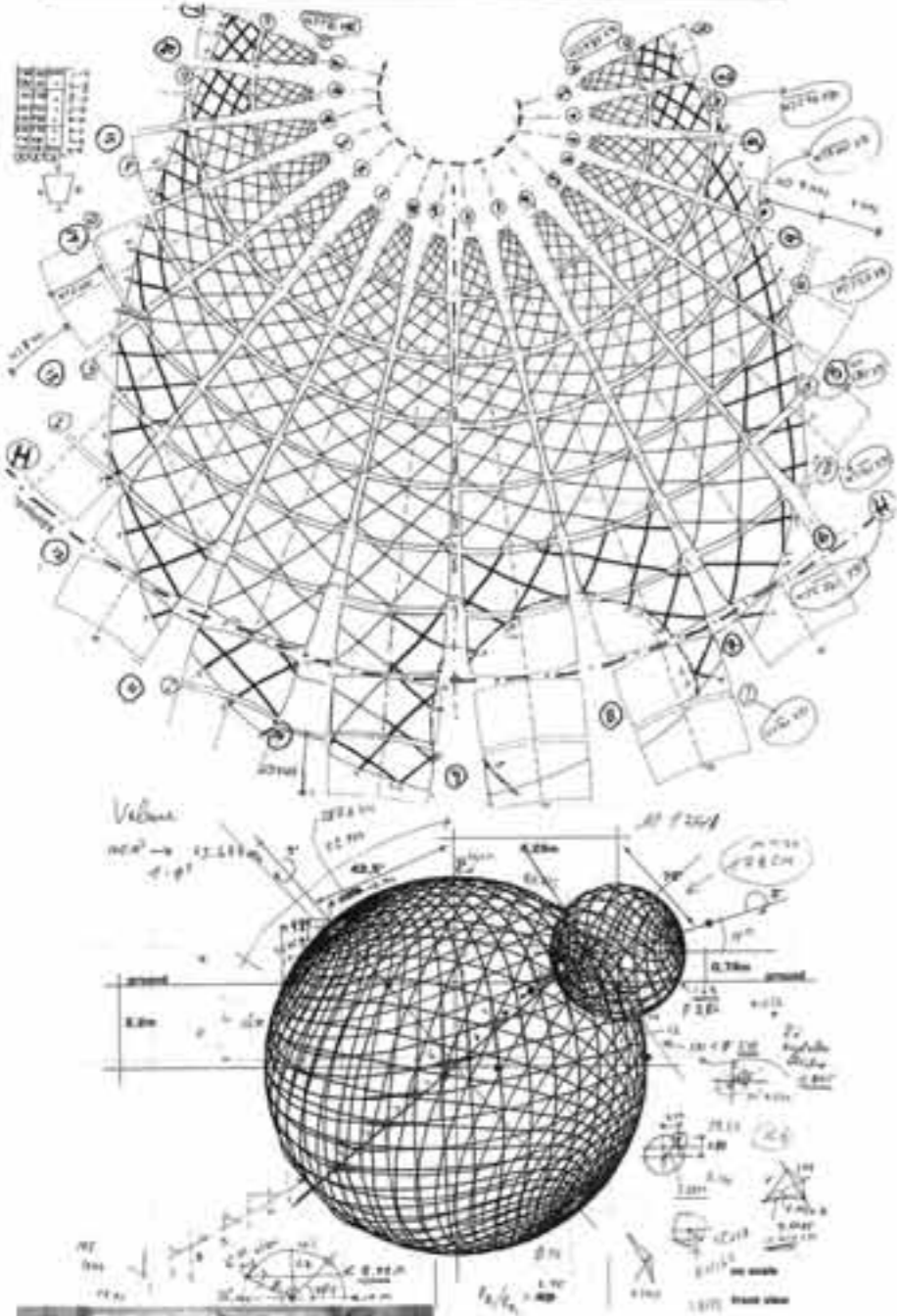


There is however nothing mysterious about this happening, for it has been shown that the mechanism behind this is a sensible dynamic process of the buds growing out from the flower's center and moving as they grow towards the periphery of the circular plant form. So the golden ratio is here a consequence of these dynamics rather than a planned efficiency of packaging.

The same can be found in other plants like for instance in a cone of a Norway spruce or an American larch. Or pineapples or daisy heads for that matter.

The Golden Ratio Pavilion has also two sets of 3D golden ratio geometric spirals. But we did not find it for the construction by studying plants. In 1979, when I was working heavily on polyhedral geometry, I discovered – as many have before me – that the three triangular Platonic "solids" all fit into one another. When the Icosahedron is fitted into an Octahedron, eight of both sides touch in full. But there is a specific angle under which the triangles touch. The smaller has rotated $22,2387$ degrees compared to the larger, which is also another golden angle. But as a result, now the smaller divides the edge of the larger in the golden ratio. – More than that the three new, smaller triangles formed by the intersection of the Icosa – Octa triangles away from the center have the edge ratios $1:1,414214$ and $1,618033$ all three main ratios found in nature.



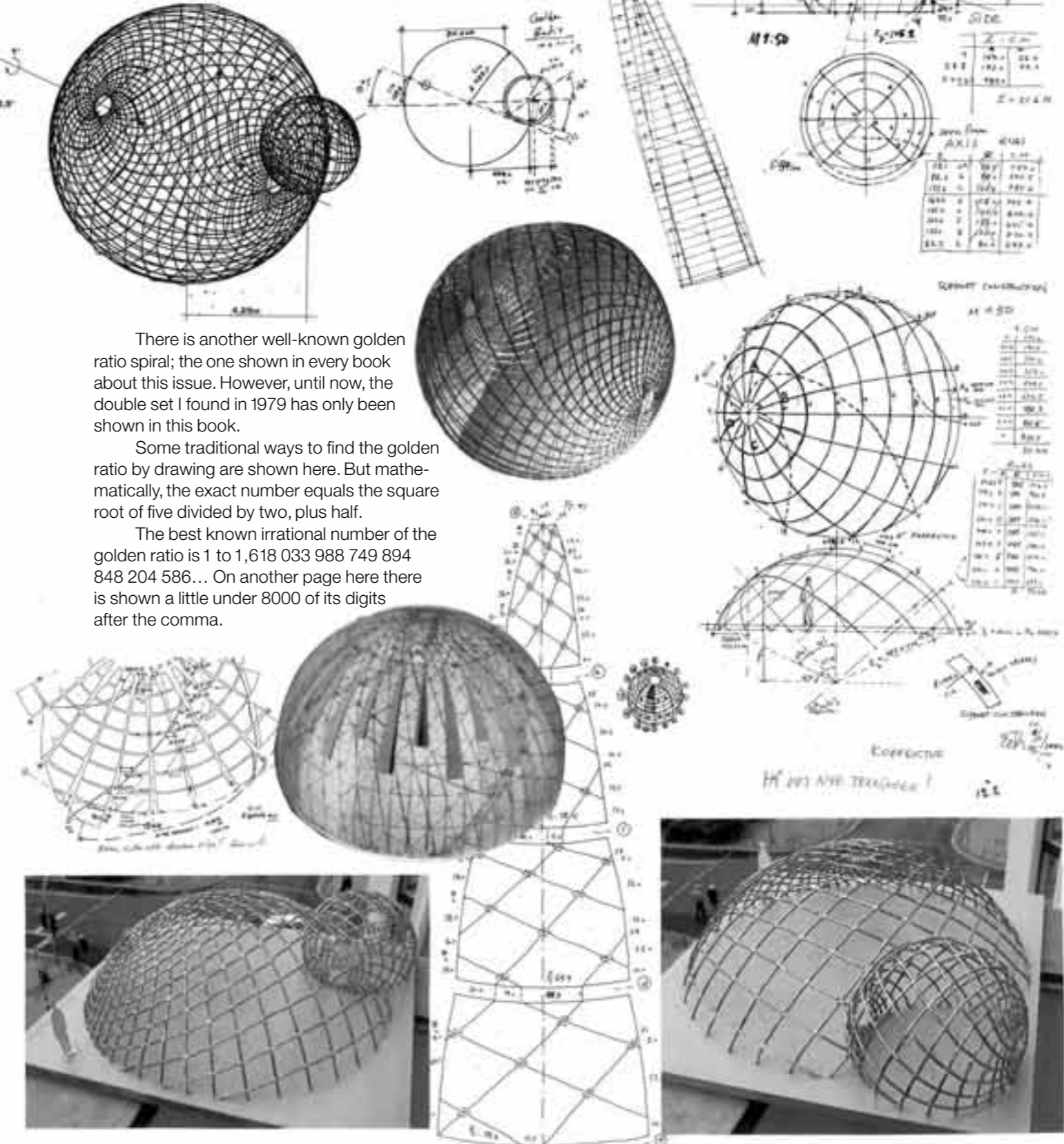


As I played around with this harmonic system with larger and smaller triangles around the same center, I saw a spiraling movement going into and out from the center. By combining the golden ratio cutting points on the edges with a drawn line in and out from the center, there emerged two sets of crossing spirals. One going faster to the periphery, the other curving slower on the way outwards.

The spiral divergence angles are not $137,5$ degrees here but $97,761243$ and $142,238756$ (parts of 240°) and the sinus number of those two are – you guessed it – also in the golden ratio!

To find the two spirals in flat form the best way is to draw a $5,236''$ triangle. Section all its three lines in 1 to $1,618\dots$ or $2,0''$ to $3,236''$ in the same clockwise direction. Then connect the new dots to form a new smaller triangle inside the first. The length of the new lines will be $2,0'' \times \text{Sq Rt of } 2.0 = 2,828''$.

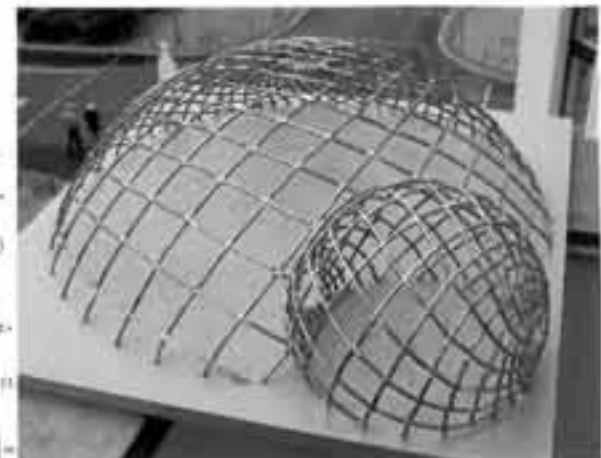
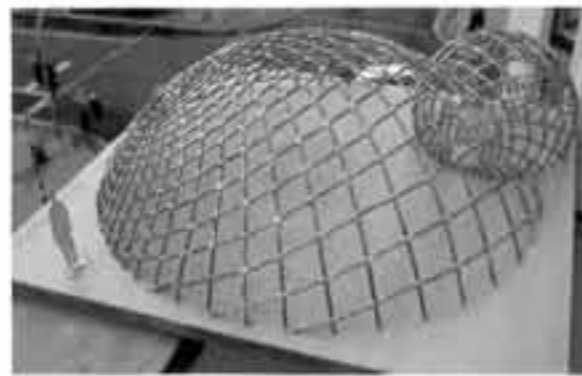
Continue sectioning all other thus formed new triangles in the same way to make progressively smaller ones until you have to stop. Now you can start to draw a spiral line from the center that will enclose one short leg in each of the triangles. And finally draw another spiral line in the opposite circular direction that will enclose one long leg in each of the triangles. These are the set of spirals we superimposed upon a sphere for the Golden Ratio Pavilion. We chose to have their number on the spheres also approximately in the golden ratio or 10 to 16 and 20 to 32 .

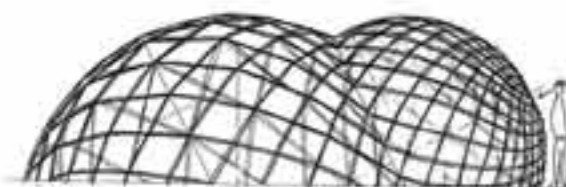
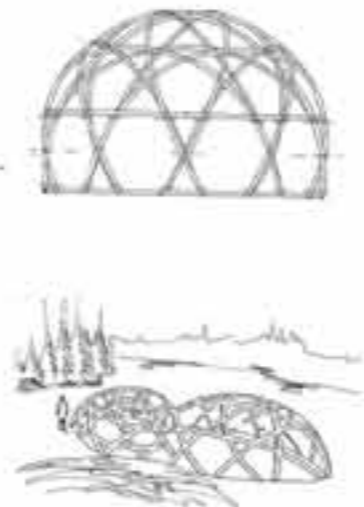
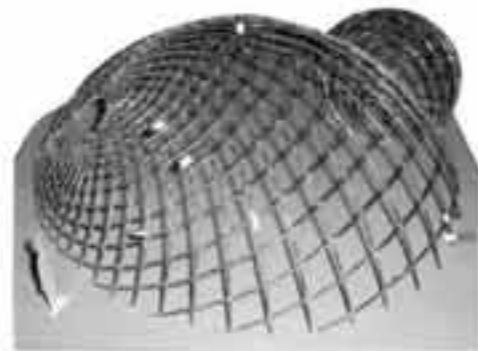
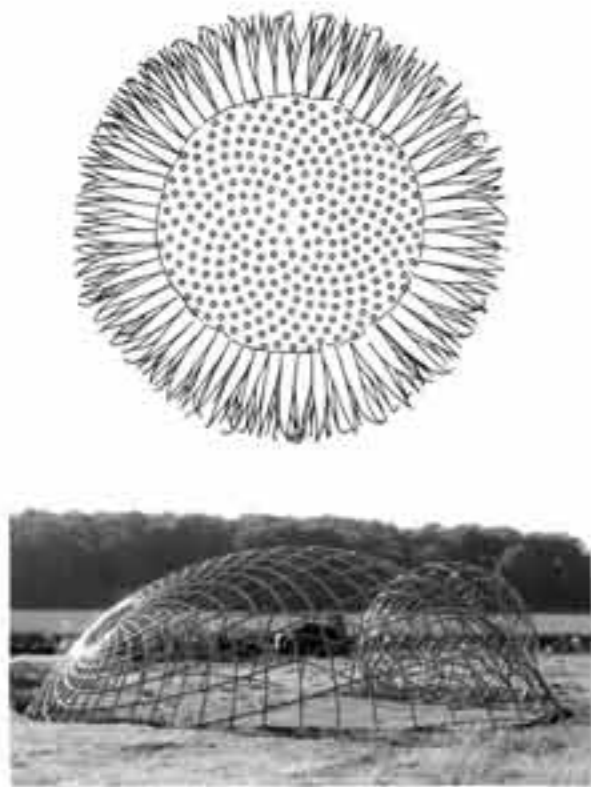


There is another well-known golden ratio spiral; the one shown in every book about this issue. However, until now, the double set I found in 1979 has only been shown in this book.

Some traditional ways to find the golden ratio by drawing are shown here. But mathematically, the exact number equals the square root of five divided by two, plus half.

The best known irrational number of the golden ratio is 1 to $1,618\ 033\ 988\ 749\ 894\ 848\ 204\ 586\dots$ On another page here there is shown a little under 8000 of its digits after the comma.





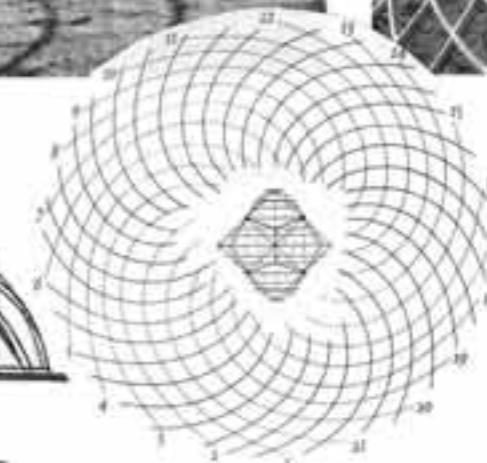
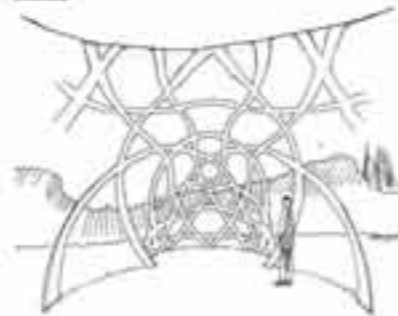
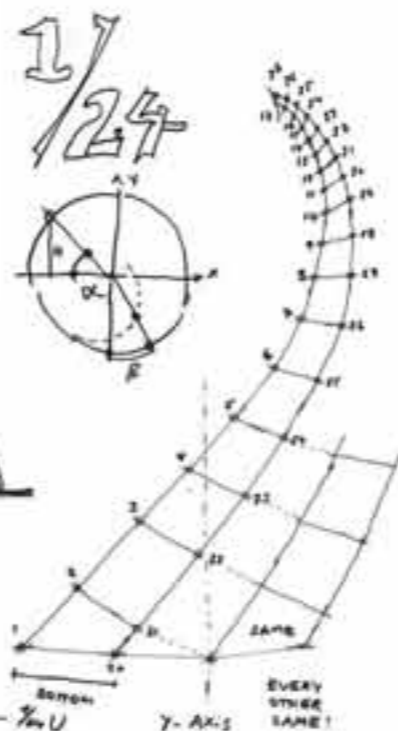
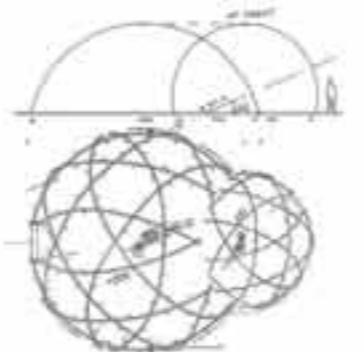
As one can see here, the art piece is made out of two sets of spirals that form two dome structures. The flatter one is larger. It has a diameter of 30 Feet and a height of about 11 Feet. The other is smaller and rounder. It has a diameter of 11 Feet and a height of 7 Feet. They are connected as the smaller one sits inside an opening in the larger one.

Now another reason for the art piece's name, the Golden Ratio Pavilion, is that every part of it was chosen to be in a golden ratio in the first or third power.

Starting with the two domes, which are cut out of whole spheres in this ratio: the larger has its shorter leg of the divided diameter as height, and the smaller has the longer leg of the divided diameter as height.

The volume sizes of the space that each encloses, cut in this way, have a ratio to each other that is the golden ratio, but now of course in third power - 1 to 4,23606...

This art piece is now sitting on the grounds of an art collector's compound in south of Sweden. Bo's workshop produced the piece in Copenhagen, Denmark."



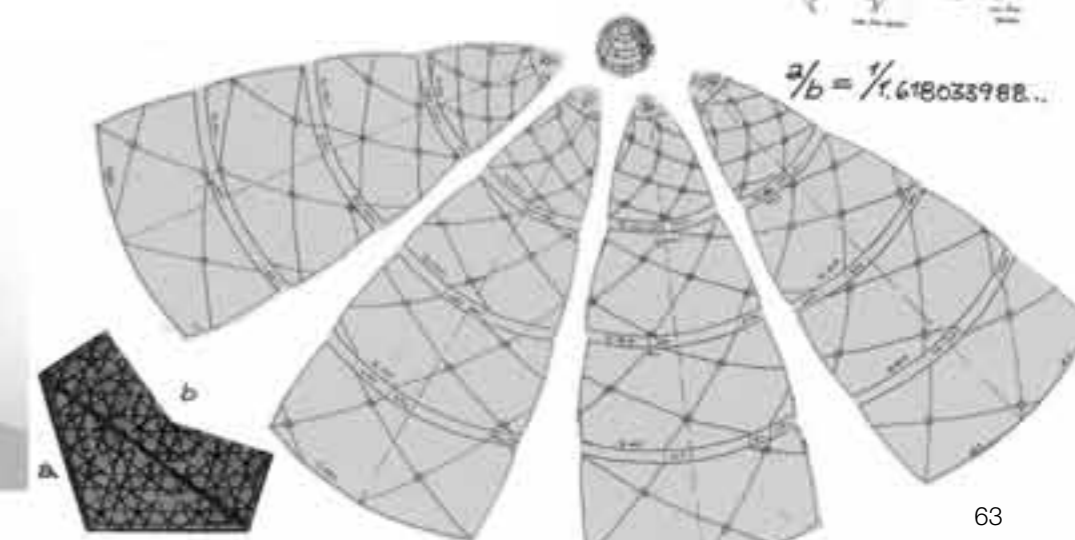
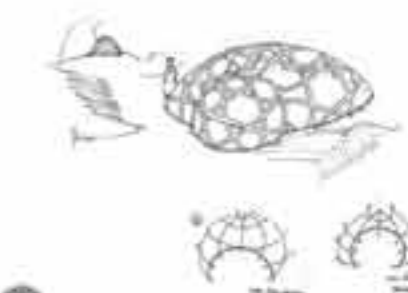
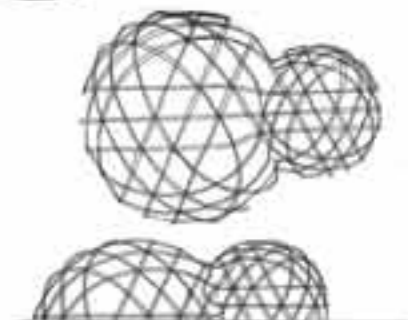
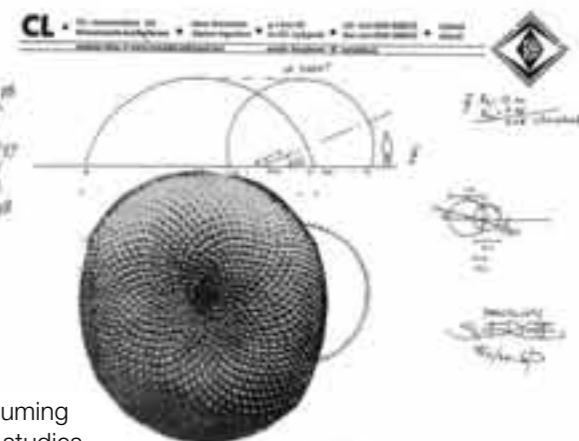
"It was extraordinarily time consuming to do this work. Since late 1999 many studies were made but thrown away. On these and the previous pages are some of these studies. They all point in the same direction but grow from loose ends into perfect harmony.

However, as soon as we came down to the idea of the double spirals in June 2000 in St. Louis things started happening.

To do the study of this project justice, I also made one model that shows the complete larger sphere. This is now a possible project for an art piece. It is one of my favorite pieces because of the harmony it radiates.

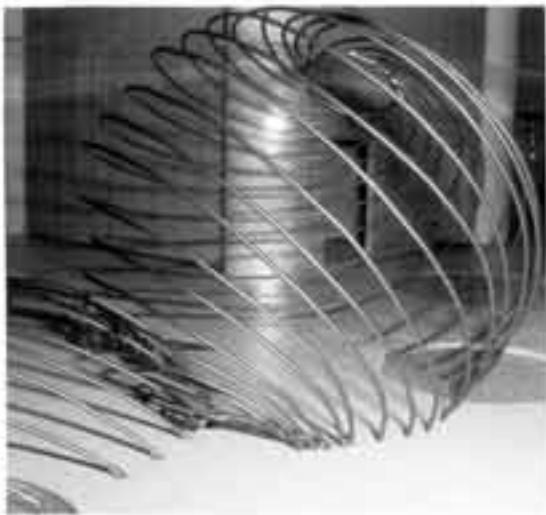
The art piece itself is in my opinion - although I am involved - a complete success. It is just a shame that its location is such that only a handful of people will see it live.

I want to congratulate the owner of this piece for his luck to obtain this unique piece of art."





the submerged garden



"Some of the intensive studies we did for the Golden Ratio Pavilion, although not used in that project, were useful and did not, after all, land in the waste basket, but rather in the development drawer.

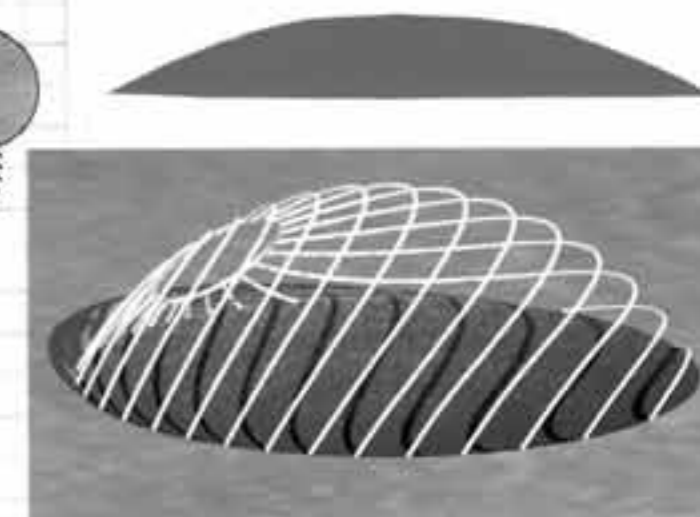
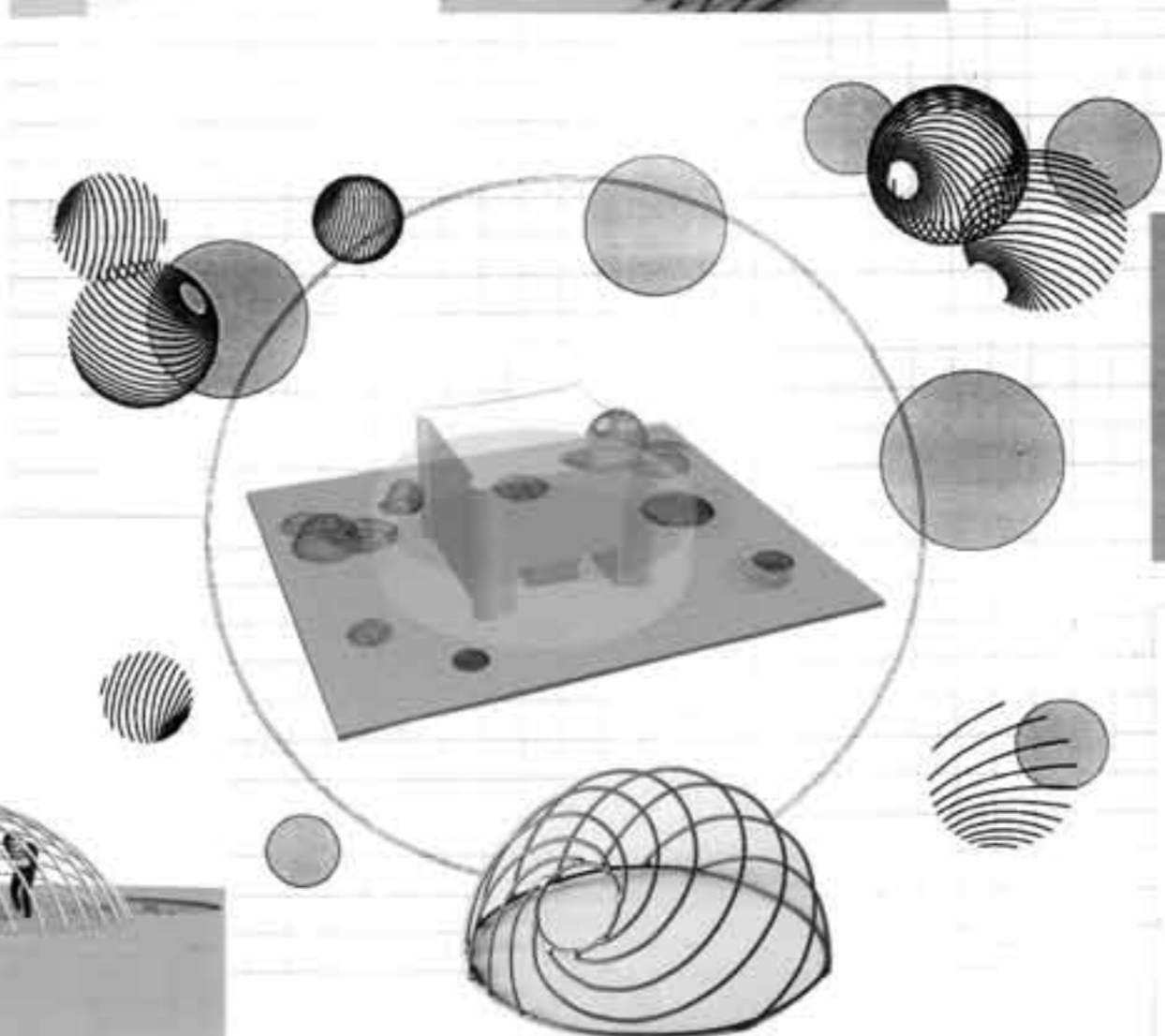
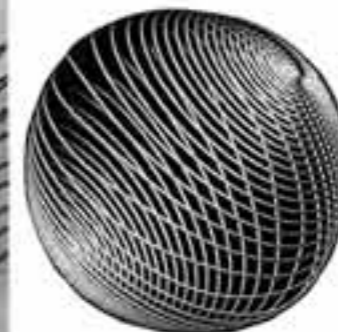
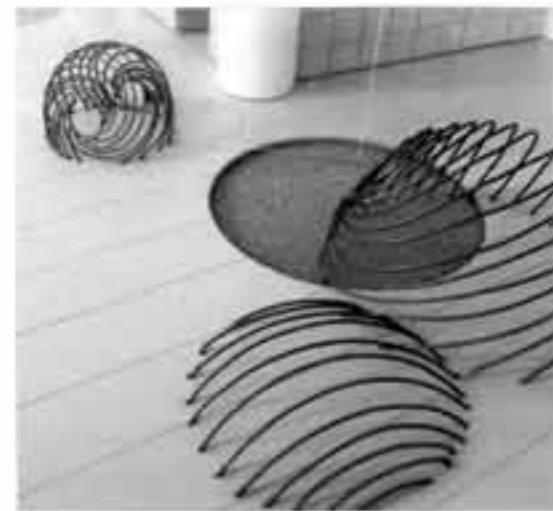
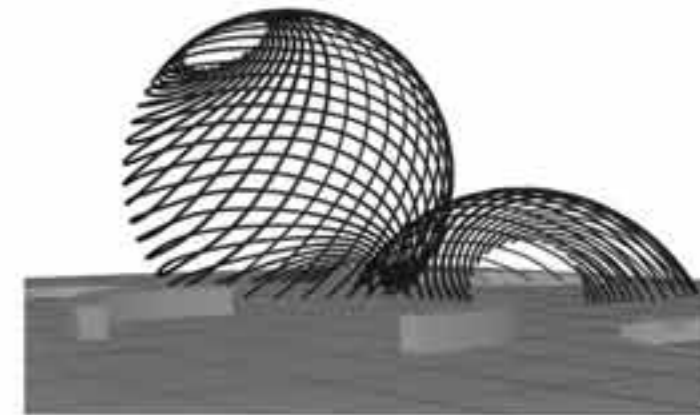
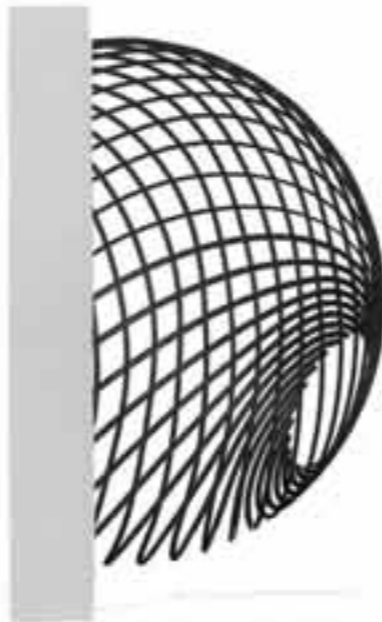
One of those options was the basis for an invited competition in downtown Chicago: The Submerged Garden project.

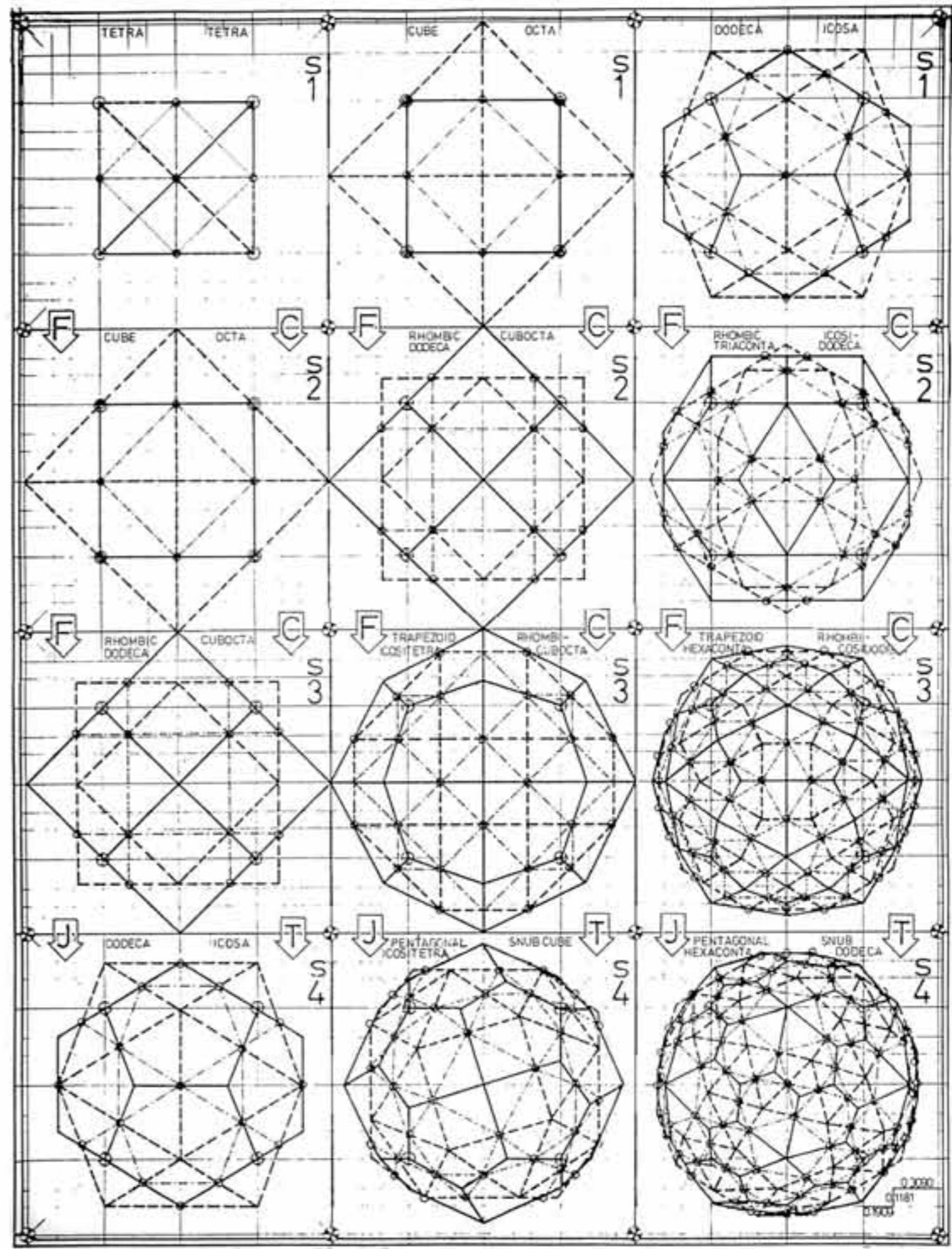
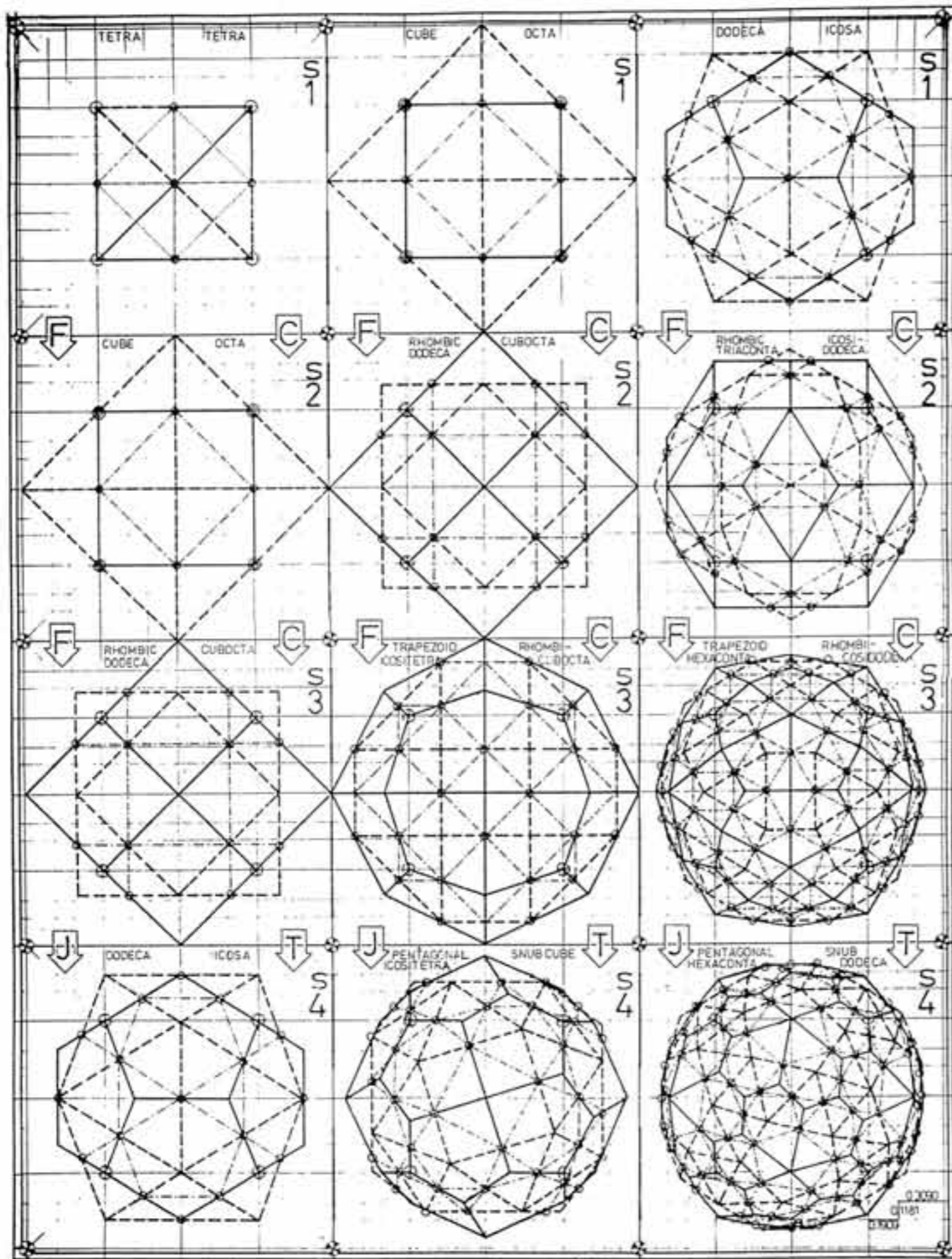
This was accepted as a project, but now the total concept of the location has been altered so it will not come to be executed.

The settings for this art piece were difficult: A plaza is planned underneath a new high-rise office building standing in a typical large American city. It is open to the public and will be a genuine part of downtown Chicago. Due to regulations, possible vandalism and overall maintenance, many things are not possible here.

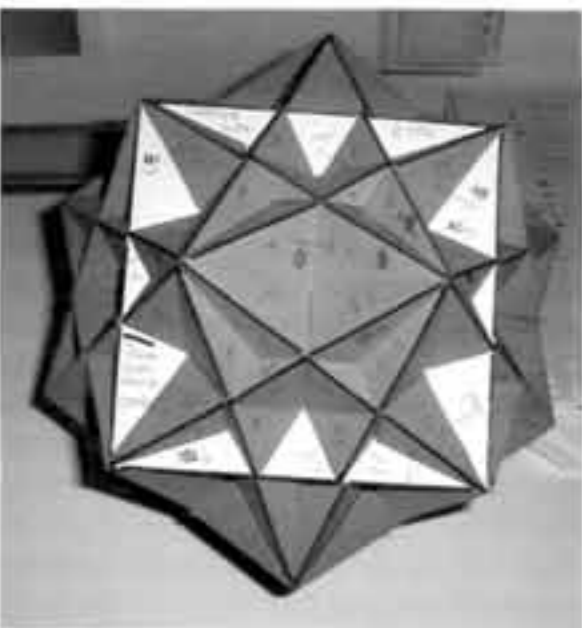
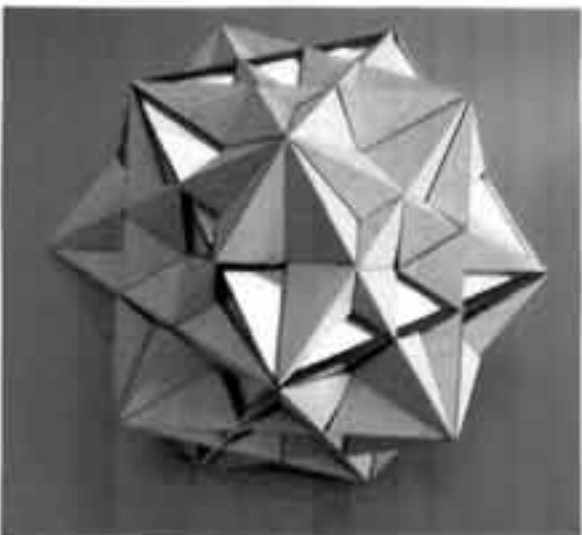
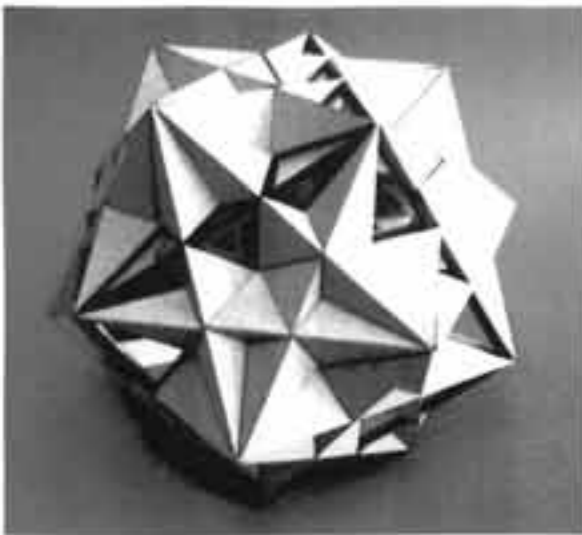
The builders probably want to make a new city landmark by the ground level environment so nobody will have any difficulties in finding this location inside the city.

I had little to do with this project directly, as I was doing some basic research work. But Olafur and Sebastian were responsible for most of the ideas regarding how this finally came down to earth."





5 in 1 cubes



"Next we come to polyhedral geometry. The art piece here, described as "Five in One" and other projects related to it, have to do with "The Development Pattern of Geometrical Structures", a report on a geometric research project I carried out in 1975-1979 at the Constructions Lab in Iceland.

The results of this study pointed to a regular pattern within which the polyhedrons enfold, i.e. are formed from one another, starting with the simpler forms that then change into the more complicated polyhedrons. And also starting with two or fourfold geometry, but always ending in fivefold geometry.

To find this pattern, a "missing link" had to be discovered. And once that was done, everything fell into place.

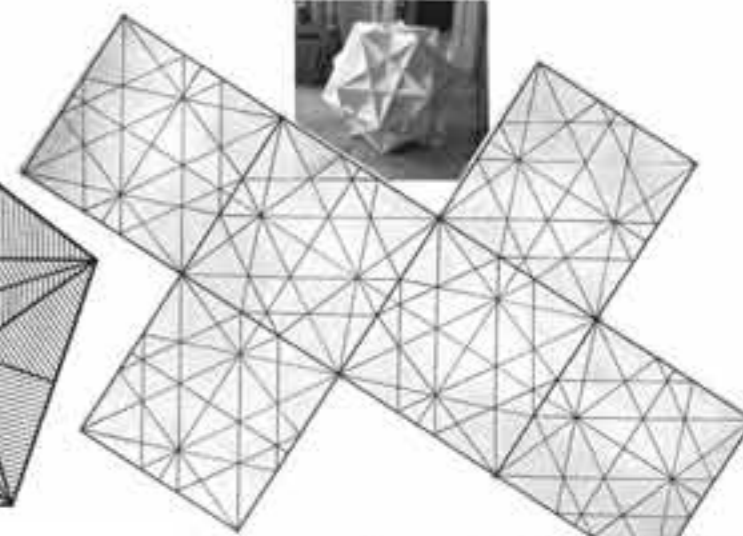
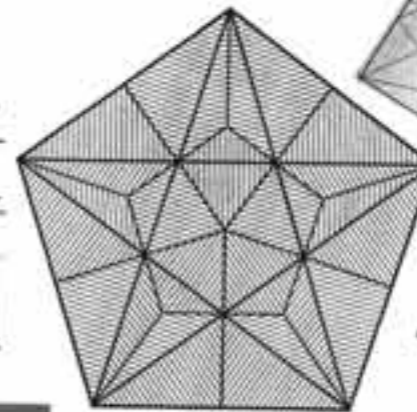
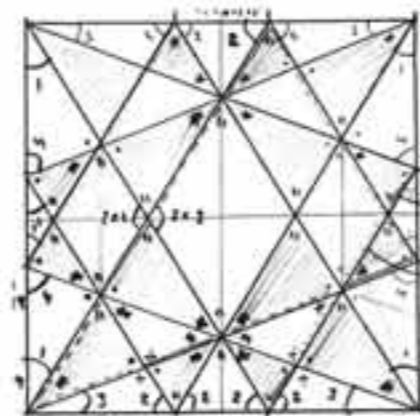
I will try to restate this in simple language: Every polyhedron has a "partner", or another polyhedron that is closely related to it. There is a dual connection between the two: The vertexes of each fit to the faces of the other. For instance a cube has an Octahedron as a partner. The former has six faces and eight vertexes, the latter eight faces and six vertexes. This is a rule that applies to all polyhedral pairs.

The only polyhedron that has itself as its partner is the Tetrahedron. It is also the one at the beginning of a long development pattern. Each pair can be harmonically fixed into one geometric compound. Then two things happen: their faces section each other and new lines emerge. Secondly, a new enclosure made of flat faces can be laid on their crossing edges enclosing them.

These two formations then make the next two regular polyhedrons, which are also a polyhedral pair.

The two steps, or transitions, have the names Frequency and Crossformation. But there is more to this: after two repetitions of these two transitions - through which three polyhedral pairs are fixed in this way - a new transition takes place. And what has for instance been fourfold symmetry in all three pairs, now becomes fivefold symmetry in the last pair forming.

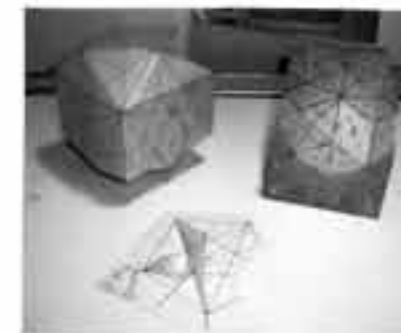
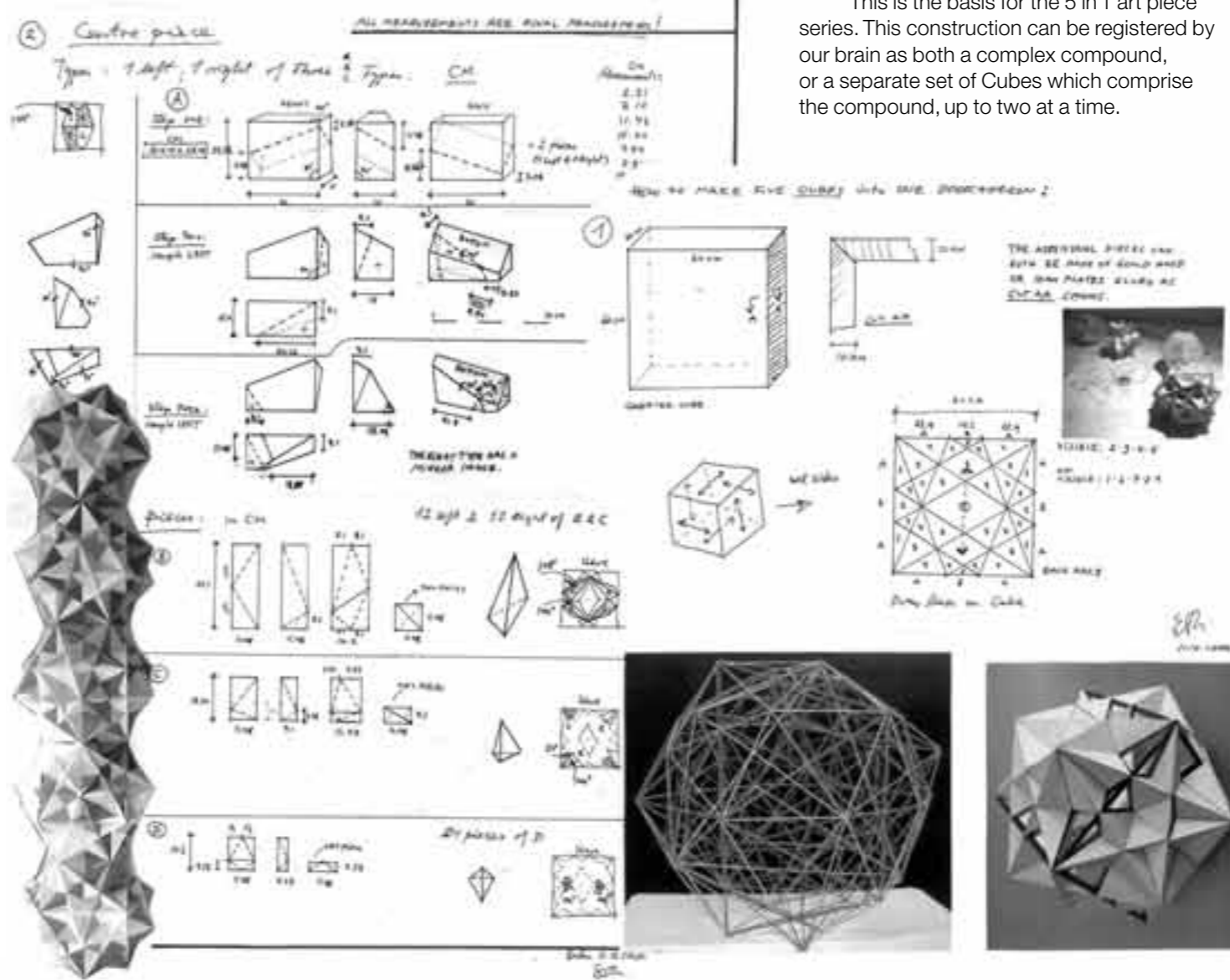
Here is where my discovery, the "Tango", came in: before that Bucky's "Jitterbug" transition where a Cuboctahedron transforms into an Icosahedron, had been established. But in order to have a complete system, there was one step missing: the parallel change of a Rhombic Dodecahedron to Dodecahedron. This came to be through the Tango transition.

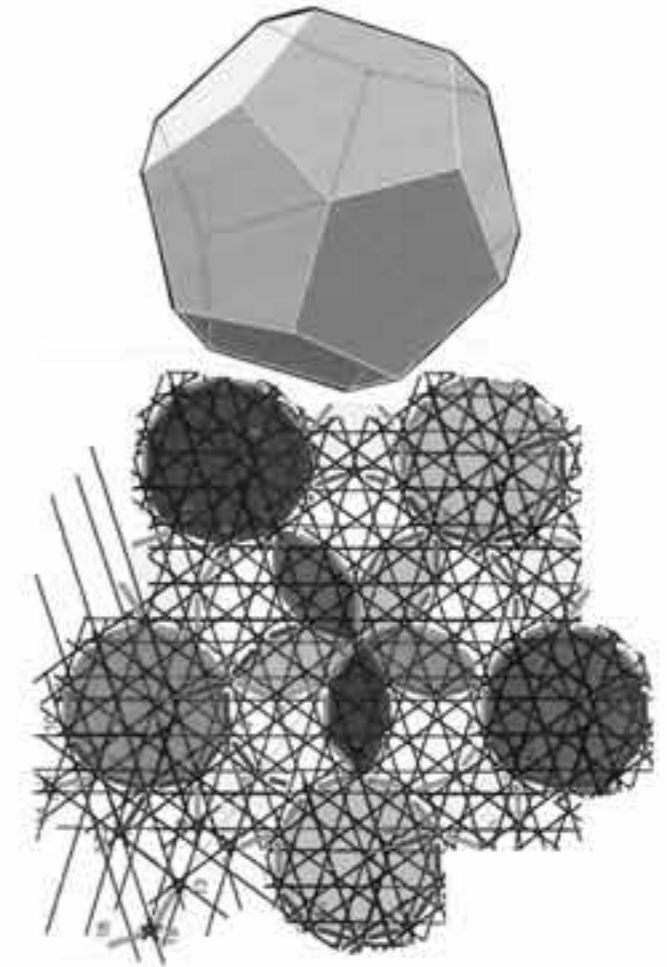
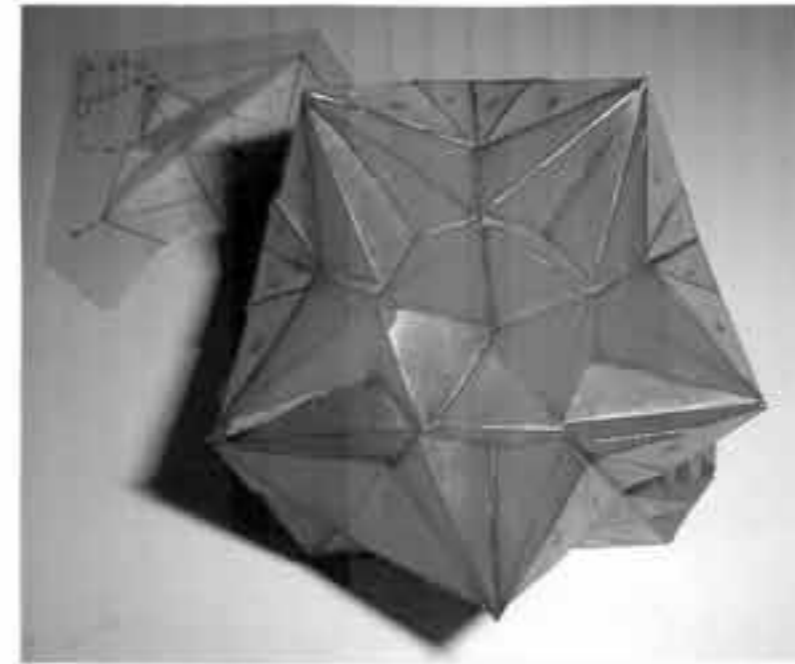
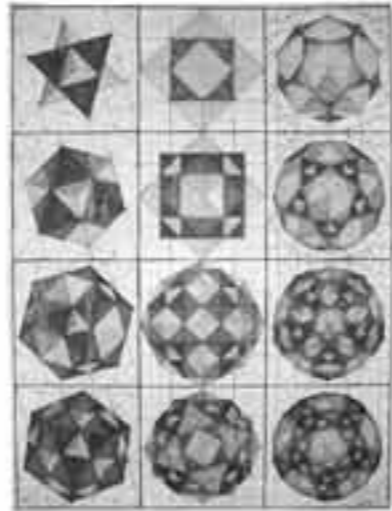
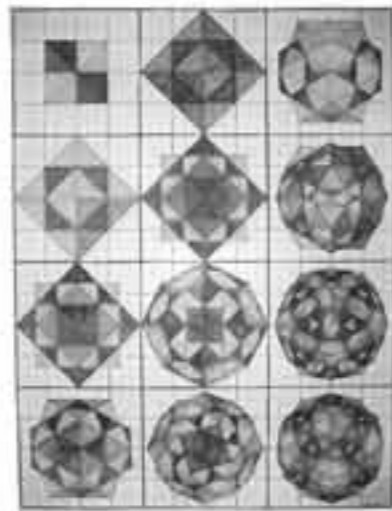


Similar to how a polyhedral pair can form a harmonic compound and as all the polyhedrons have also a common background and related size when formed in this way - the not so complicate polyhedrons, however different, also fit exactly into other more complicate polyhedrons.

In this way five to ten separate Tetrahedrons fit into a Dodecahedron. And as two Tetrahedrons also fit exactly into a cube, five Cubes also fit exactly into a Dodecahedron.

This is the basis for the 5 in 1 art piece series. This construction can be registered by our brain as both a complex compound, or a separate set of Cubes which comprise the compound, up to two at a time.

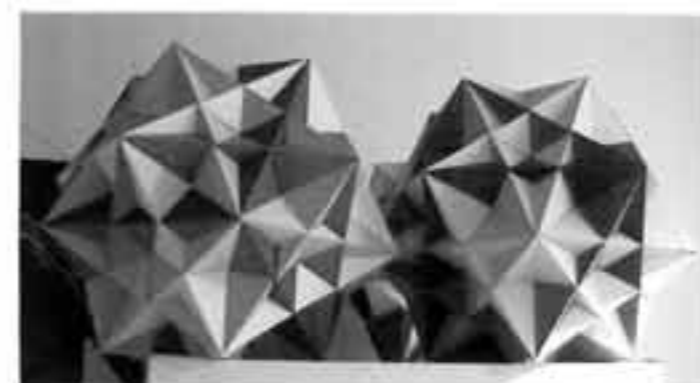
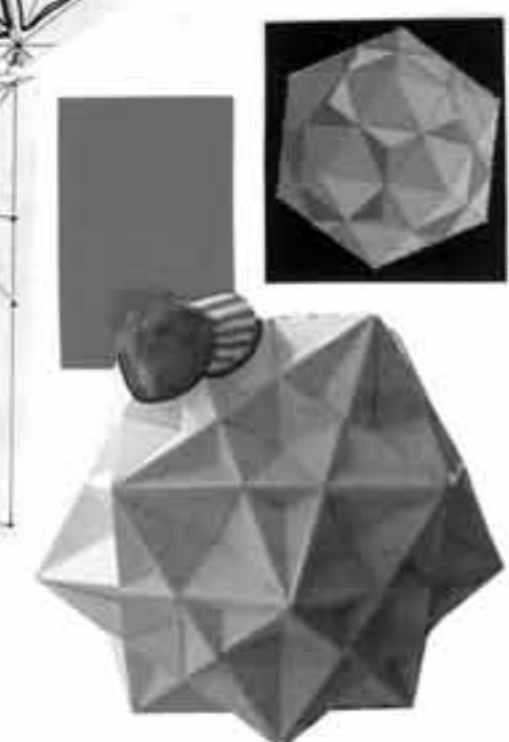
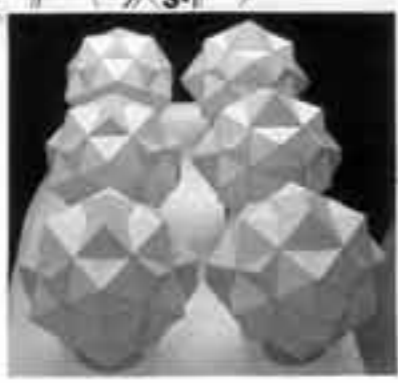
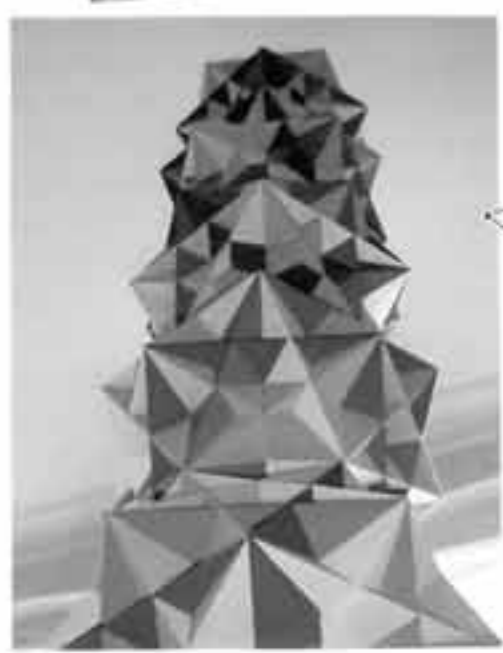
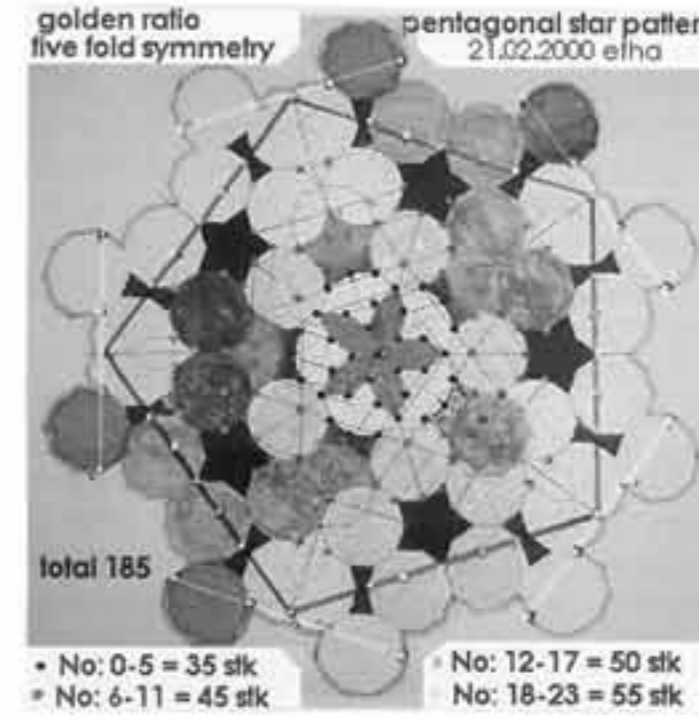
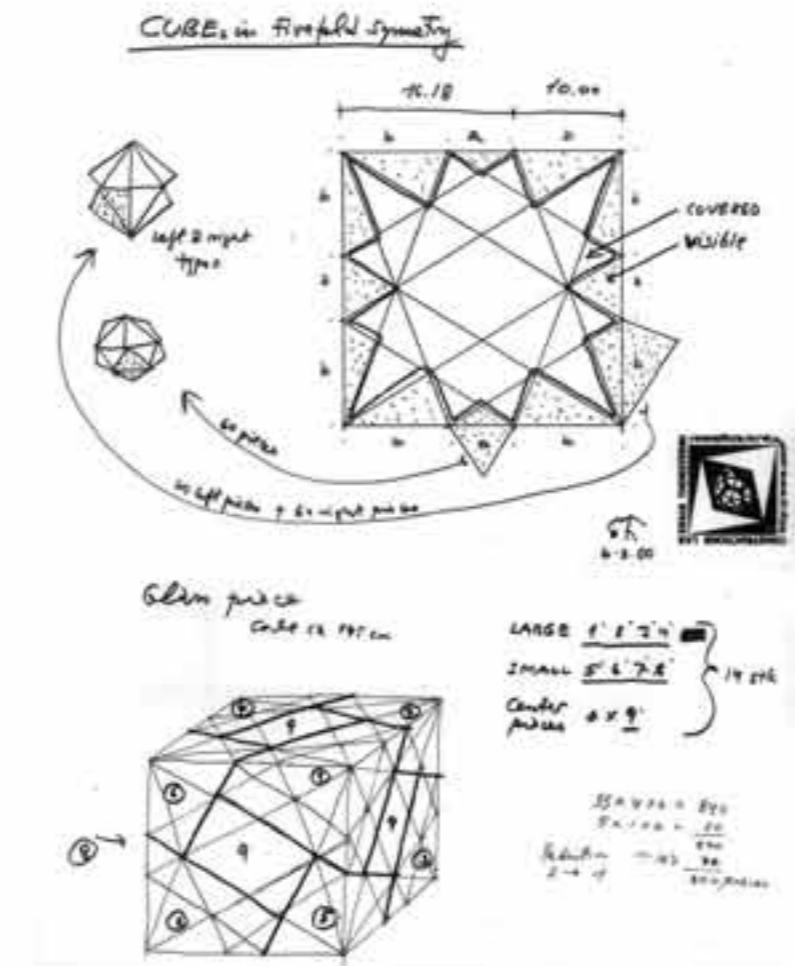
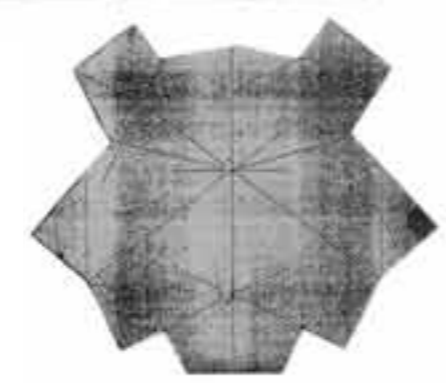
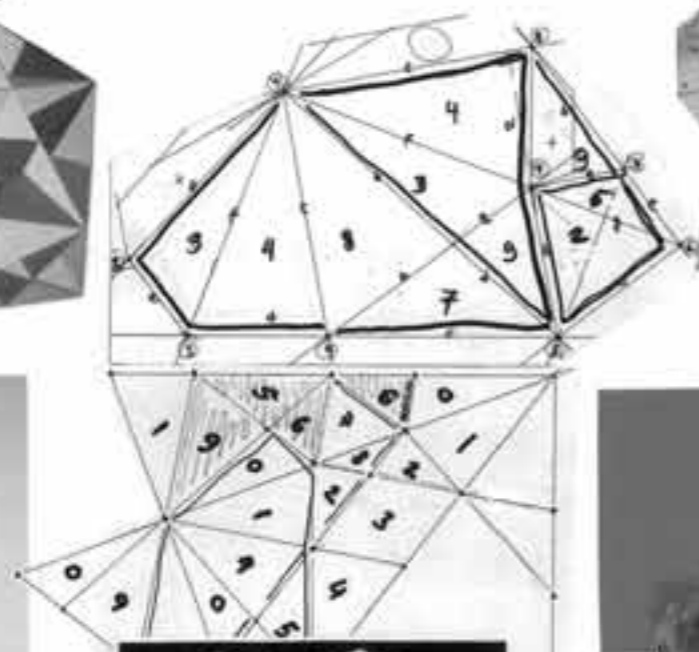
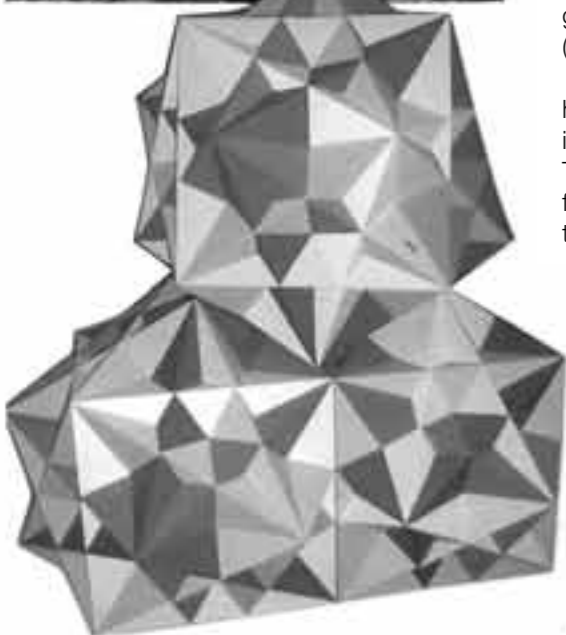




What is interesting here, besides the outer form seen, is the myriad of small volumes emerging from the fivefold sectioning inside. But also, the innermost form is a Rhombic Triacontahedron.

There is a lot of Golden Ratio here, too. Then, the edge of a Cube (longer leg) is in the golden ratio to the edge of a Dodecahedron (shorter leg).

The following art pieces and projects have manifested so far around this mathematical pearl: 5 in 1 Cubes: Five Wooden Cubes. – Trans series of seven 5 in 1 Cubes – Study for a look through version of glass. – Study of the big white model.”



3D geometry



"3D and polyhedral geometry are usually spoken of in the same instance. On the next few pages, we will take a closer look at this and then end the notes on pure geometry with some aspects of fivefold symmetry in 2D geometry.

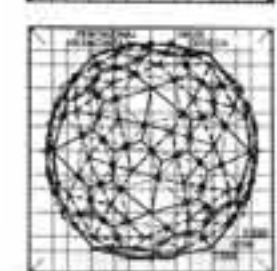
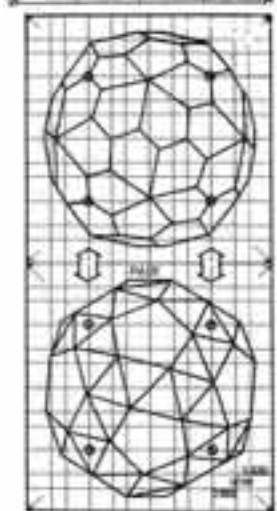
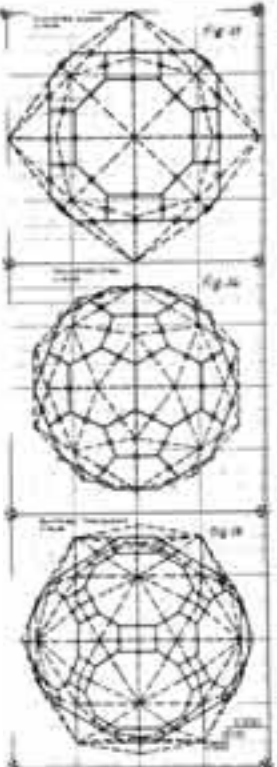
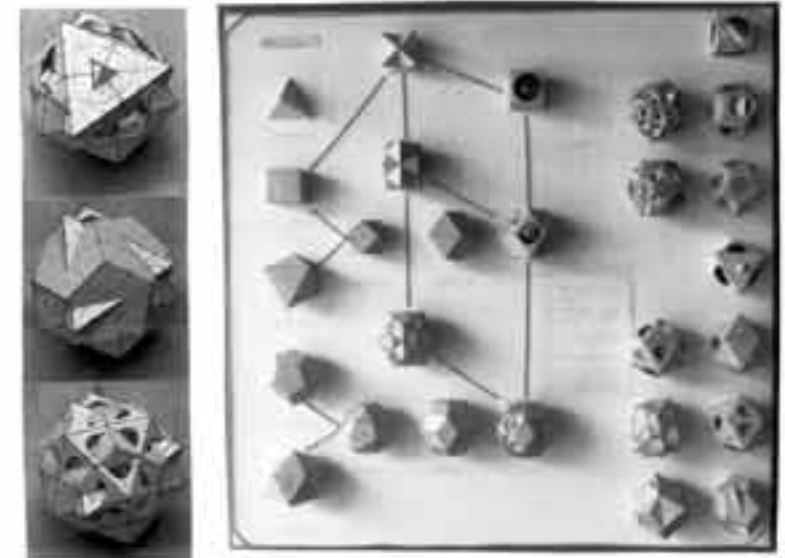
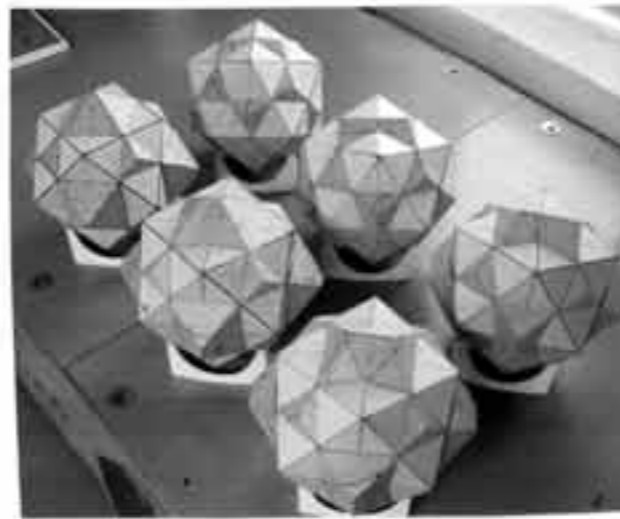
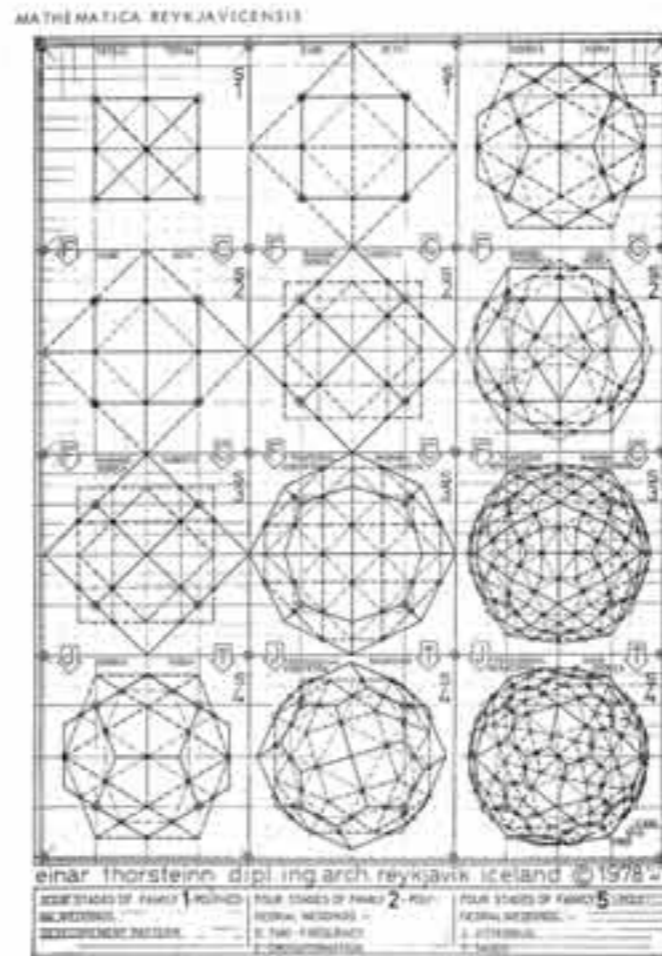
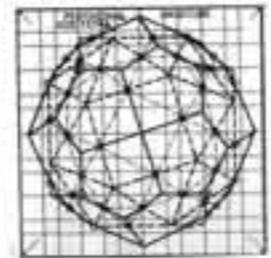
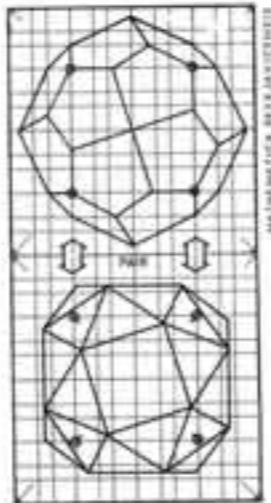
If one gets the hang of geometry, there is no way back. And to seriously study geometry is an irreversible decision to make.

I don't know how many years I have spent in this pursuit – when I could have been playing golf or washing my car... – but I tell you, I do not regret one second of that time.

One side effect of such a study is the discovery of how surprisingly regular and harmonic the world of polyhedral geometry is. In my opinion, these pure mathematical laws expose to us once more that the universe is a "planned phenomena". And also reminds us of the fact that the polyhedral forms are probably the only cultural forms in the visible universe that every possible extraterrestrial culture will know as the same. These 3D geometrical forms are therefore culturally independent.

It would seem that for a first understanding between our world and other universal citizens, polyhedral geometry would be a good issue to present.

In my first 1977 book on geometry: "Nature's Forms" I wanted to give the children of today the possibility to get to know the regularity of geometry and in this way influence the way they think about the world and their



part in it. The modeling material that comes along with the book is now 21 different polyhedrons.

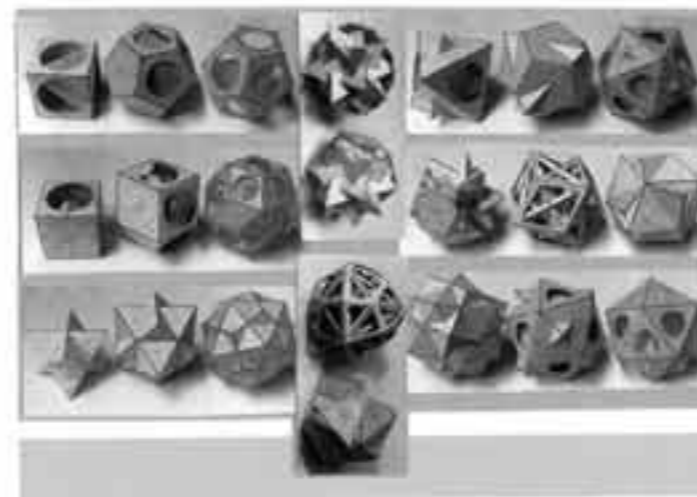
Of course in 1977 computers were not all that important, but still I had planned to do a computer game along these lines. That idea, however, never got the "lift-off". But it is still on my mind, somewhere.

I also realize that without computerization of the subject of polyhedrons there would be little ground to expect children to look into this issue.

I have been selling this book the last 25 years and to this day some percentage of people love to look into the model building of the most regular polyhedrons presented in my book.

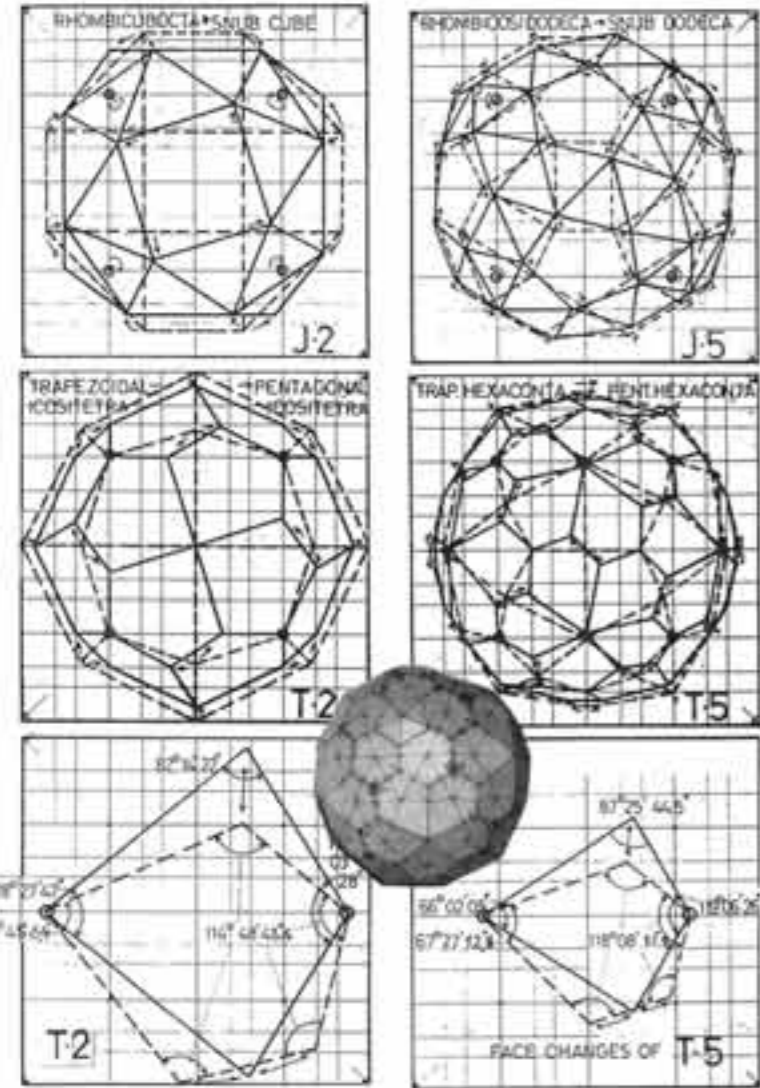
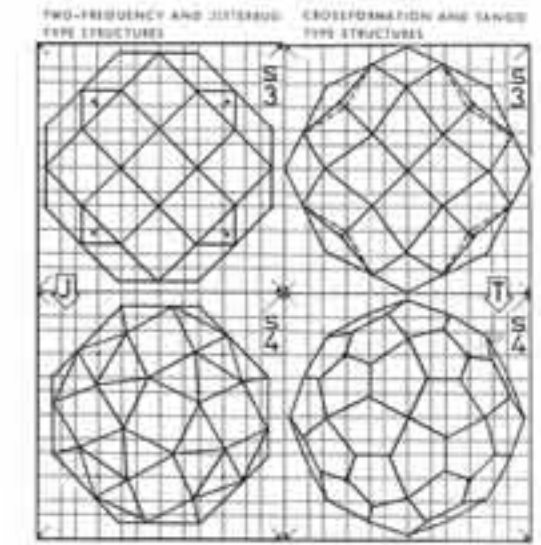
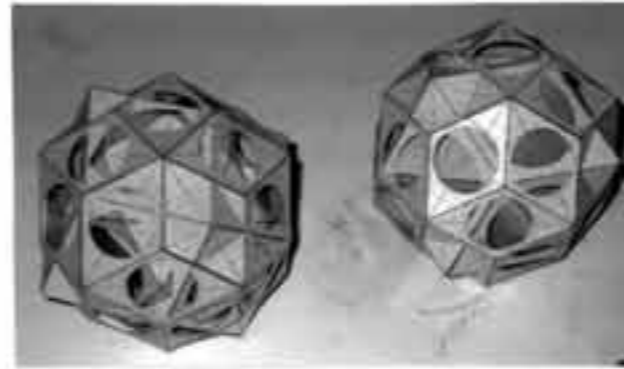
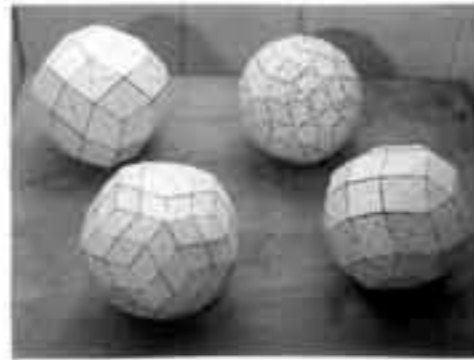
Since that time I have also found some new polyhedrons that no name exist for as yet. Then by applying the Development Pattern I found in 1976, new polyhedrons will automatically be formed. However without that pattern our brain is not good enough to find them. On account of that I have also made a graph of how the family tree of polyhedrons looks. On this family tree only a few have yet been discovered. And most of the new ones have fivefold symmetry and not two- or fourfold one.

It is interesting to see how even pretty regular fivefold symmetry polyhedrons like Trapezoid Hexacontahedron and Rhombi Icosidodecahedron undergo a Jitterbug/Tango





MATHEMATICA REKJAVICENSIS



pair transition and once more get a fivefold symmetry work over.
 Now the question becomes: Are they then of a higher degree of fivefold symmetry or is this symmetry definition business, where one makes a big thing out of the difference between four and fivefold symmetries, perhaps just a misunderstanding?

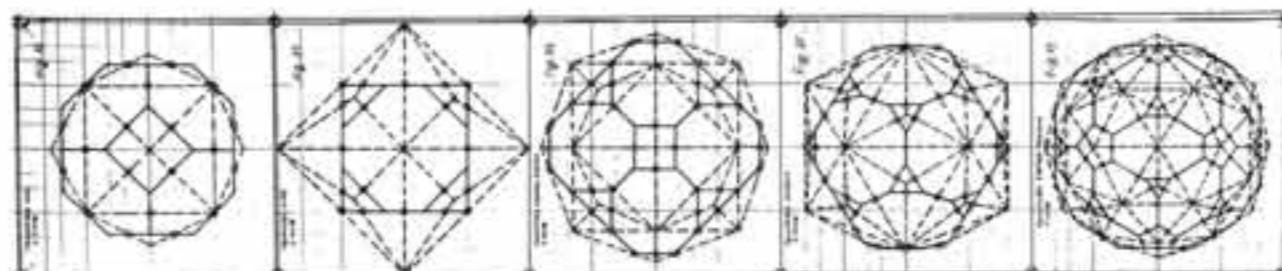
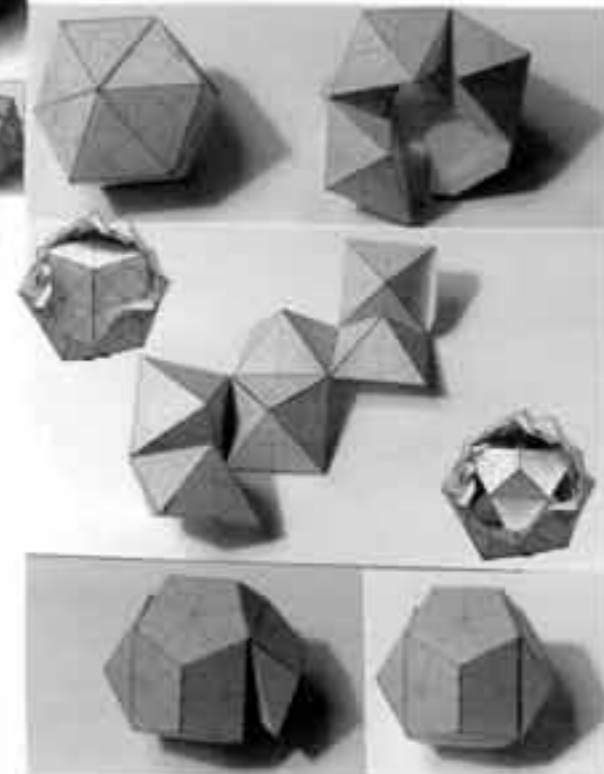
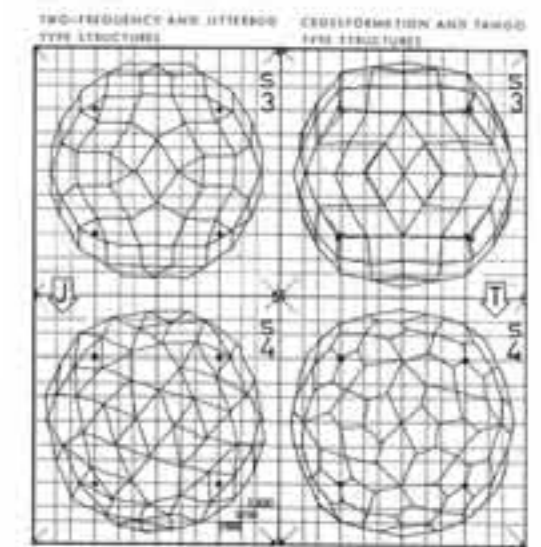
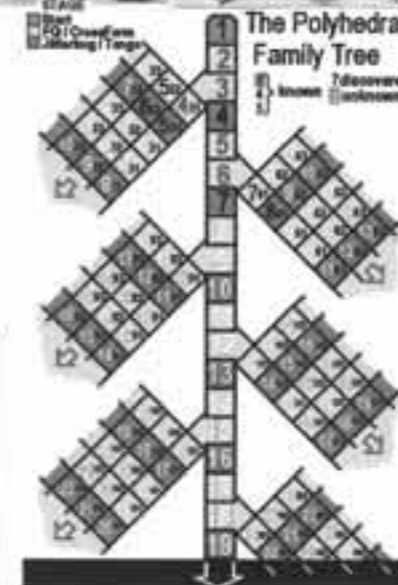
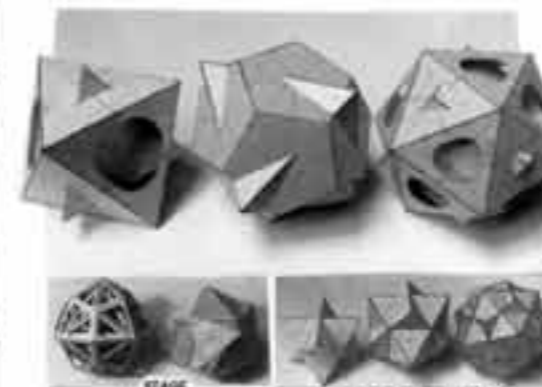
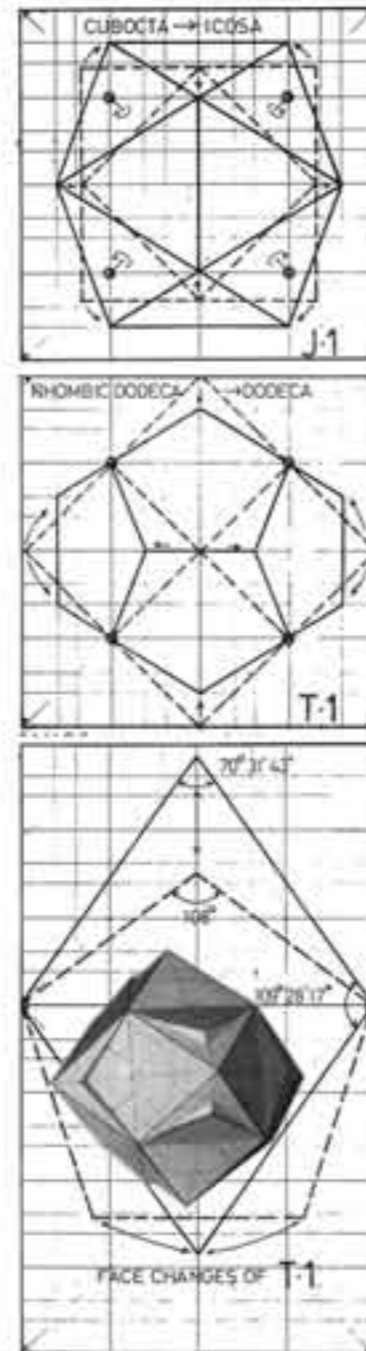
This has been the foundation for a long time study I call the NSU-Theory, or the Natural Symmetries Unification Theory. Of course it is still far from being finished.

One thing is sure about the difference between so-called four and fivefold symmetry polyhedrons: the former have an option of "all space filling" qualities whereas the latter do not. This can for instance easily be demonstrated by how the "five cubes in one" cut each other into at least 17 different pieces. Alas the pieces all have volumes that compared to each other feature a golden ratio relationship.

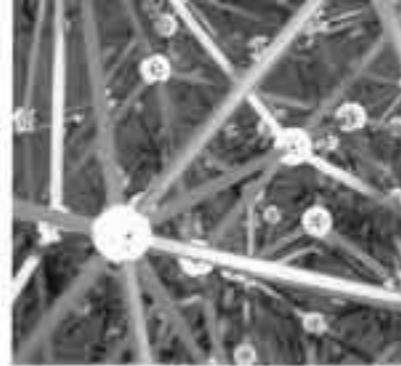
However, in 1984 a Japanese mathematician discovered that two different forms: called the Thin One and the Fat One – two "skew cubic forms" or a cube which is kind of twisted or skewed in two different ways – can fill in the space of the Rhombic Triacontahedron. Ten of each can do the trick.

The interesting thing here is when locked onto my Development Pattern the cube has the volume 1.00000000 and the Rhombic Triacontahedron has the volume 2.500000000. Whereas in comparison the Icosahedron has the volume 2.181694989 and Dodecahedron has the volume 1.809016994.

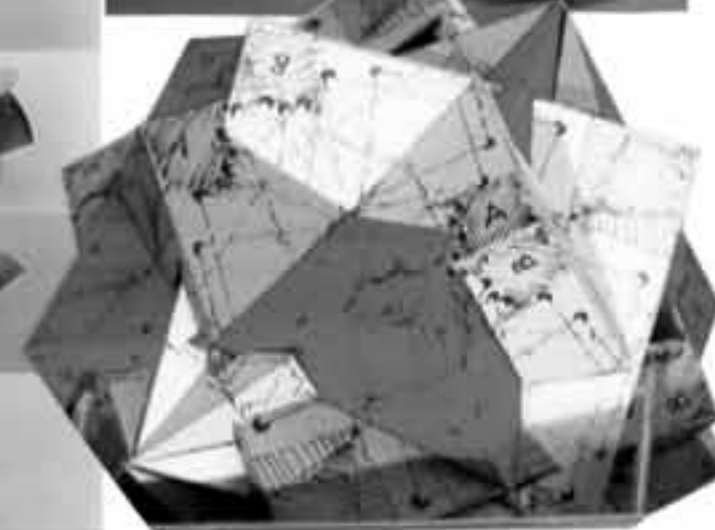
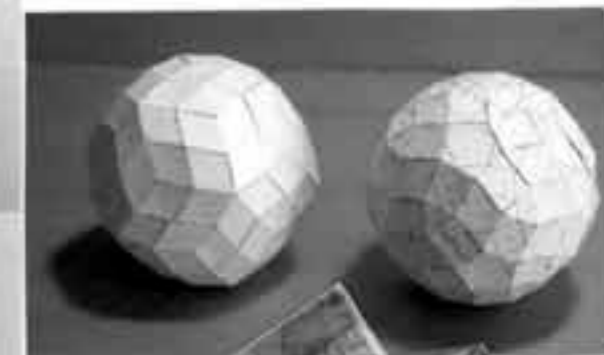
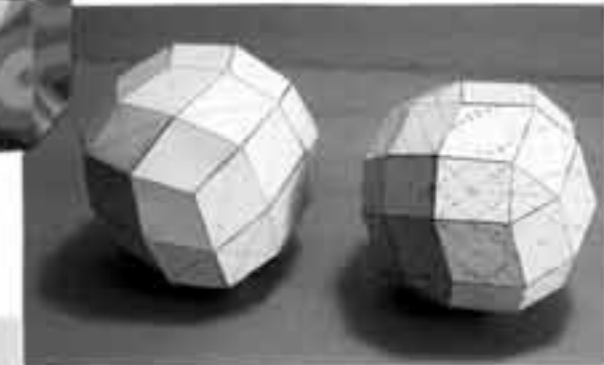
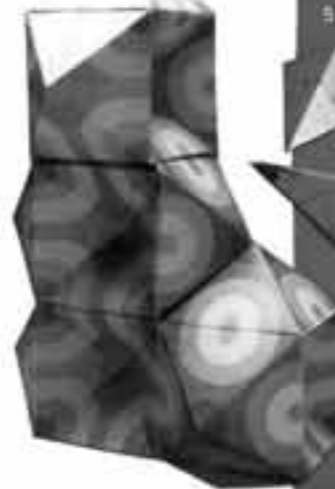
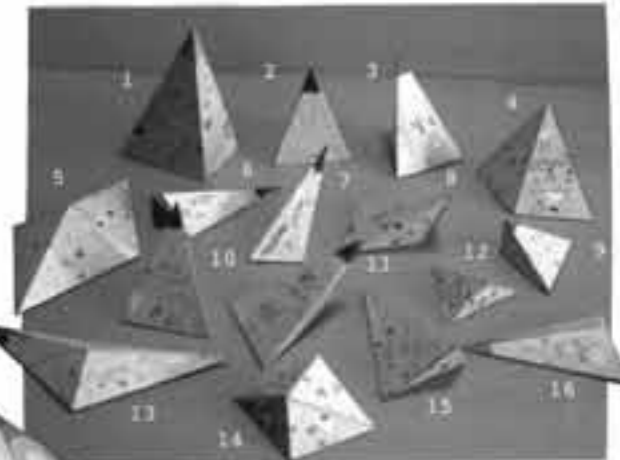
I have come to the conclusion that the number 2.5 is both a rational number and a golden ration number, even though these are normally irrational numbers.



model studies



paperworks

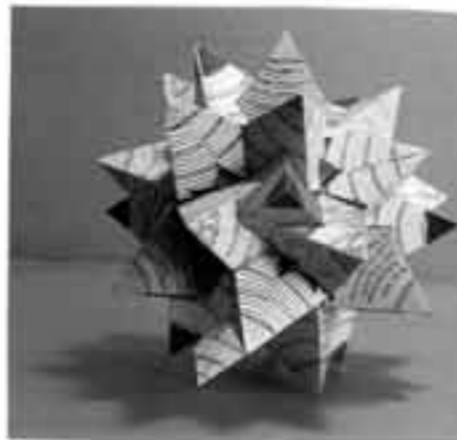


“But are there also some practical ways of using the principles of geometry? You might ask. – I was asking myself that same question back in the nineteen seventies.

Apart from geodesic domes, I started working on some geometric toys. And I remember one instance when I was applying for a new pass in Iceland and was then asked what profession they should put in my pass. – Well, designer, I answered. – Now that is too general, came back at me. So I suggested “toy-designer” which was fine with them. – This was in my pass for many years and helped me get smoothly into many a country.

My most successful toy was / is the MBC or Magic Ball Chain. It had a start in 1977 when my cousin Haukur and I were designing an exhibit stand for a paperboard company in Iceland. Some 80 thousand pieces of MBC were given away at this exhibit.

This piece is based on the Cube and the Rhombic Dodecahedron – both all-space-filling forms. The latter is divided into six same size forms and they are connected together by flexible joints. Therefore many movements of the whole are possible and many forms appear during the movements. Haukur was responsible for the development of the movements. But without seeing them, they are impossible to describe.

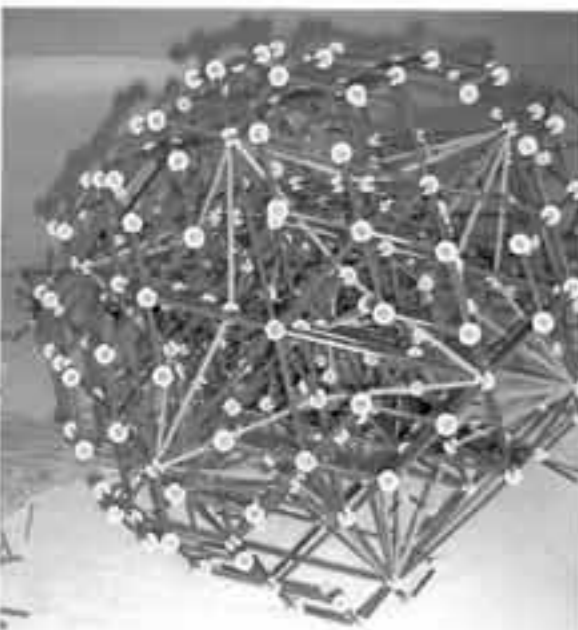
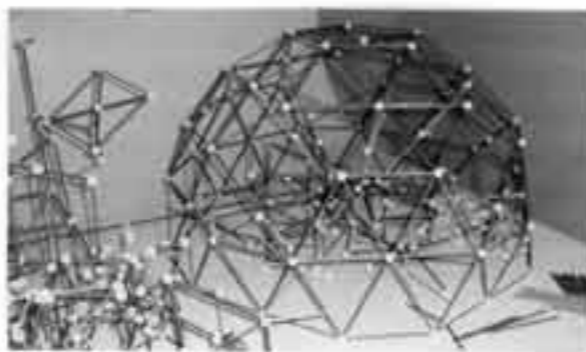
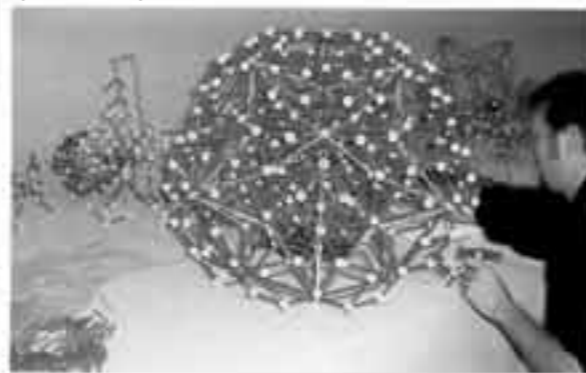


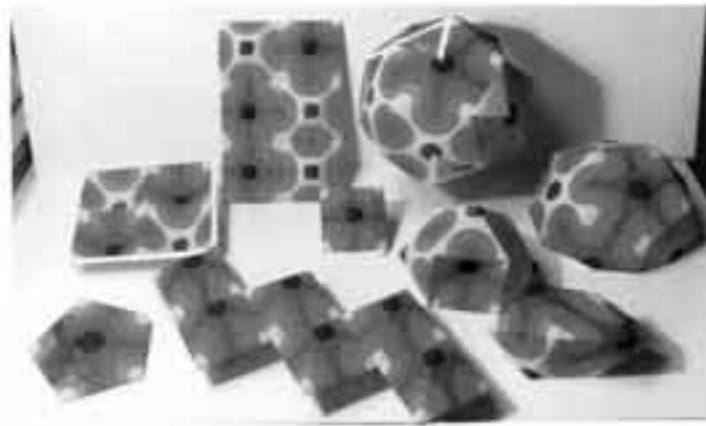
“True to his credo, Olafur had the idea of giving the spectators of his exhibits an opportunity to take a direct part in the creation process by supplying them with Zome Tool Geometry kit for building polyhedral and other models.

The first exhibition of this kind was in the Mala Galerija in Ljubljana in November 2001 where the pictures here come from. It was a big success. And to point it out, we found one of the Zome Tool pieces in a fish bowl in a bar downtown in Ljubljana the night after the opening.

In larger exhibitions in Paris and Copenhagen, in the spring of 2002, this was repeated and the crowd was enthusiastic there also.

As a whole the response from the spectators, who now became operators – then they are creators, in any case – was great. No surprise to us, who are hooked on all kinds of geometric games anyway.”





The six forms can then be added into regular chains of different lengths. The longest that we did was with the kids in Reykjavik at Kjarvalstadir in 1979. It was 920 meters.

After some research work on how this one paperboard coupler could be connected in more ways, next I made another toy version. And later I did the US version that I sold in art museum shops in the US.

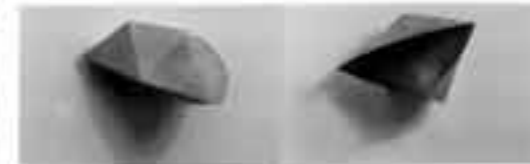
In 1999 Olafur used a larger version of this same MBC toy at an exhibition in Leipzig.

But this was just the beginning of the development of the MBC. I also did a "Pet-Globe" version that used the feature that the MBC could be turned inside out with different graphics or even different forms on each side.

The next step for this paperboard piece came in 1986 when I developed a "take-out" food packaging version of it. The idea was to have a ready made flat packaging that did not take up much space. And could with one hand be snapped into a fill-in form. But once emptied at home the bottom part of the packaging could be used as the MBC toy. Thus giving the customer one more reason to come back to have some more.



KASSAKÜLAN
OTU. BAKIŞI. ÇİZİM. İZLEN. DENEYİM.



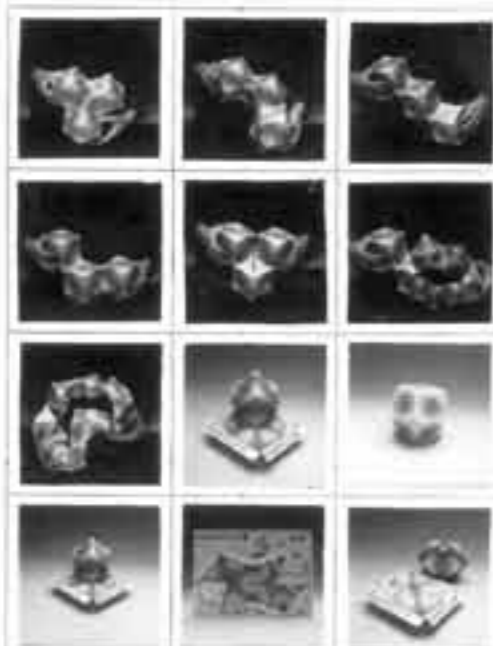
This all sounds good, however how does one convince a manager that this whole process is going to work? The offer I got from the big take-out food companies was to hand over 30 thousand pieces and they would test them and then tell me yes, or no. – Thanks, guys.

In this paperboard connection I also did some more studies: some for more globes. One was smaller, to do-it-yourself, and another larger one was also a toy for older kids with the name "Spaceship Earth" in 1980.

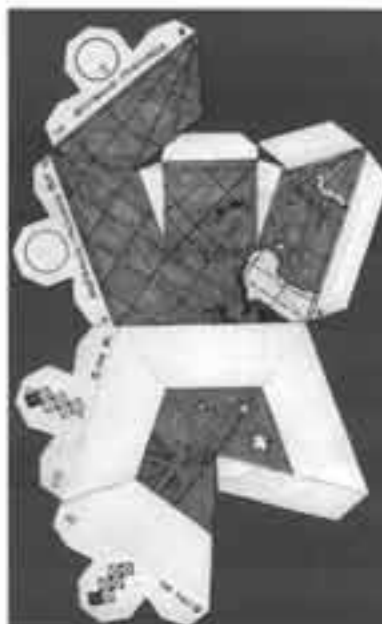
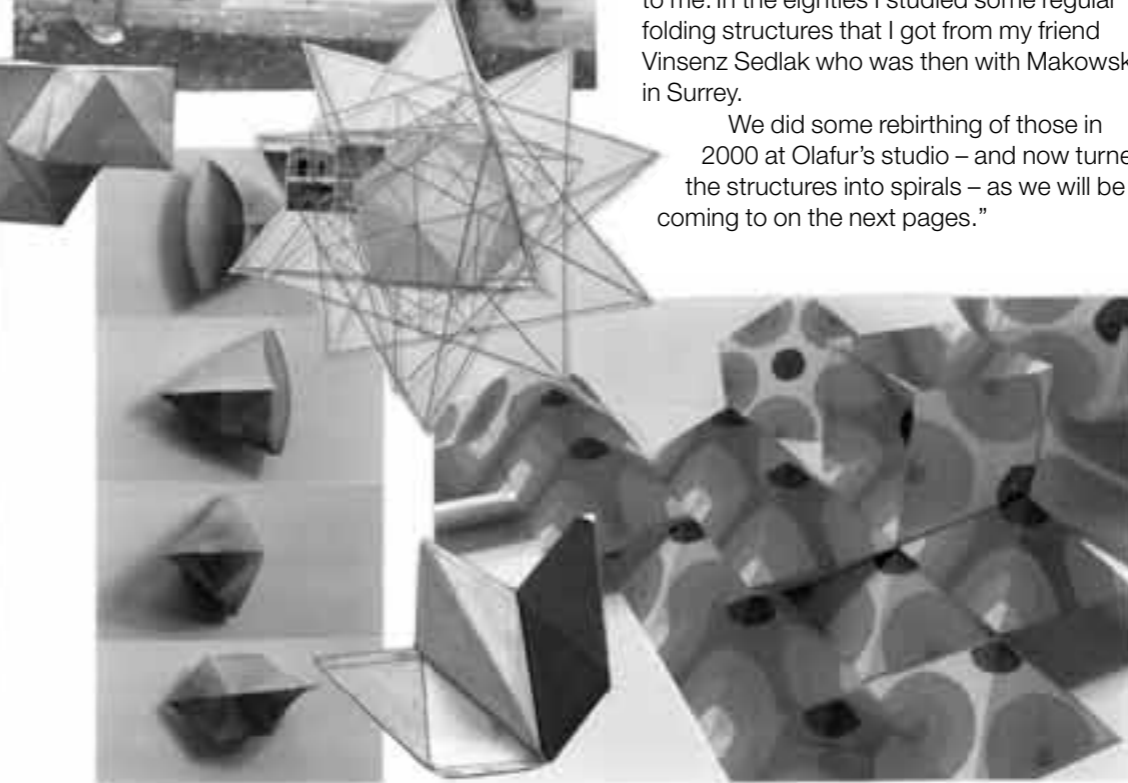
Some more packaging for food followed in this period of my paperboard interest. One in particular was the "Banana-Cube". This was a fluid package that could hold three different drinks but was delivered in a 100 x 100 x 100 MM cube, fit for the freezer.

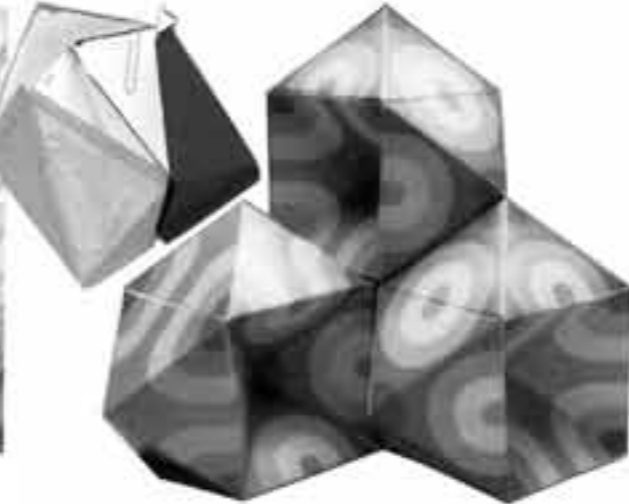
The art of folding that the Japanese have made into a real science also appealed to me. In the eighties I studied some regular folding structures that I got from my friend Vinsenz Sedlak who was then with Makowski in Surrey.

We did some rebirthing of those in 2000 at Olafur's studio – and now turned the structures into spirals – as we will be coming to on the next pages."



KASSAKÜLAN
OTU. BAKIŞI. ÇİZİM. İZLEN. DENEYİM.





"In connection with my Magic Ball Chain many a funny thing happened. From this I draw the conclusion that people are basically very interested in geometry even though they may not be accustomed to it, and more so than is generally acknowledged.

It just happened that 3D geometry was not "in" for a number of years, or rather decades. And only a few odd people like Bucky Fuller or M.C. Escher made extensive study and use of it. And expressed themselves primarily in this way.

Yes, there was somehow a cultural belief existing that wanted to express that the human race was somehow already past such "Renaissance" stuff. I also heard that when my book: "Barnaleikur" or 'Nature's Forms' was first published in 1977.

This all changed with the discovery of quasi-crystals in 1984. Now 3D geometry suddenly was in and more than that, because of the low investment it took to study quasi-crystals every university in the world took it on. And still to this very date the solution of how the spaces of fivefold symmetry function has not been found. But it is tempting to go on, as the Nobel Prize is the carrot hanging on the stick.

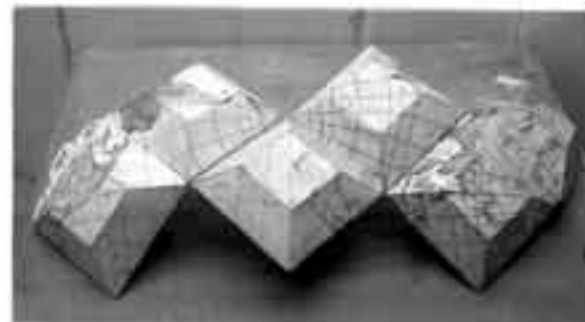
One of the scientists looking into this is the physicist Paul Steinhardt at Princeton University. He had the sensible idea to have a geometric toy made to be able to study three-dimensional space of this fivefold kind. I don't know if he succeeded in that however.

I have the feeling that in spite of all the latest computers we have access to, it does not help our brain very much to study quasi-crystals. The rational build-up or self-growth pattern of those crystals is much more complex than our brain is built to handle. It has nothing to do with intelligence but very much with being able to see two or more things at the same time.

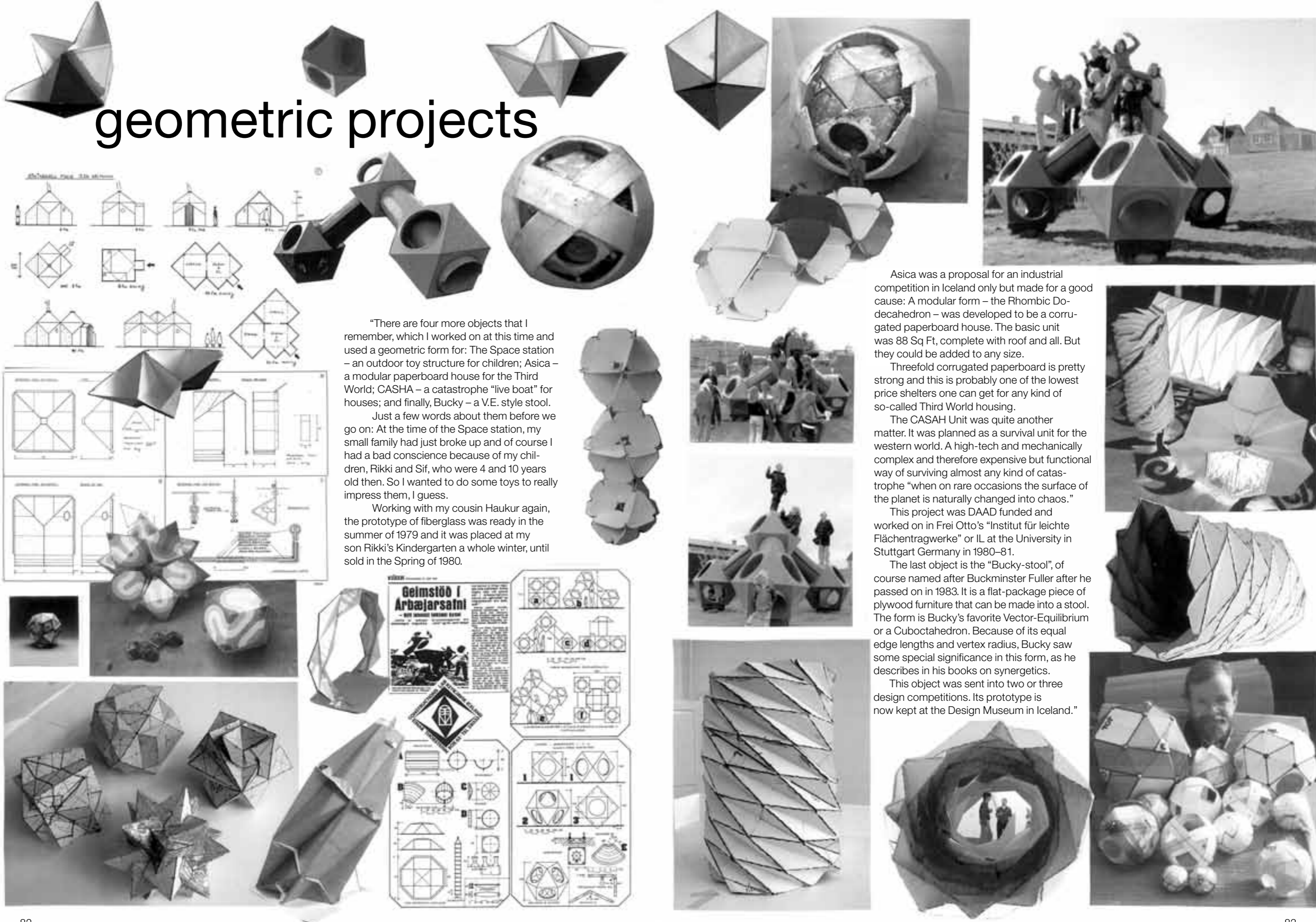
Everyone knows the example of the melon and the apple contra the football and the tennis ball. If we are to put two and two into separate categories, we can of course think of two fruits and two sport gadgets. However we can hardly think of the other option at the same time: two small and two larger spherical objects.

In a nutshell, it is a similar experience when we look at a compound of five Cubes ordered in a Dodecahedron way. We cannot see the complex whole and singular Cubes at the same time. But we can "blink" from one to the other. And this is what draws our attention to a piece like that.

But what was so funny that happened in connection with my MBC? Well, one thing was that I could draw one piece out of my pocket and start playing with it on any street corner and people would flock around me to see these "impossible" movements. – I can also remember standing at the desk of a museum shopkeeper in Houston and he was wondering how many pieces he should take for his shop to sell. At exactly that moment a kid about 12 years old happened to come by, saw my MBC and started exclaiming how fantastic that was. The shopkeeper thought that this was a setup and said so, but he still took more items than I had expected."



geometric projects



"There are four more objects that I remember, which I worked on at this time and used a geometric form for: The Space station – an outdoor toy structure for children; Asica – a modular paperboard house for the Third World; CASHA – a catastrophe "live boat" for houses; and finally, Bucky – a V.E. style stool.

Just a few words about them before we go on: At the time of the Space station, my small family had just broke up and of course I had a bad conscience because of my children, Rikki and Sif, who were 4 and 10 years old then. So I wanted to do some toys to really impress them, I guess.

Working with my cousin Haukur again, the prototype of fiberglass was ready in the summer of 1979 and it was placed at my son Rikki's Kindergarten a whole winter, until sold in the Spring of 1980.

Asica was a proposal for an industrial competition in Iceland only but made for a good cause: A modular form – the Rhombic Dodecahedron – was developed to be a corrugated paperboard house. The basic unit was 88 Sq Ft, complete with roof and all. But they could be added to any size.

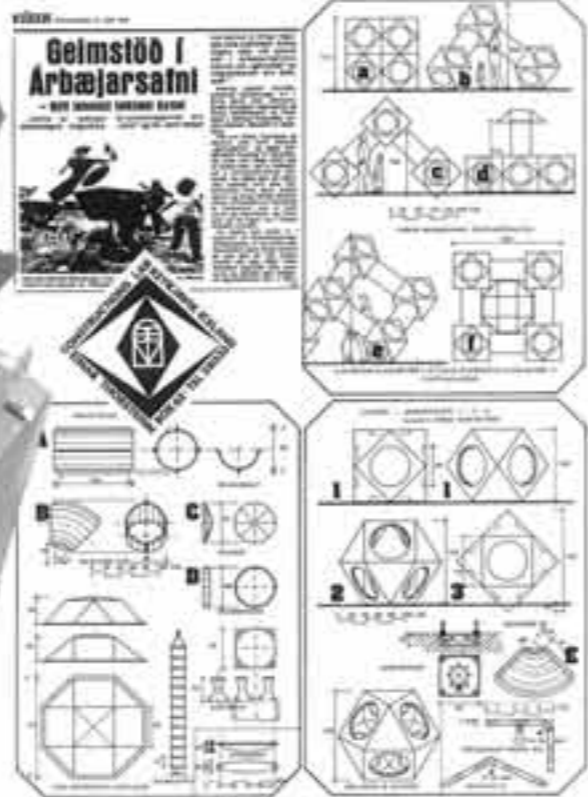
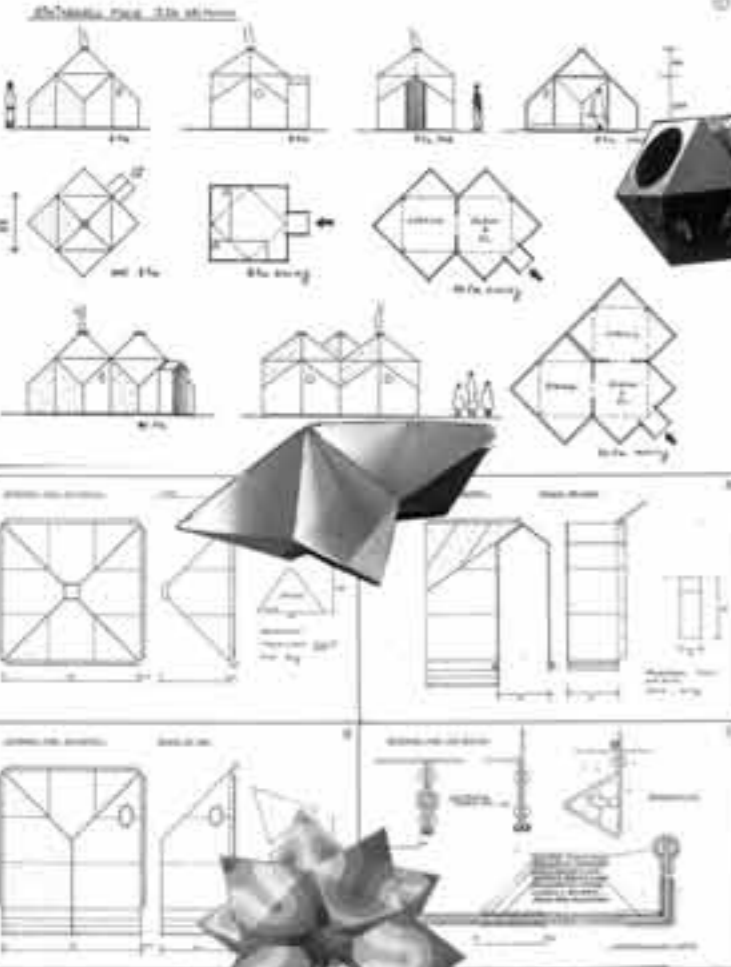
Threefold corrugated paperboard is pretty strong and this is probably one of the lowest price shelters one can get for any kind of so-called Third World housing.

The CASHA Unit was quite another matter. It was planned as a survival unit for the western world. A high-tech and mechanically complex and therefore expensive but functional way of surviving almost any kind of catastrophe "when on rare occasions the surface of the planet is naturally changed into chaos."

This project was DAAD funded and worked on in Frei Otto's "Institut für leichte Flächentragwerke" or IL at the University in Stuttgart Germany in 1980–81.

The last object is the "Bucky-stool", of course named after Buckminster Fuller after he passed on in 1983. It is a flat-package piece of plywood furniture that can be made into a stool. The form is Bucky's favorite Vector-Equilibrium or a Cuboctahedron. Because of its equal edge lengths and vertex radius, Bucky saw some special significance in this form, as he describes in his books on synergetics.

This object was sent into two or three design competitions. Its prototype is now kept at the Design Museum in Iceland."



the thing you don't see

that you don't see



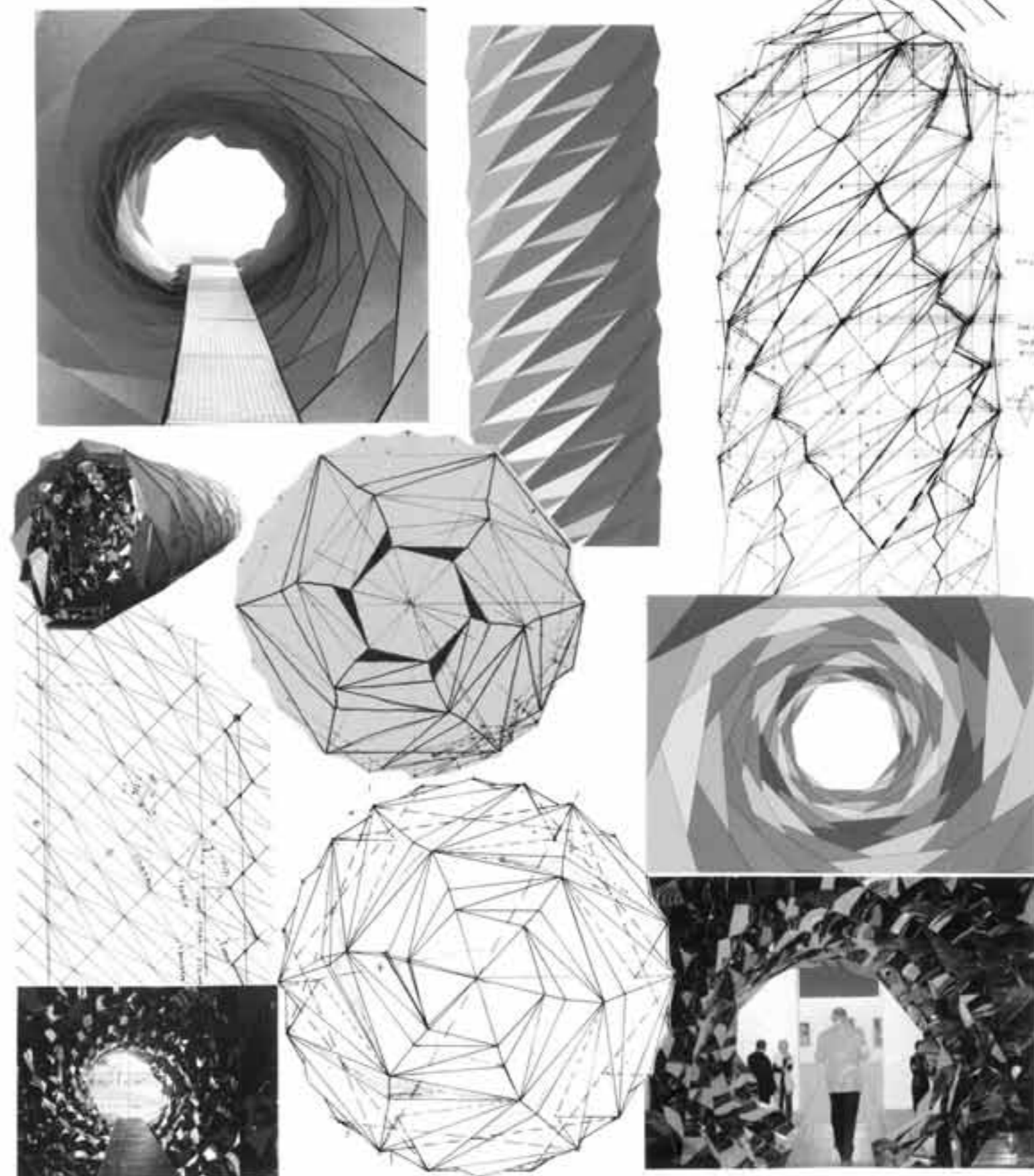
"In 1977 I was invited to take part in a design exhibition in the Art Museum of Kjarvalstadir in Reykjavik. At that time I had the opportunity to do a lot of research work, and this became very much visual in this exhibition.

One of the pieces I showed there was a small folded arch of corrugated paperboard that one would pass under. This way of folding a pretty rigid structure out of a flat surface without adding anything is very interesting and in this way there is formed some useful self-organized architecture.

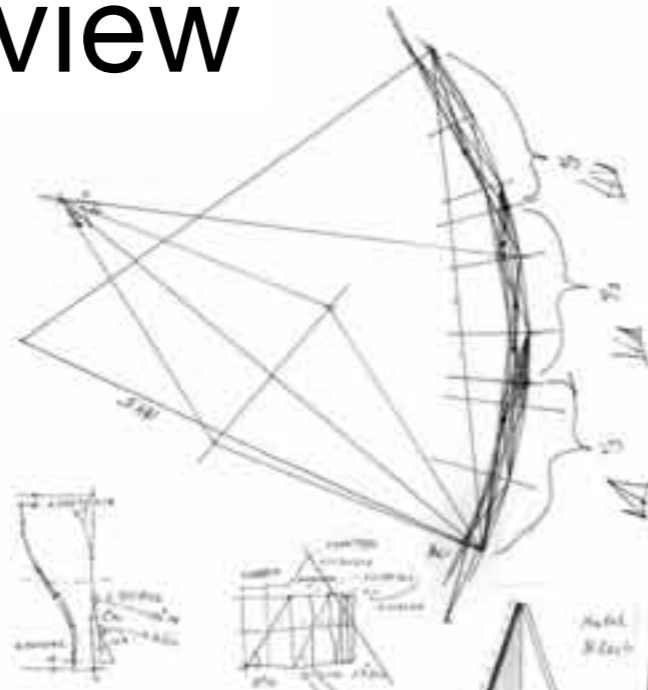
Later at Olafur's Studio in Berlin we did a lot of studies of the same, first for the Spiral Tunnel in Long Island but that did not work there. However as mentioned before we now added a twist to the pattern to form a spiral tunnel.

We then did some intensive studies of a Mirror Pavilion that has not been executed yet.

The first sets of models I made at home and as I am of a practical nature I used Corn Flakes paperboard boxes to do the models. This can be seen inside many of the first small models.

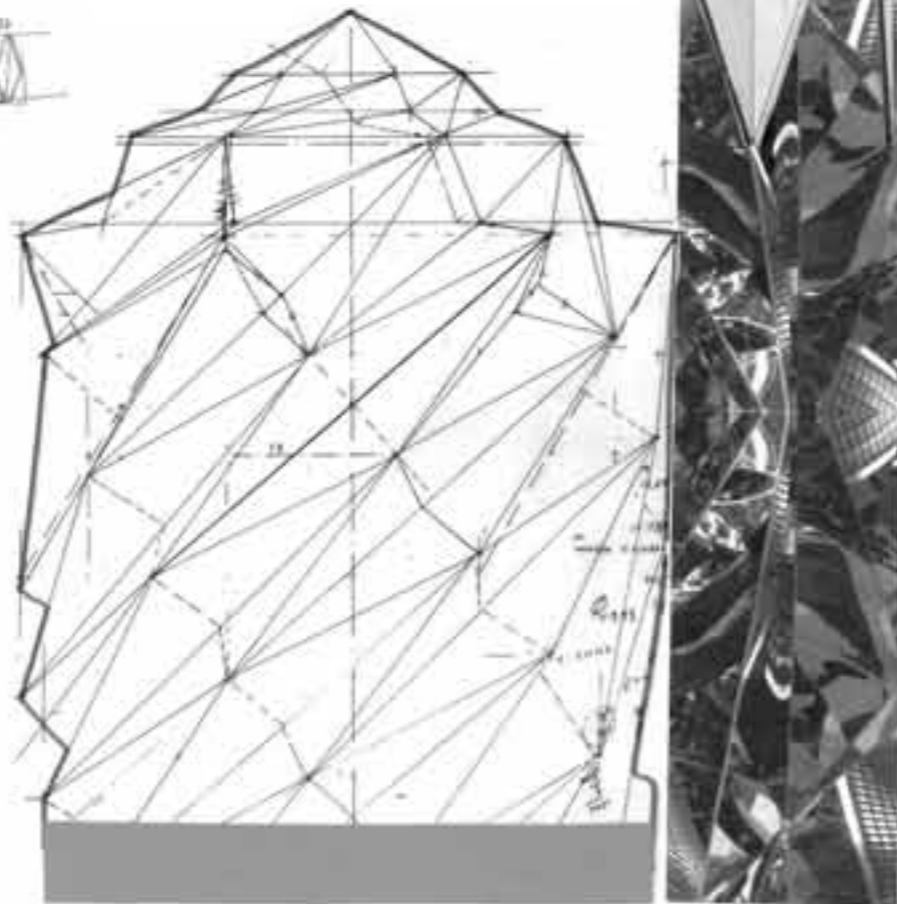


your spiral view



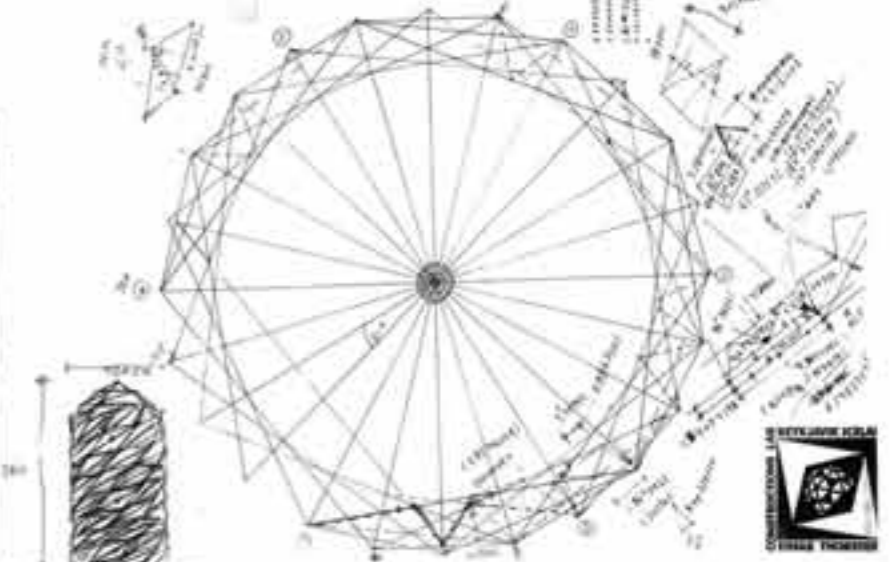
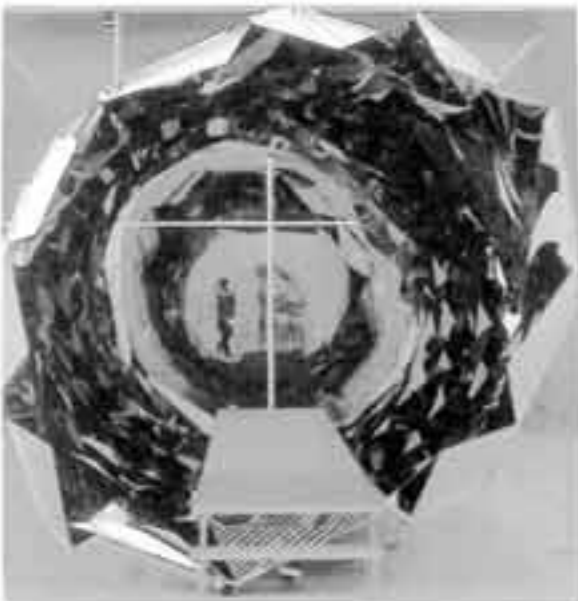
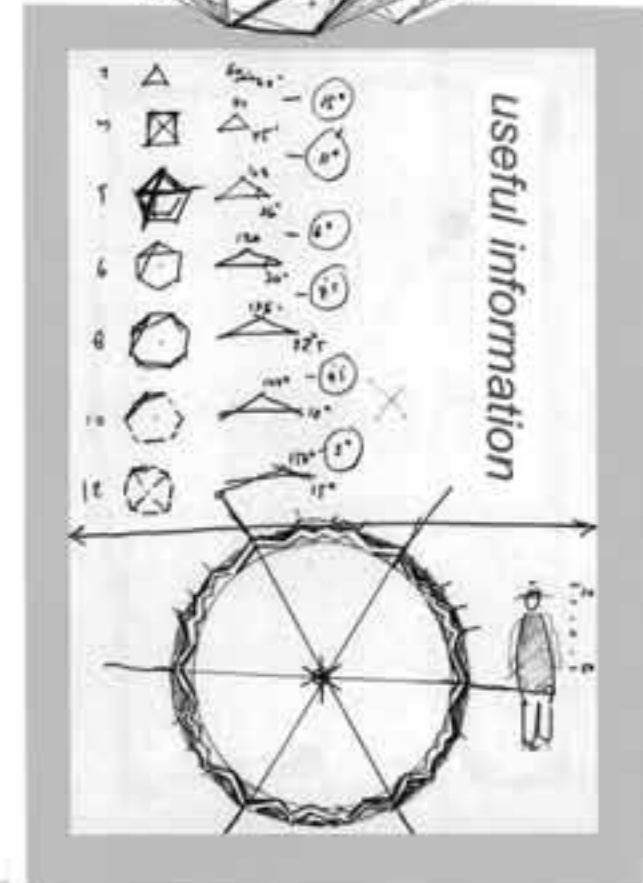
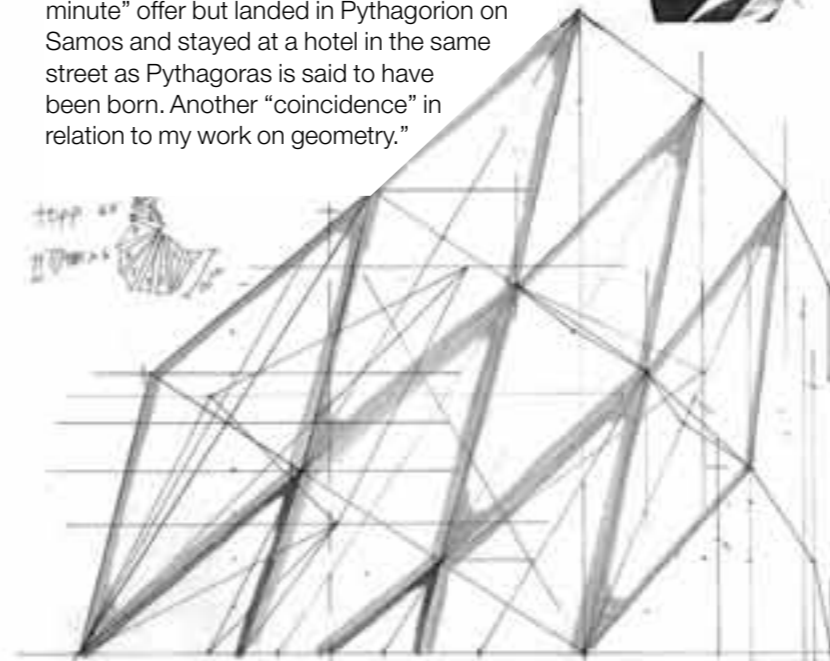
Then in 2002 two versions of this new construction were erected and exhibited as walk-through installations: One of 600 CM long of corrugated paperboard in Berlin and Paris and another of 450 CM length made of mirrored steel in Basel.

The former art piece's title is: 'Die Dinge die du nicht siehst die du nicht siehst'. And the latter has the title: 'Your spiral view'."

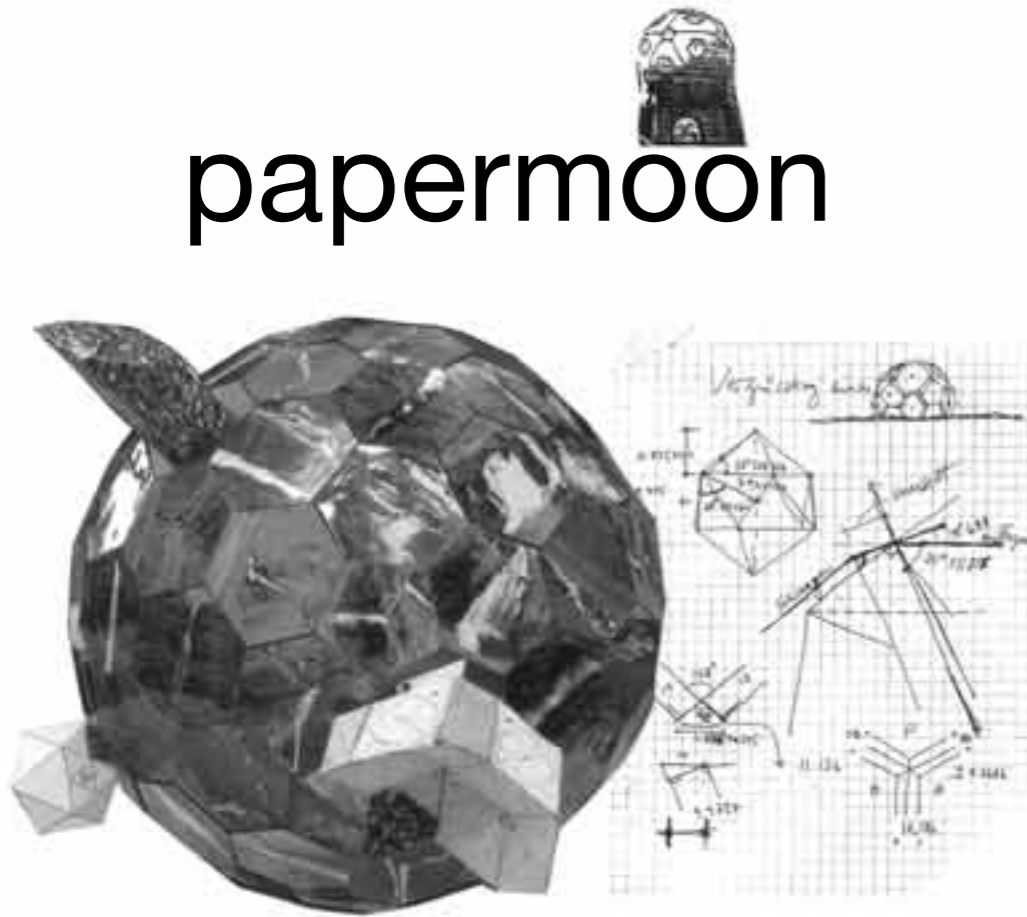


"In 1984, through the support of Linus Pauling, I received a grant from the Icelandic Science Fund to do a study on "The Family of Golden Numbers". I later heard that they wanted so much to keep the letter of recommendation from the double Nobel Prize Winner, that they could not say no to my application.

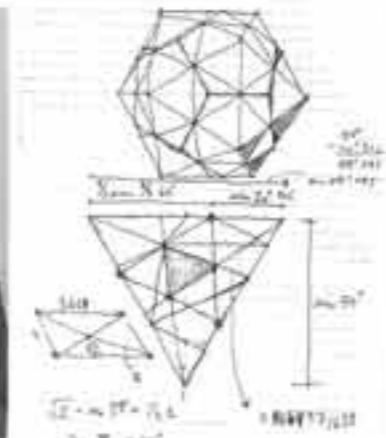
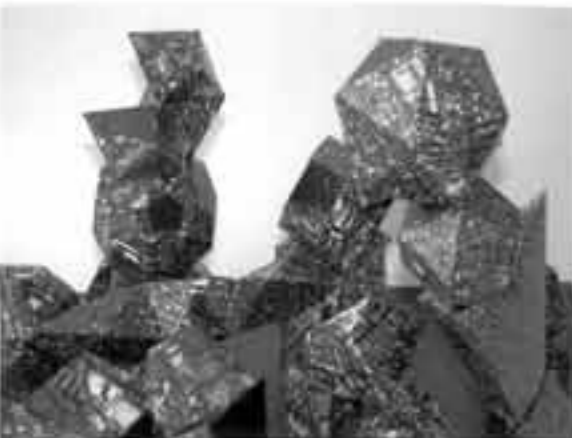
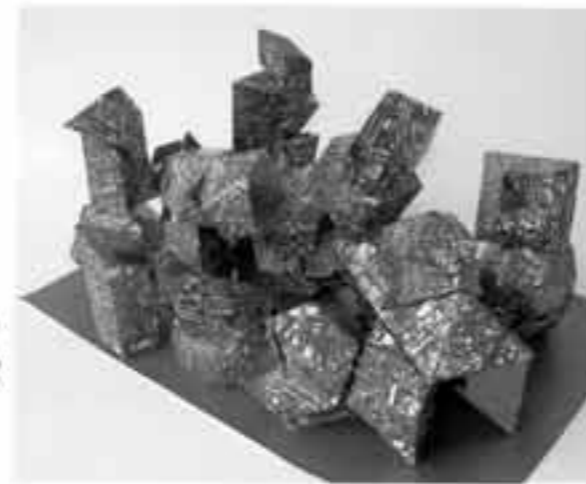
With that I went to Copenhagen to work on the project. It was a cold spring so I figured it was best for me to move with my girlfriend to the south. We just picked the first "last minute" offer but landed in Pythagorion on Samos and stayed at a hotel in the same street as Pythagoras is said to have been born. Another "coincidence" in relation to my work on geometry."



papermoon



magnet city



all-space-filling brick



“Three recent projects/art pieces that also have a geometric basis are the Papermoon, Magnet City and the All Space filling Brick. The last one is still a project but of the three it is the most fundamental in a double sense.

The Papermoon and Magnet city are paper art and one uses magnets to move the different pieces belonging to them around.

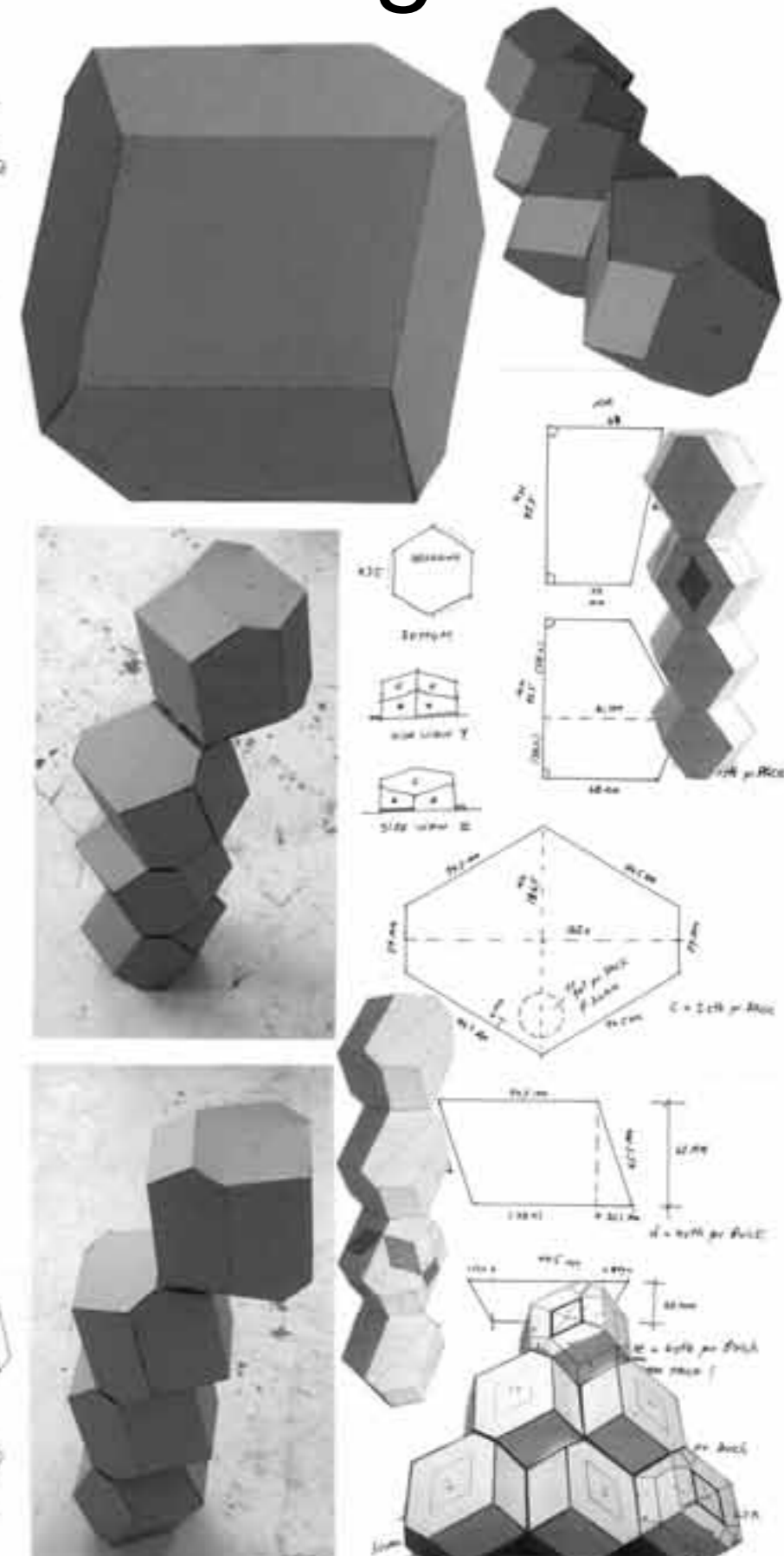
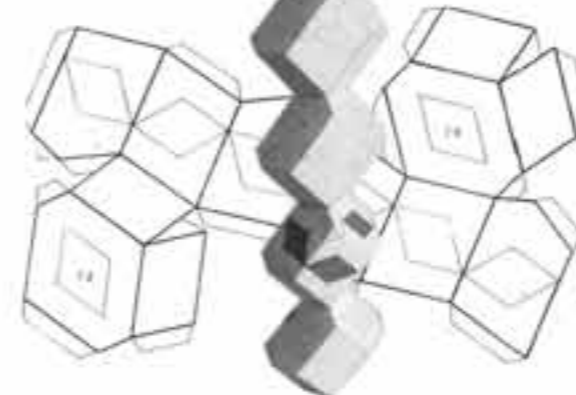
The first is a 6 FQ geodesic sphere with some 122 different pictures of Icelandic waterfalls on its faces. Ten other geometric forms can be placed in different positions on the sphere.

The latter art piece consisted of some thirty geometric pieces all with arial photographs of the city of Tokyo on their surfaces. They can all be positioned on a magnet base and thus form a very varied kind of architecture model.

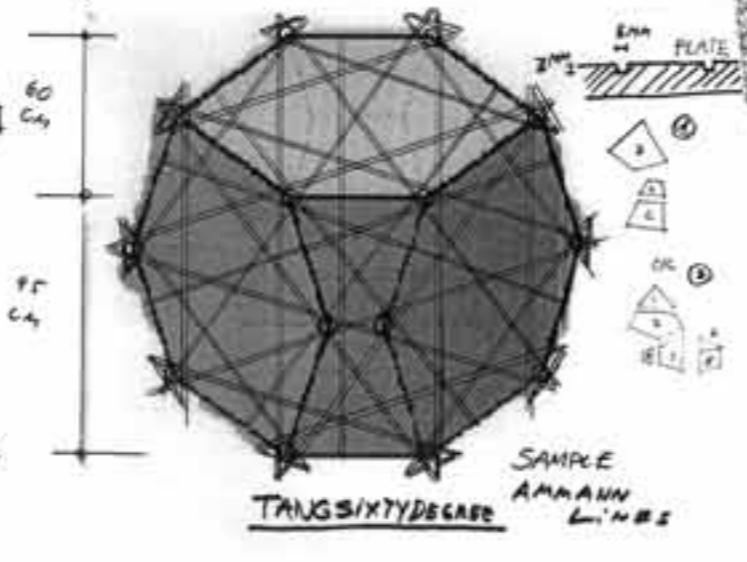
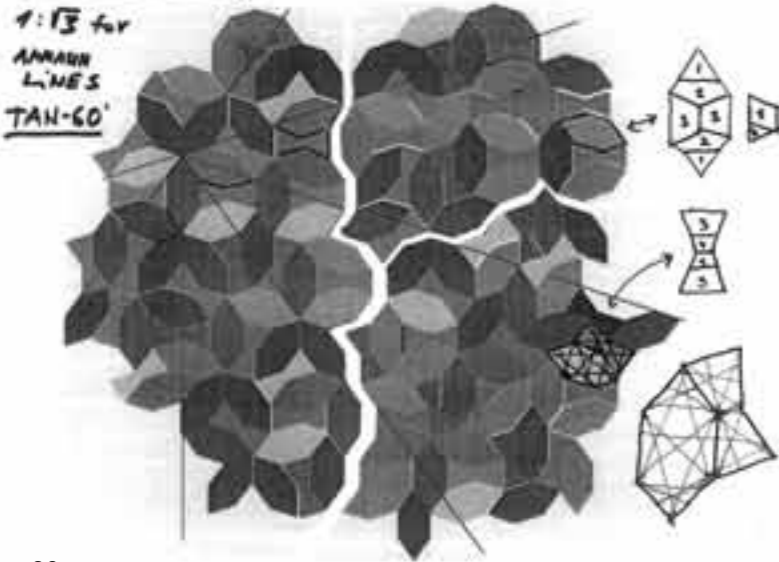
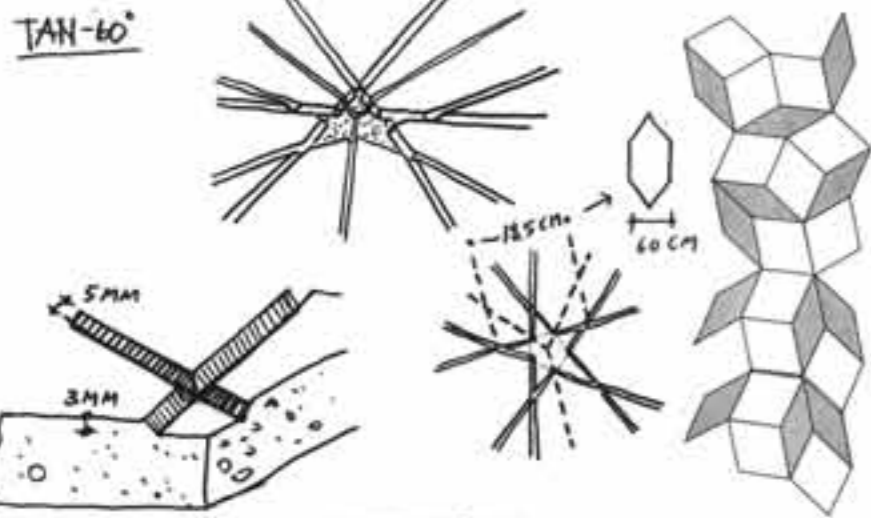
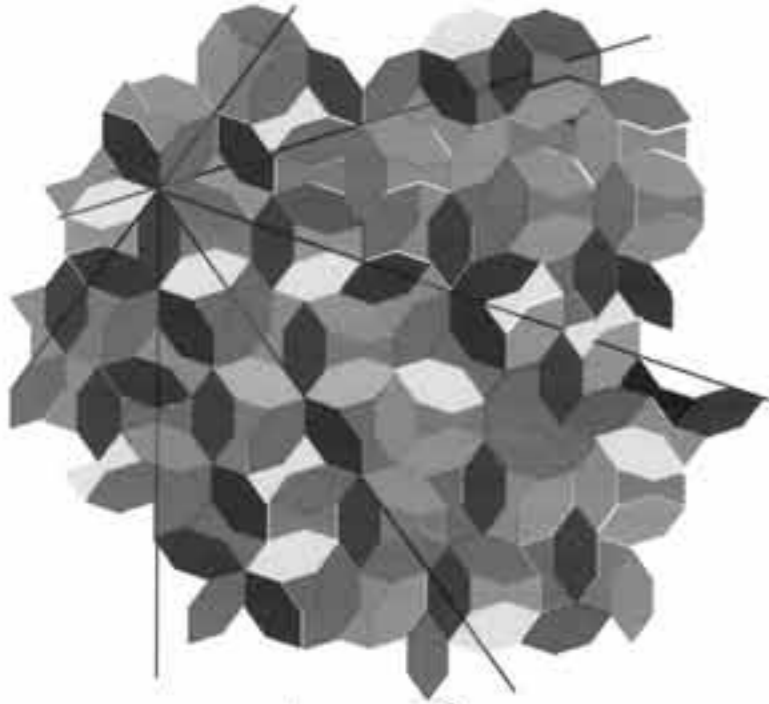
The all space filling brick or quasi-brick however will, when finished, be a new fivefold symmetry all-space-filling form. This means that when they are added together, no holes will be left between them. Not many such forms exist.

Secondly this regular brick will be used to build solid constructions, a new challenge to all bricklayers probably. The mass of the brick is chosen in harmony with the Global Scaling theory that says that all objects of certain harmonic sizes have a tendency to “live” longer.

We will need some time to finish this project, I gather.”



2D five fold geometry



“As the final touches we will look at pure non-chaotic geometry in here with further projects of a 2D nature. They are also fivefold symmetry related and furthermore in one family with “Penrose tiles and Ammann lines”.

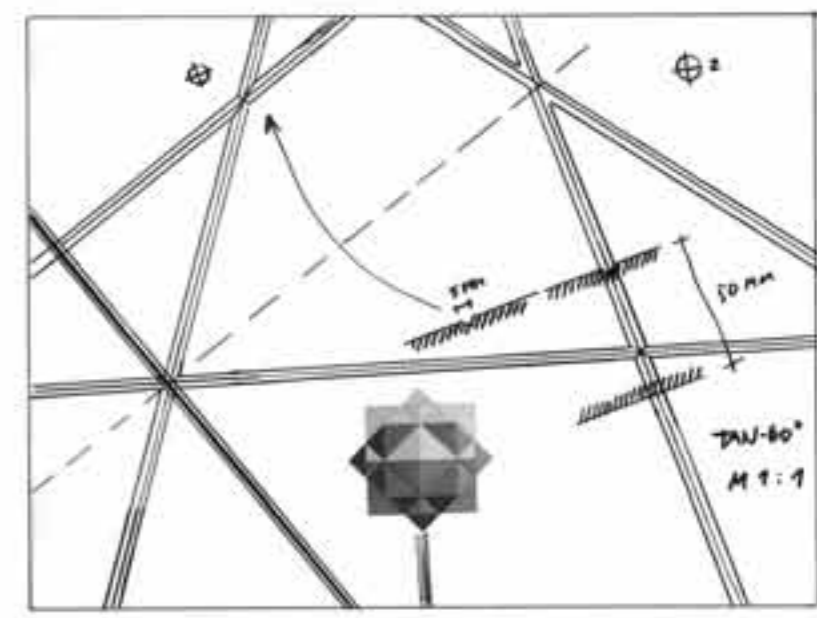
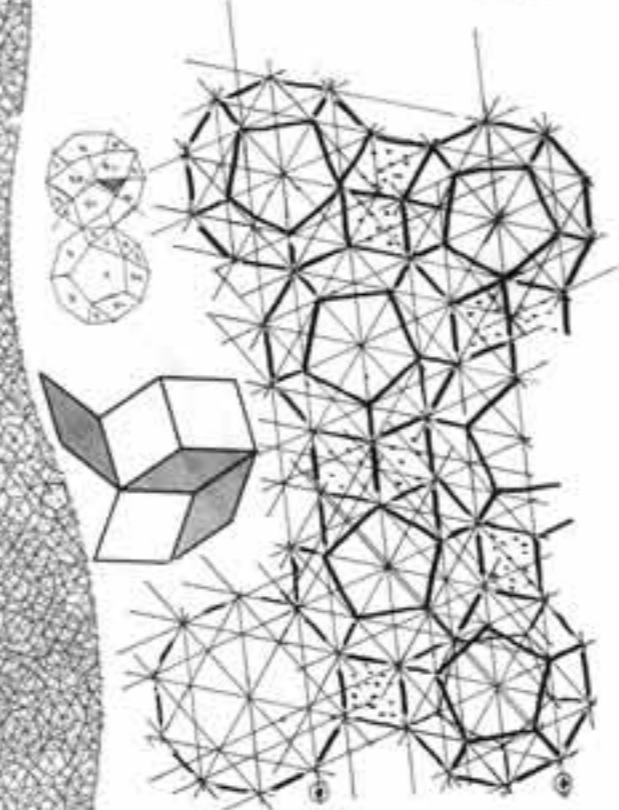
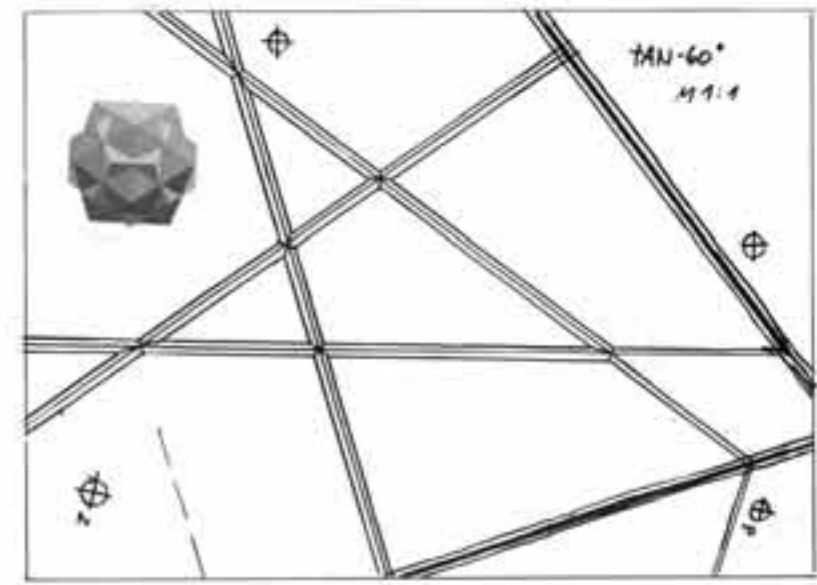
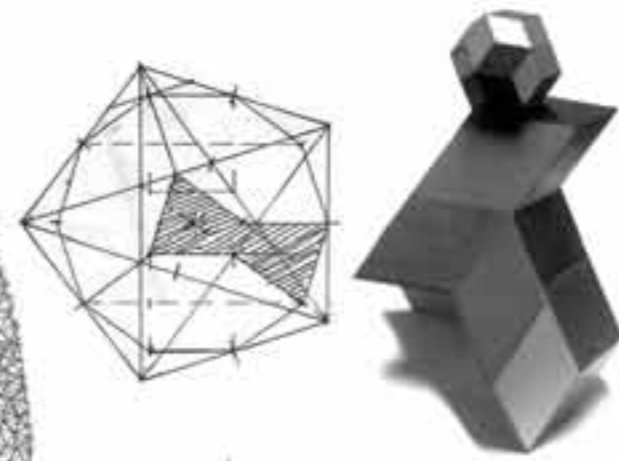
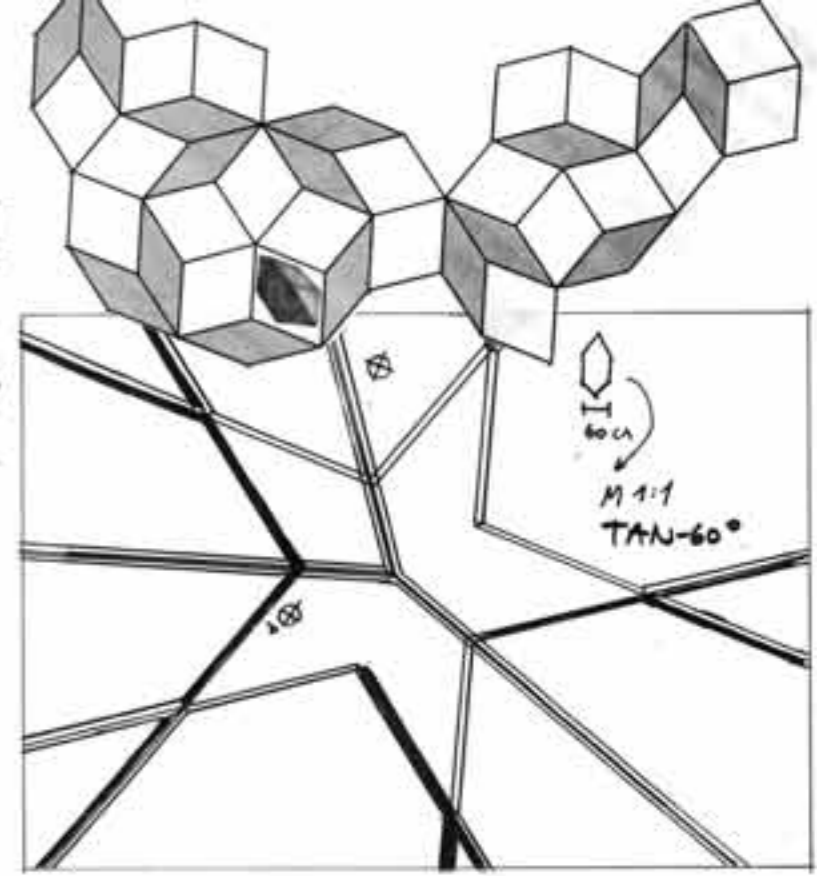
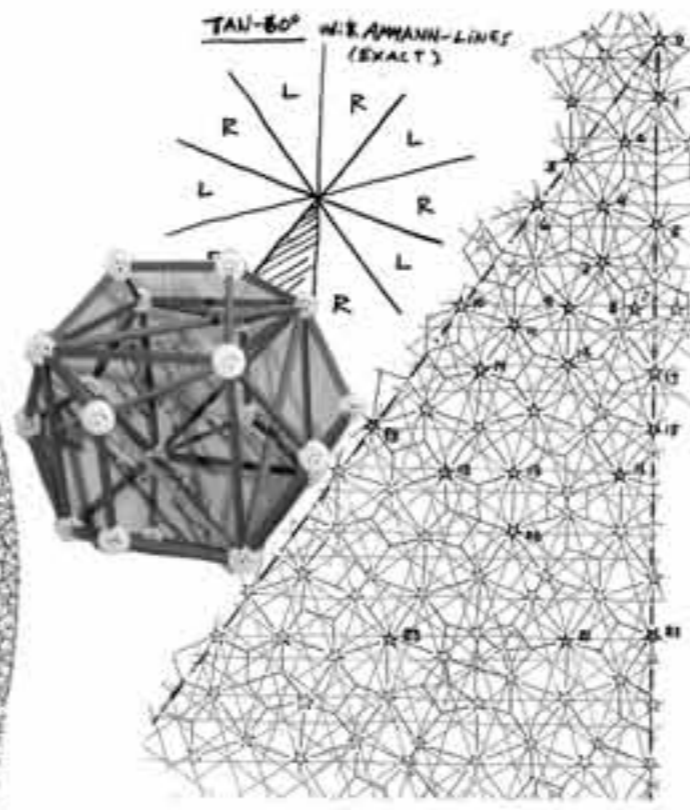
Considerable time has been spent in Olafur’s Studio on projects of this nature for floors or outside environments. It has been kept in mind to start a co-operation with a tile or plate producer.

Now the beginners in this game of fivefold symmetry tiling will of course be satisfied at first with the original Penrose tiles, like the ones we have presented here in our fivefold symmetry introduction.

But once one’s brain learns to cope with that in a way – because no one will be able to fully come to terms even with that “simple” but very original product – more complexity is called for. This we have done in the proposals for certain projects. The most notorious one – and I feel like I can say that with the confidence that it will never be carried out – was the Skybridge Project in Houston, Texas.

A very well known company in Houston – a company that has been much in the news because of some problems – planned to give a final touch of art to its circle formed bridge over a downtown Houston intersection. The first proposal Olafur did for them was a fivefold symmetry tiling for the floor. Later he made another light proposal for the glass walls.

In any case nothing came of it, as to everyone’s surprise the company suddenly went broke. Now as I know the proud Houston society, people there would not want to be involved in anything like that.



the skybridge project

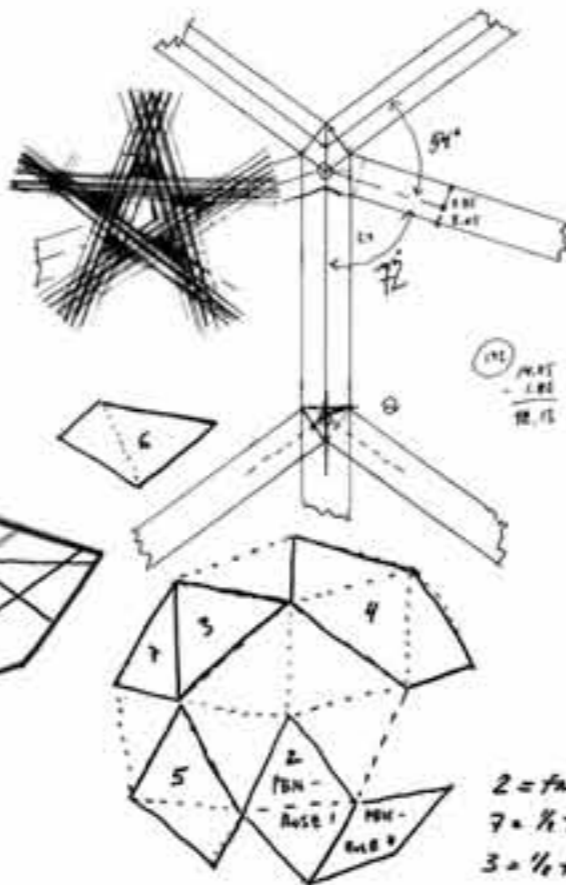
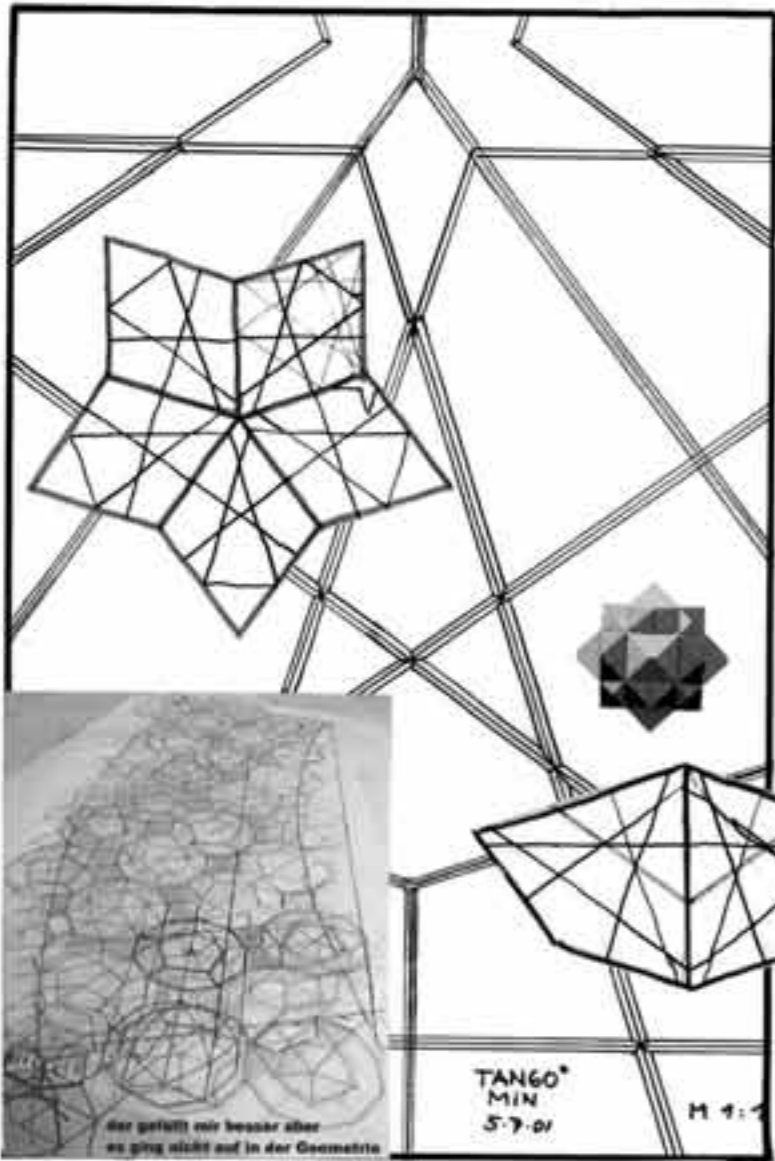
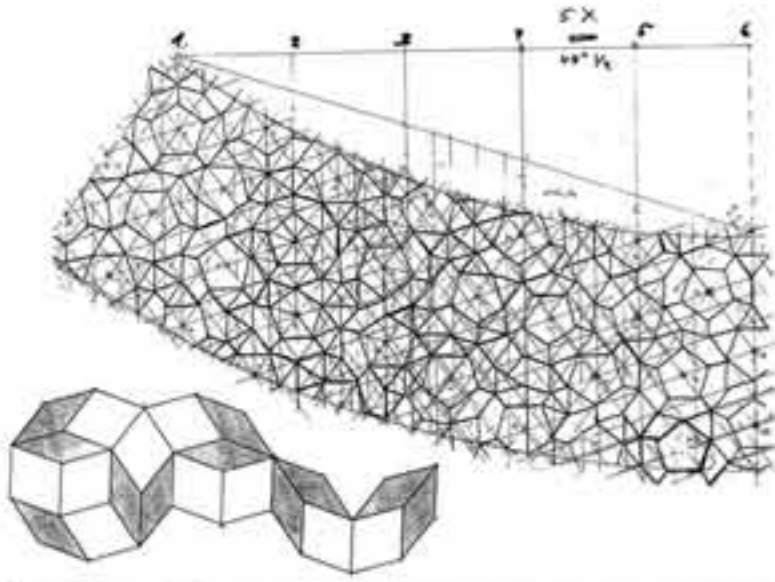


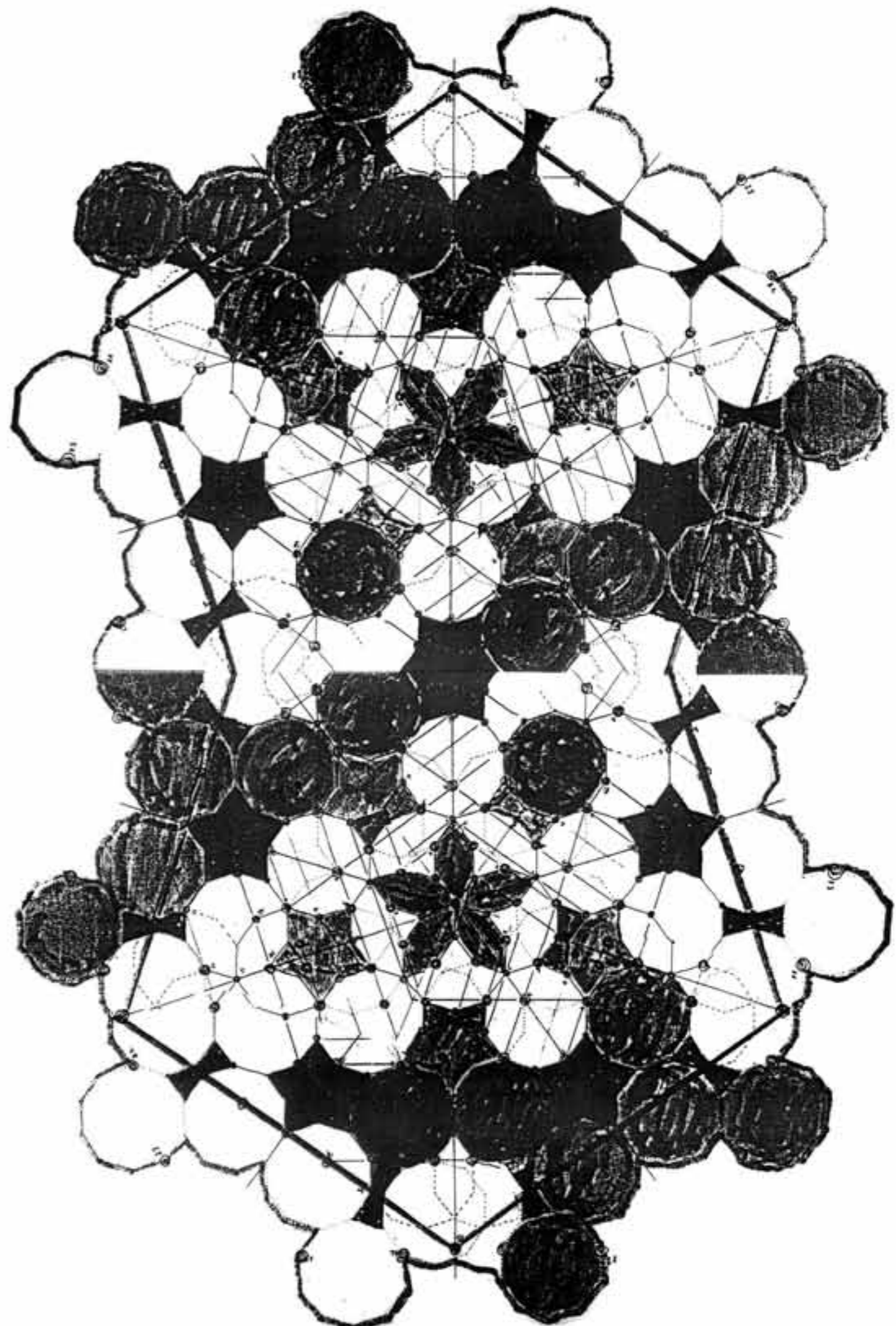
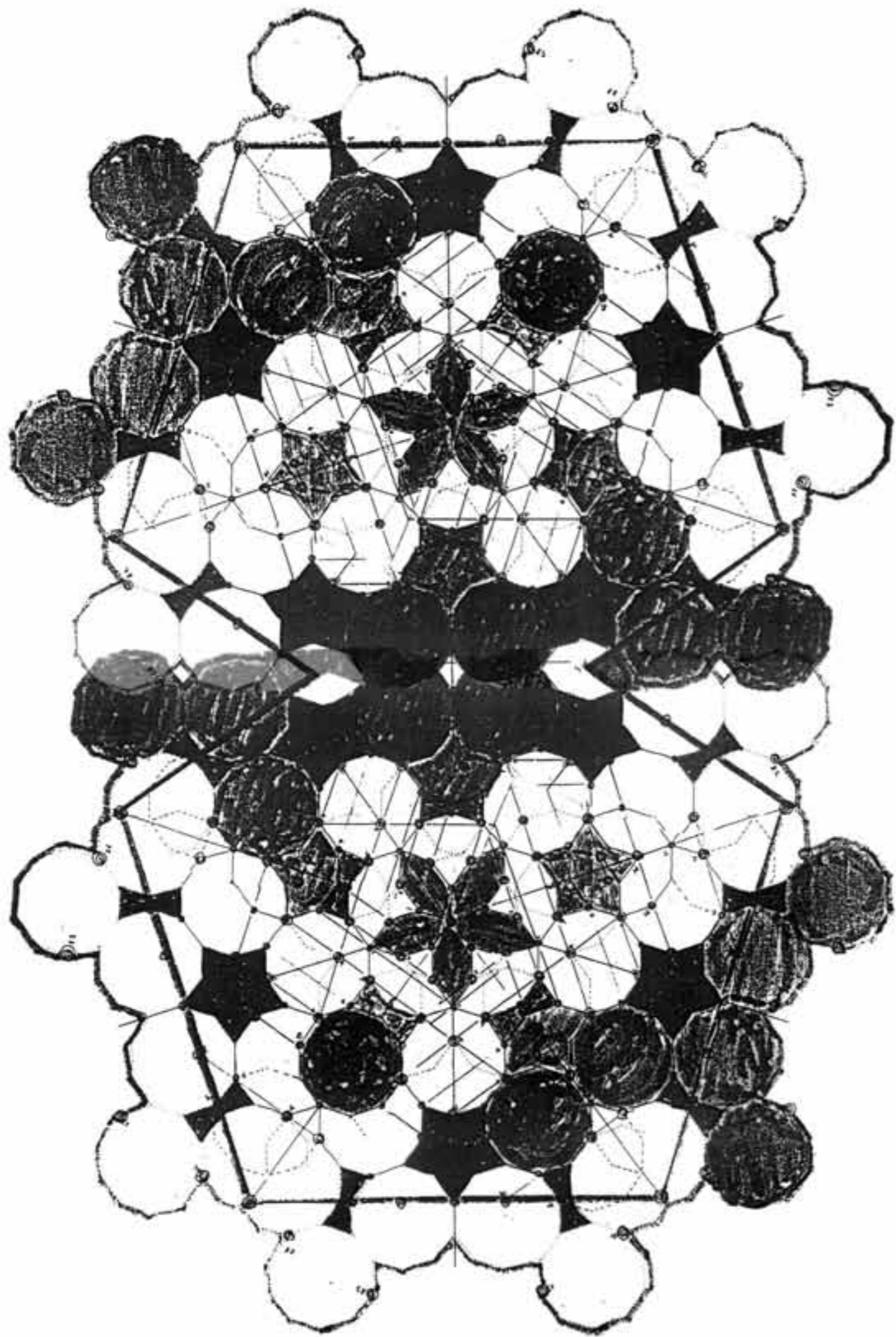
I remember my later friend, Judge Driscoll of Houston, saying to me, when he was county attorney and allowed TV camera crews to follow the police on drug-busting missions in Houston – and the images were broadcast live: "This will tell them to stay out of Houston".

Anyway, until now these tiling projects have just meant research and more research to us. But to tell you the truth, this is the way of modern art. You would never be able to imagine when you look at some art pieces, how much brain power has been working over-time before the final touches are there. It is a whole "science of art".

Therefore today – and maybe it was like that some hundred fifty years ago also – the international artist is more like a singer of a band: he or she has the attention of the correct circles, but without the band there is no show taking place. Of course, he or she can always work on a solo career, but that we all can do.

There have been some other fivefold symmetry tiling projects but they did not work out. It was however nothing as dramatic as with the Houston company."



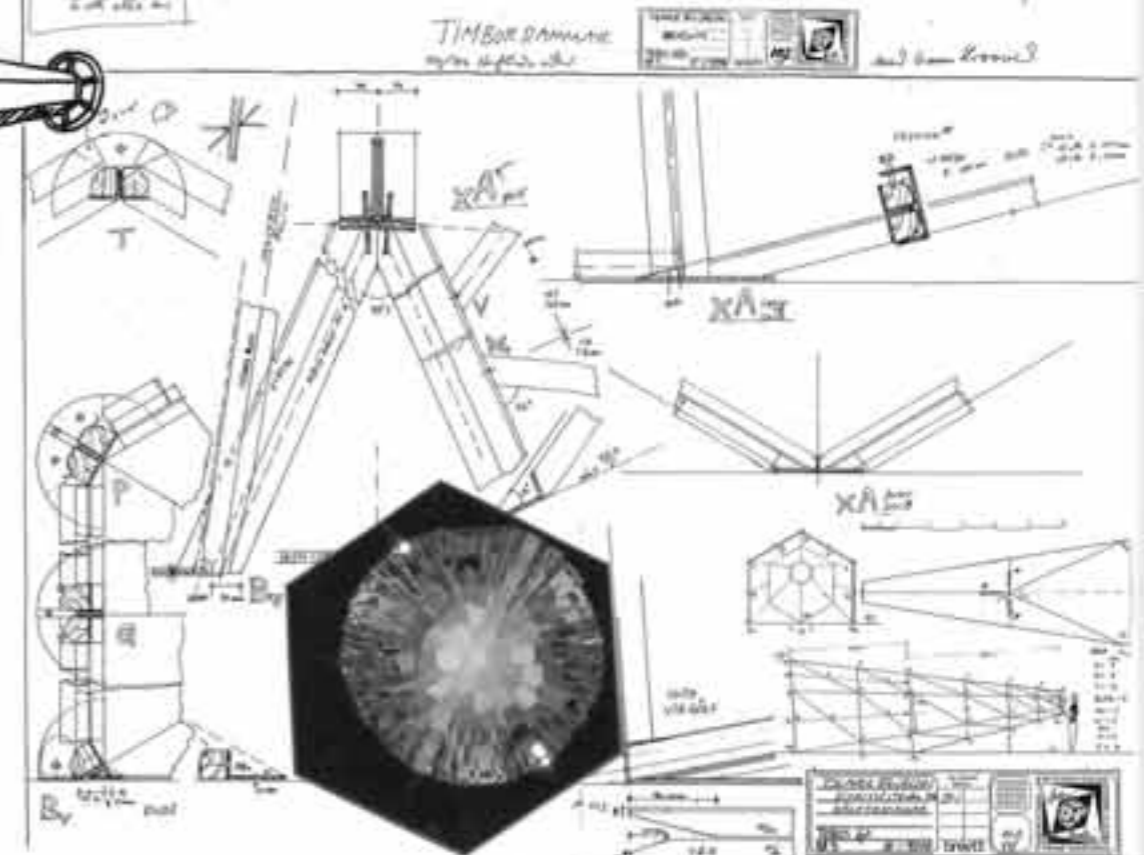
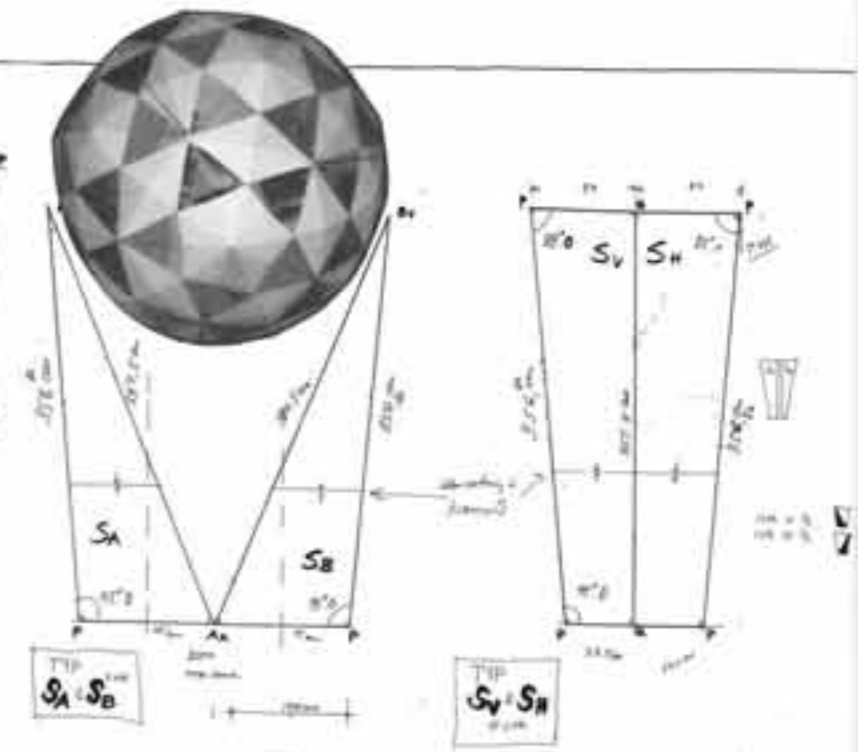
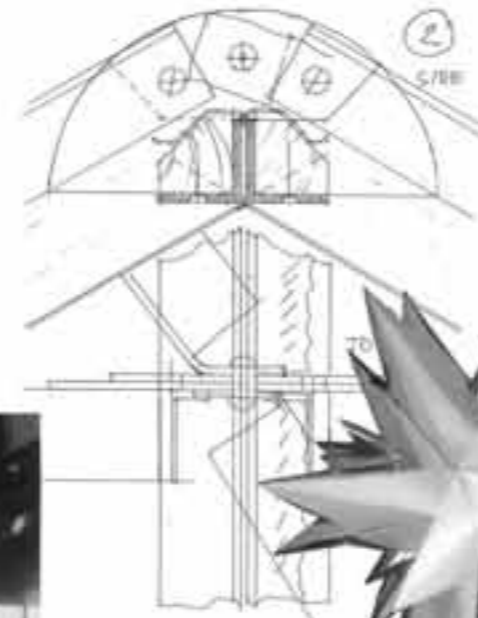
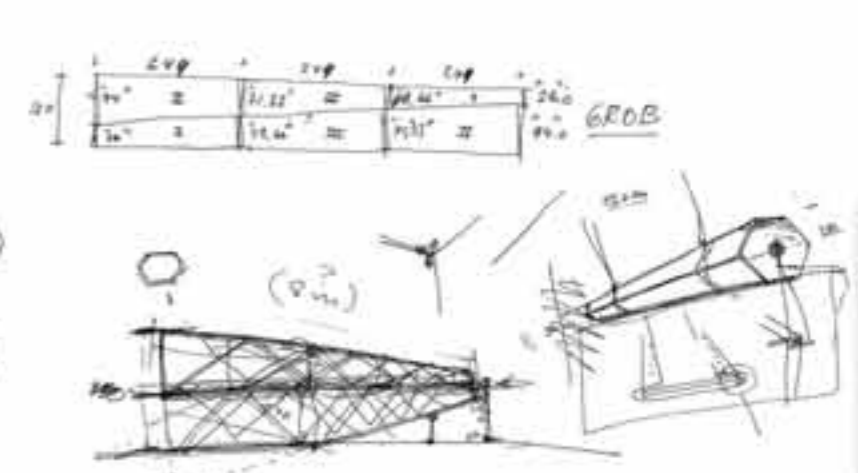
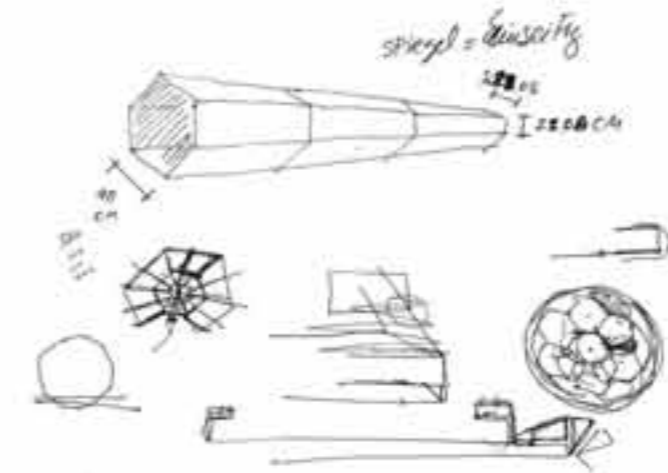
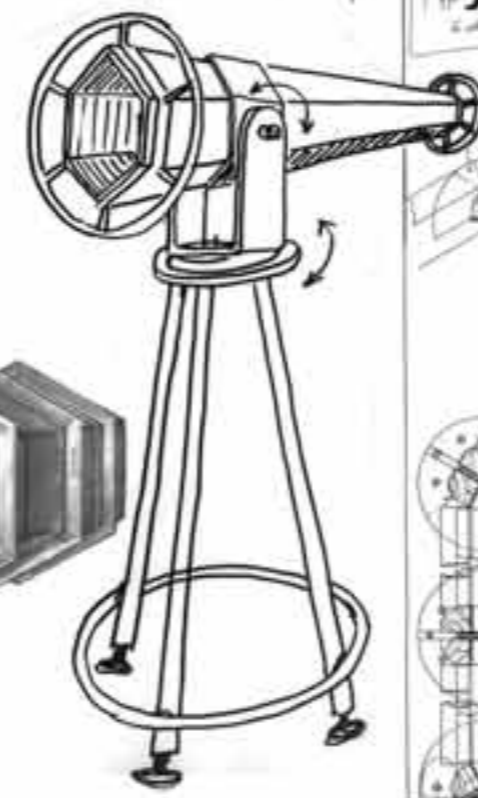
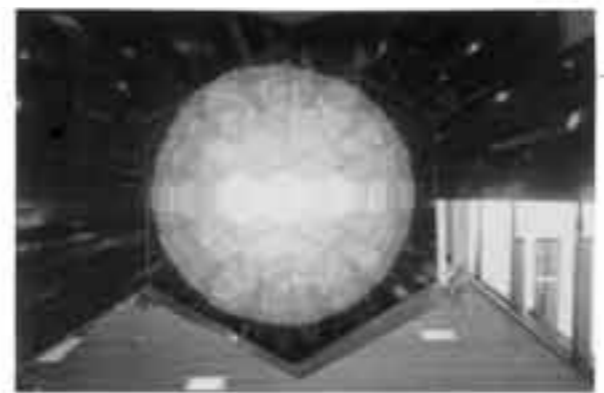
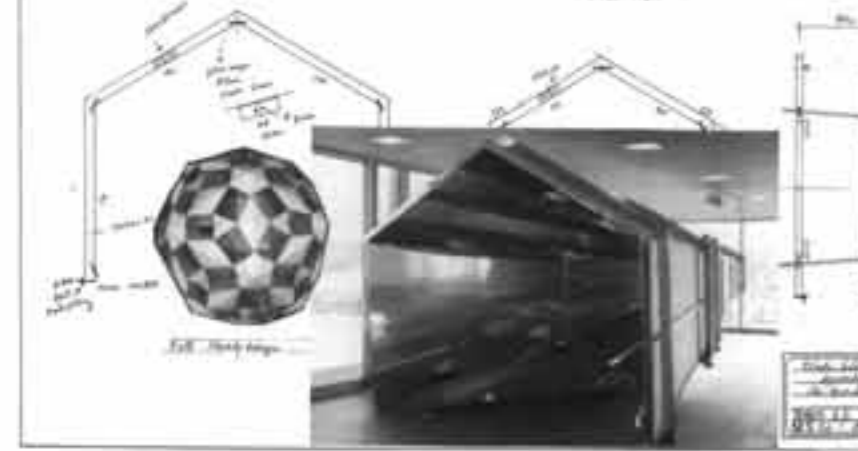
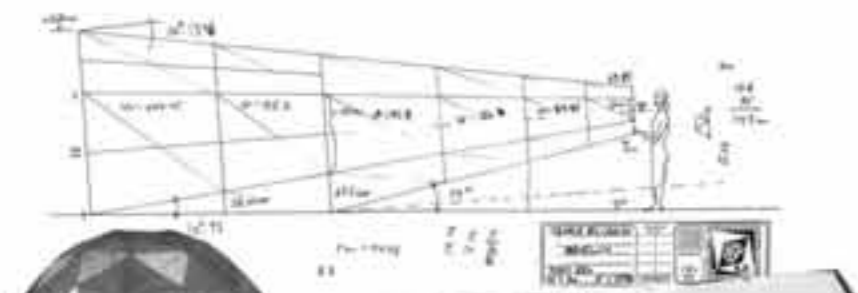
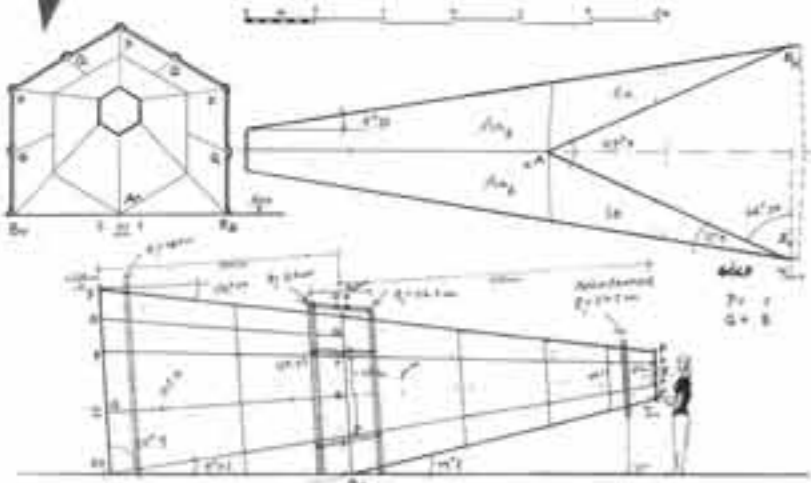




your compound view

“One of Olafur’s major theme is light in all its variations. Although until I met him – light was more important to me as a physical phenomenon and the source of matter throughout the universe – here is an issue where I have learned some interesting things from Olafur: it is the potential for playfulness as visible light reflections combine with different surfaces.

From an architect’s point of view – and this is how I sometimes think – light is of great importance. Of course architecture is more than watertight concrete and insulation, its impression is important to one’s wellness through the eyes and therefore to the mood of the users of a house.



kaleidoscopes

In relation to sustainability, light has gained a new economic aspect in architecture. And now it is not enough to just let 20% of the floors become window areas on the walls. Concentrated light – directly from above – has to be allowed to fall into the building or be reflected in some way from above in order to save electrical energy.

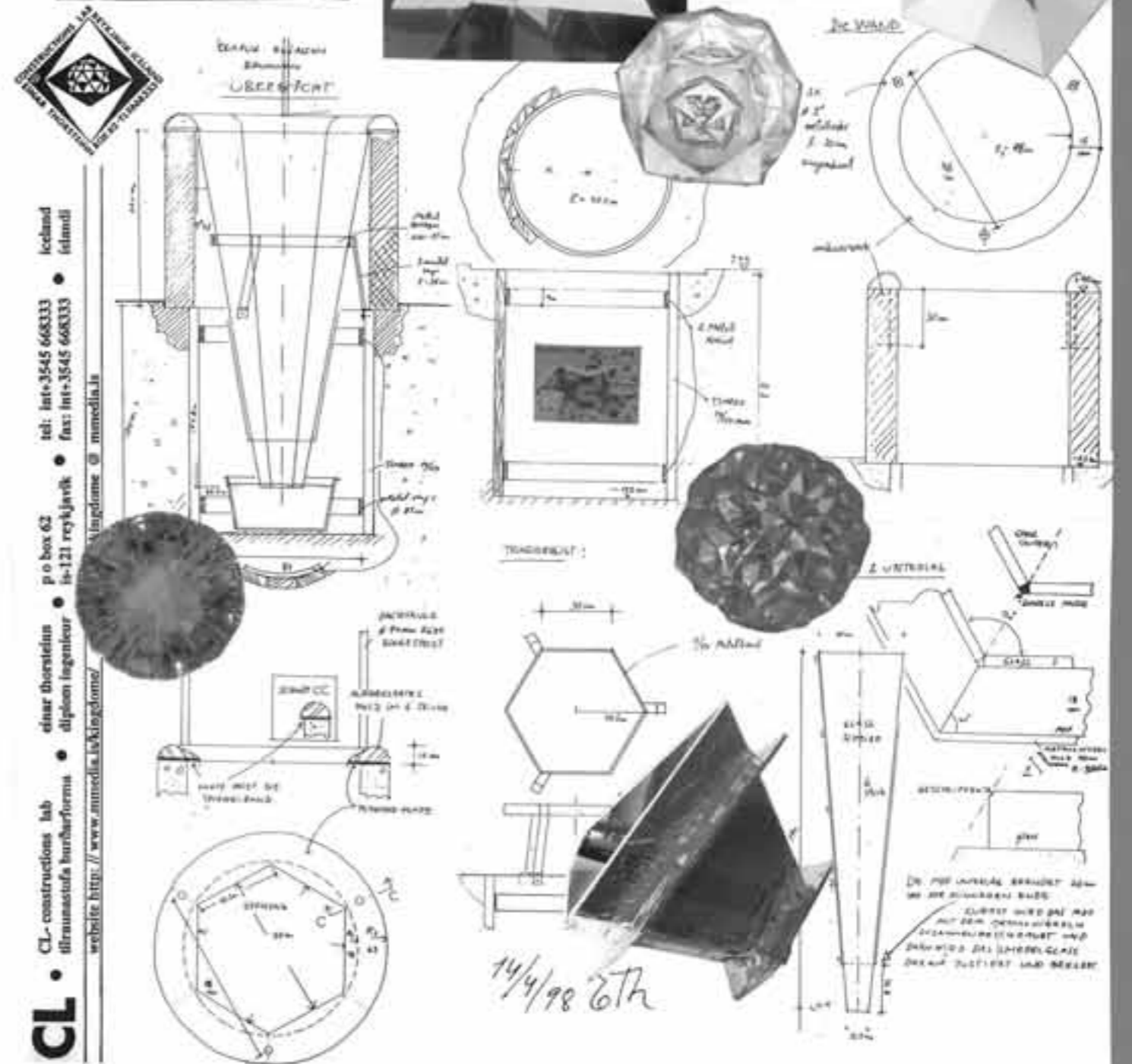
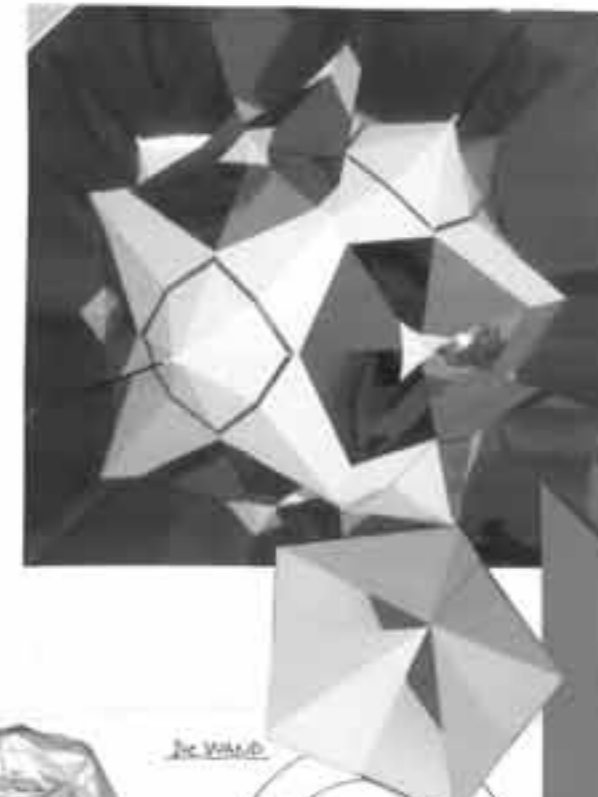
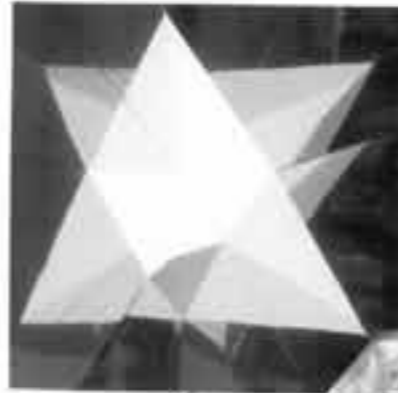
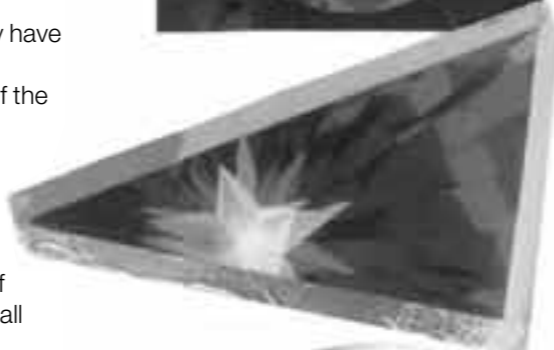
People may not realize this, but the high ceilings constructed in old European apartments were originally a health issue. It was then understood that more light – similar to washing, which started to be “in” at just about the same time – would work towards the benefit of people’s health. I think they may have been more right than is now accepted.

Kaleidoscopes have become one of the principle elements in Olafur’s art. I have assisted him in the execution of some of them and on the next pages some of those will be shown.

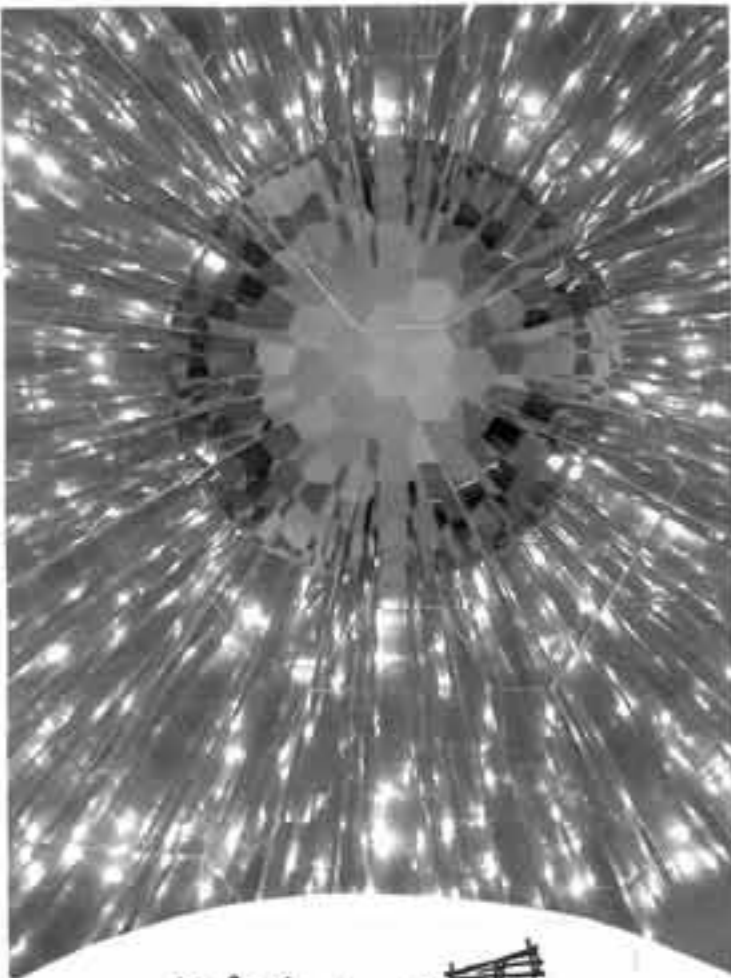
Your Compound View was the first one in 1997. It is now owned by the City of Reykjavik. Many others followed both small and large. Your Compound Space, Your Repetitive View, Well for Villa Medici and The Movable Kaleidoscope.

Following this – and with some inspiration from a toy scope sold at some museum shops that shows a simple geometrical form – I realized that more was possible than that.

This was the beginning of the Geoscopes series.



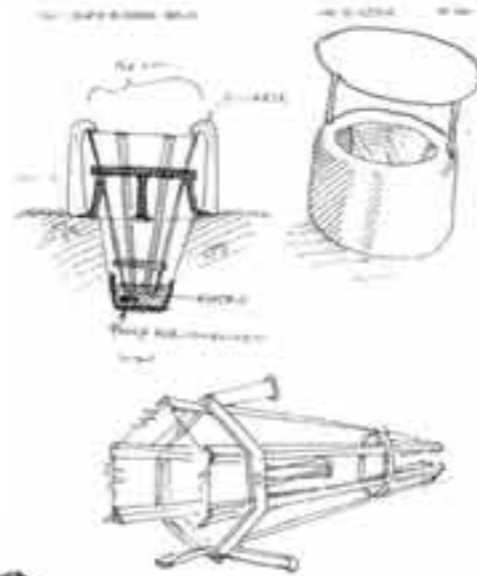
CL • CL-constructors lab • einar thorsteinns • p o box 62 • Iceland
 til: int+3545 668333 • islandi
 tilraunastofa burbarformis • 1s-121 reykjavik • fax: int+3545 668333 •
 website: http://www.cl-constructors.com/ • ingidame @ mmedia.is



Starting from three similar Polyhedrons that have certain relationship – even if they fall into very different categories in the classic geometric views – the Cube, the Rhombic Dodecahedron and the Rhombic Tricuboctahedron I could soon reduce my Geoscopes “body forms” to two. One with two and fourfold symmetries, and the other with fivefold symmetries.

I should mention what is similar with these three polyhedrons. They have many proportions of 1:2:5. For example: their number of edges are 12/24 and 60.

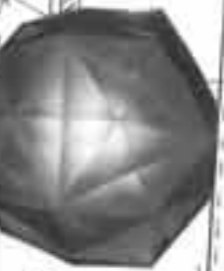
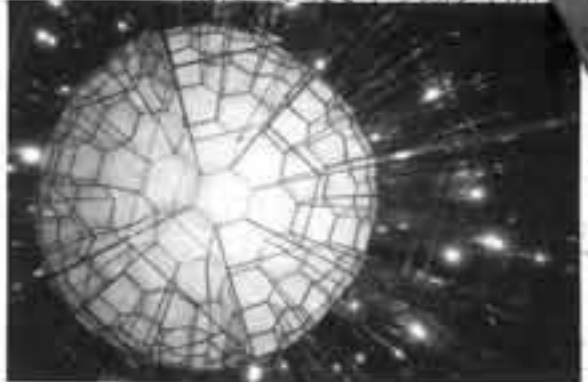
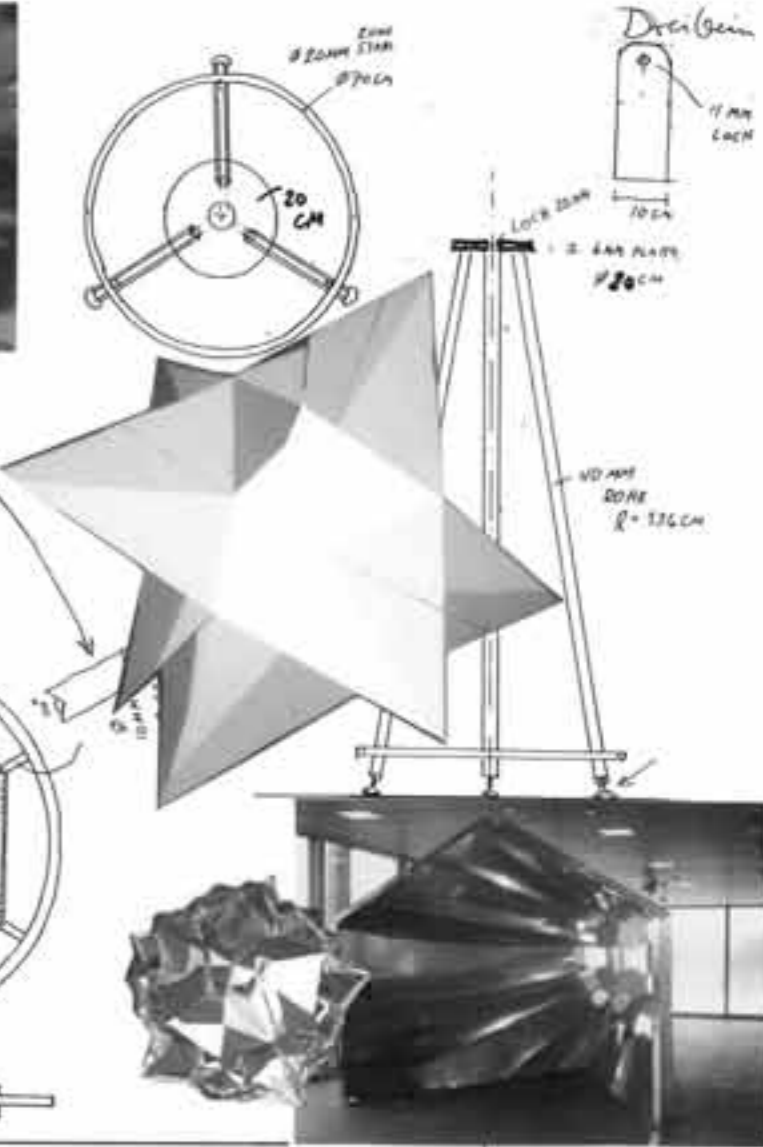
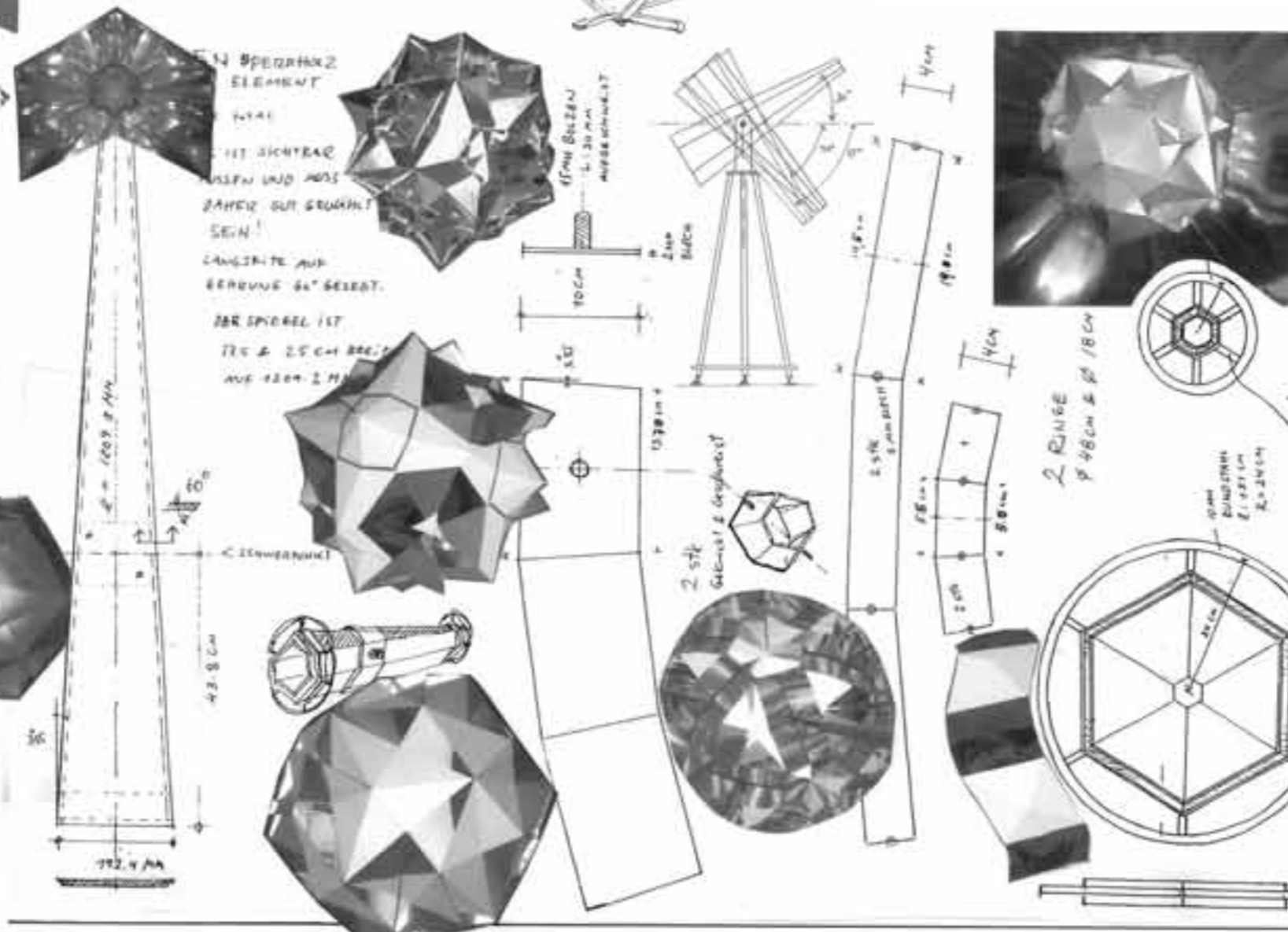
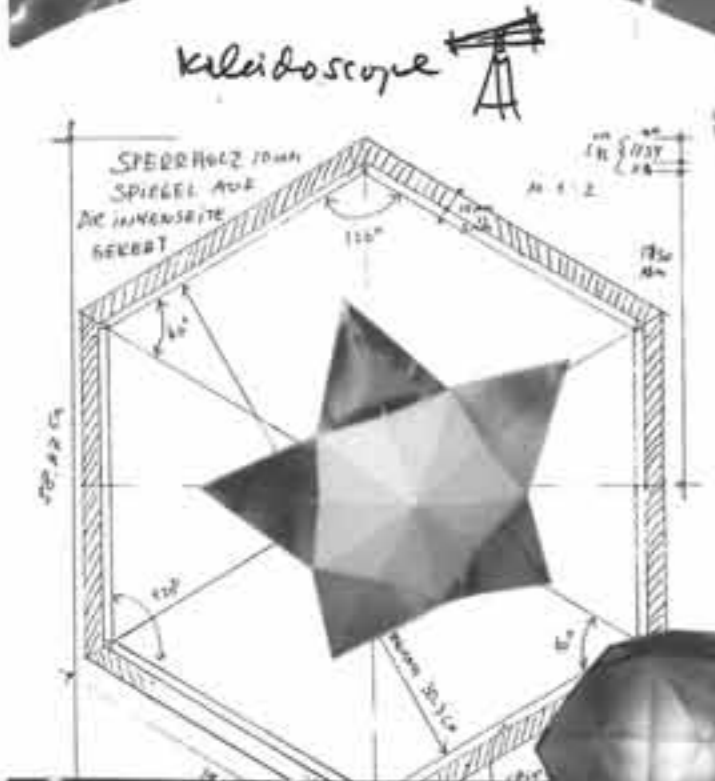
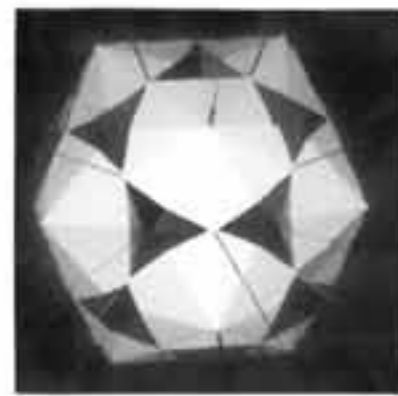
Their number of faces are 6/12 and 30. And their volume sizes are whole number relationships: 1/2 and 2,5.



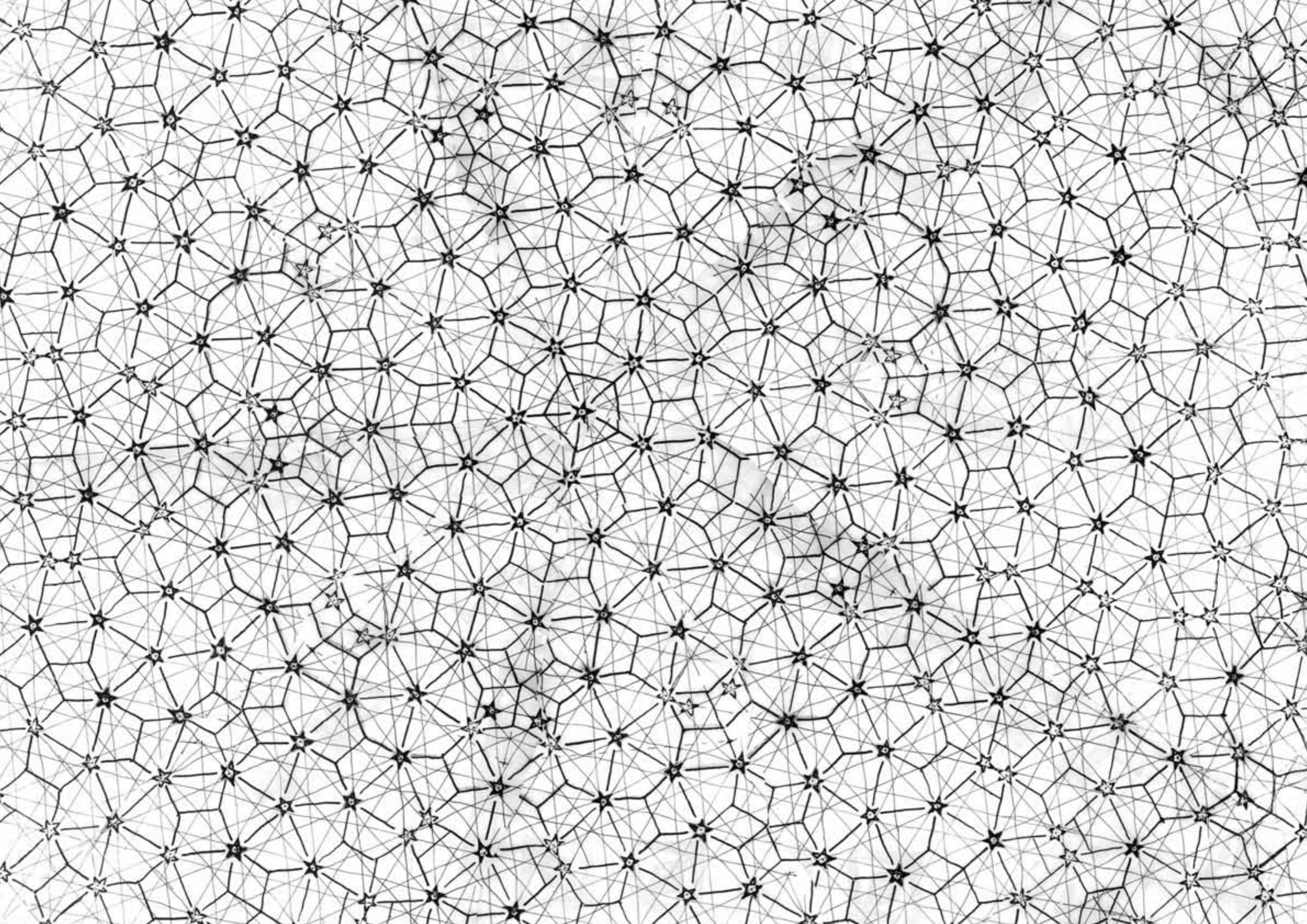
So the Geoscopes are made out of parts of these three polyhedrons but their ends are cut in many different ways – sometimes adding on some small reflective pieces – to form a number of known or unknown geometrical figures, compounds of others etc.

Even if the outer form is down to only 1/120 of the geometrical figure, mirrored images around the cutout will allow one to see the complete form when looking into the Geoscopes.

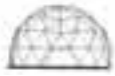
Olafur has shown some of those already in Paris, Copenhagen and Reykjavik. This – once more – geometrical input has great possibilities to add to the playfulness of light on mirrored surfaces.”



50
4.2V.98
SK 7-4433
504
100000
F. 102



spiral tunnel

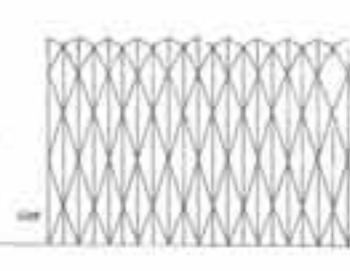
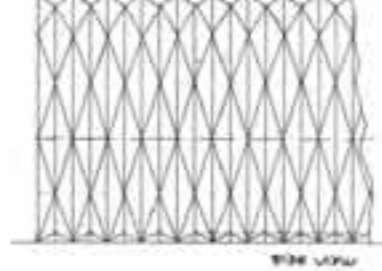
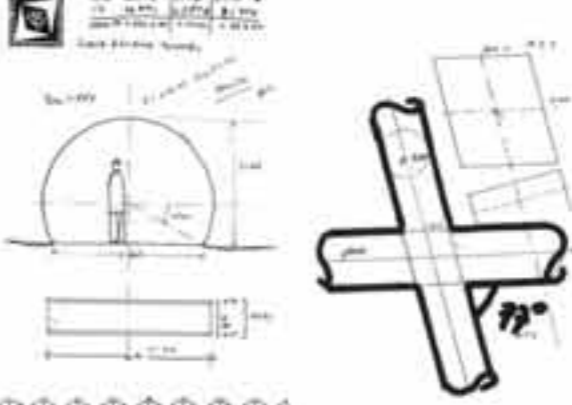
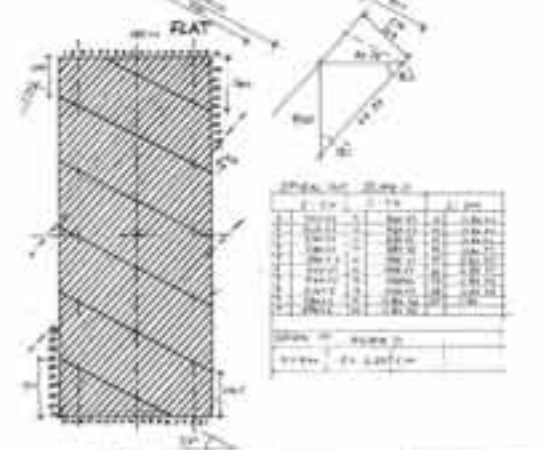
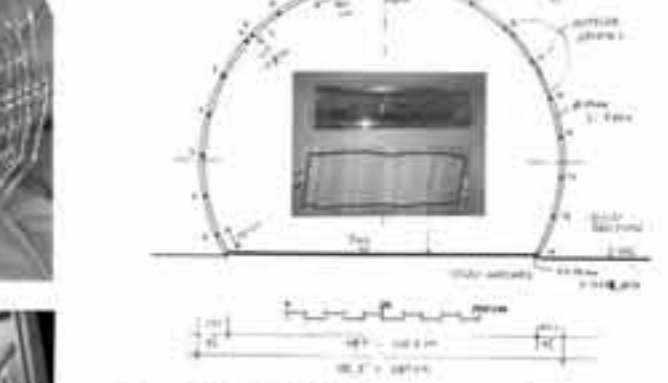
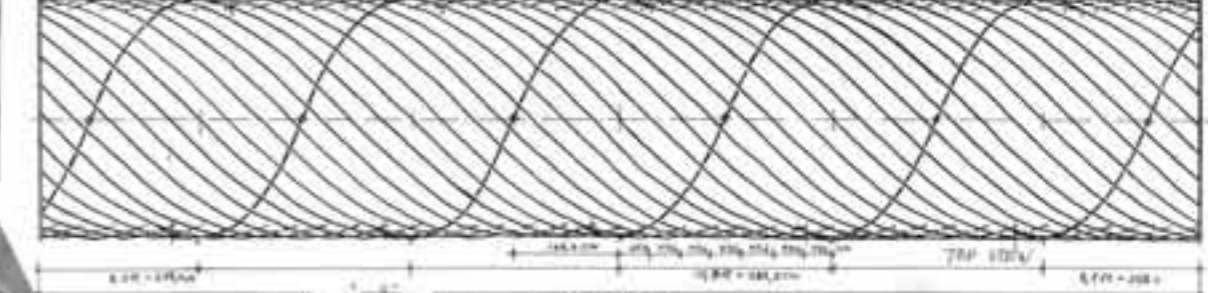
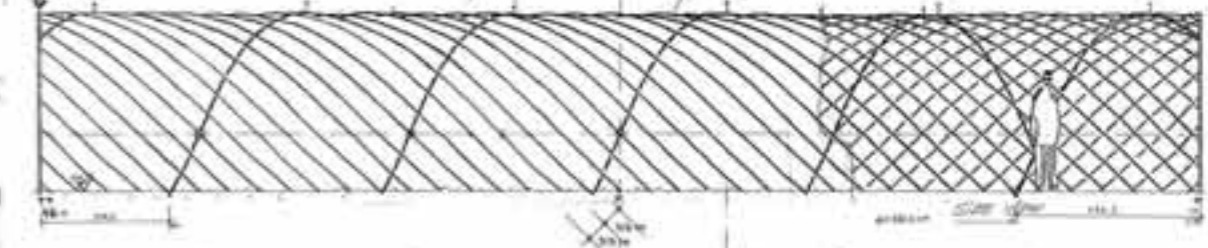
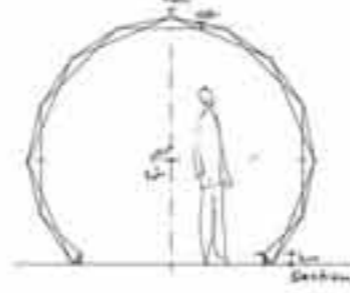
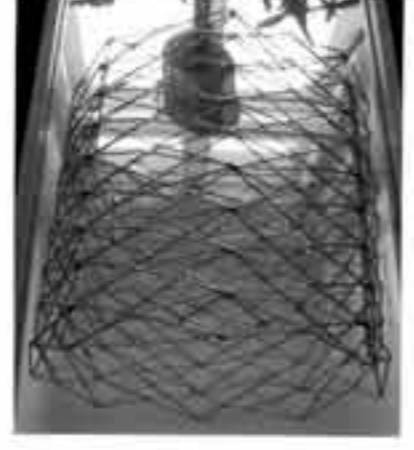
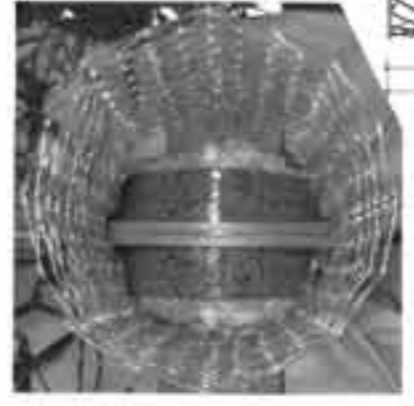
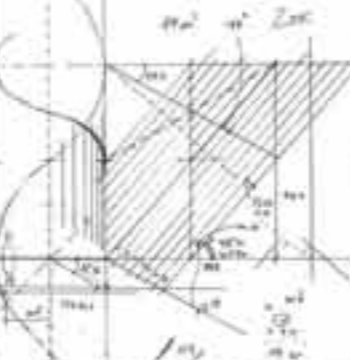
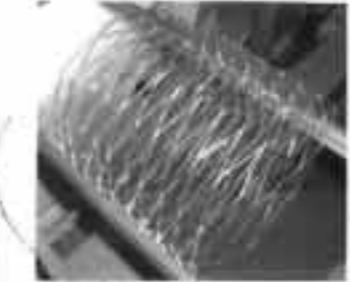
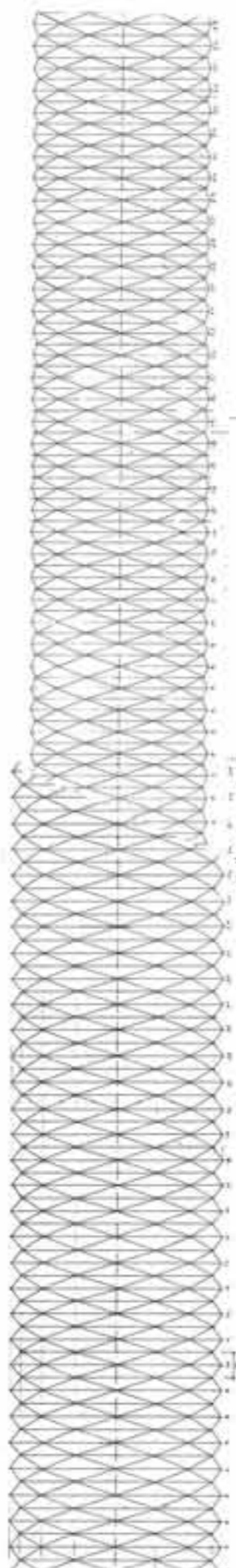
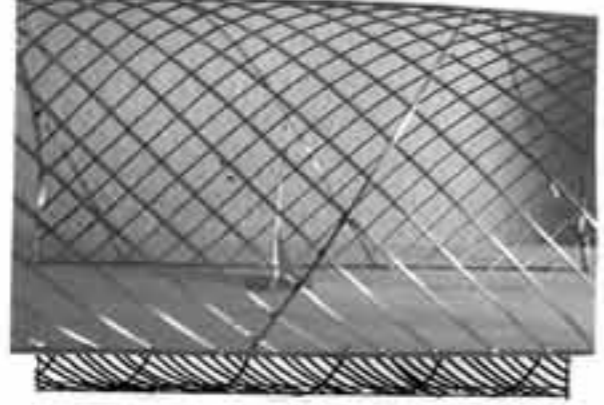
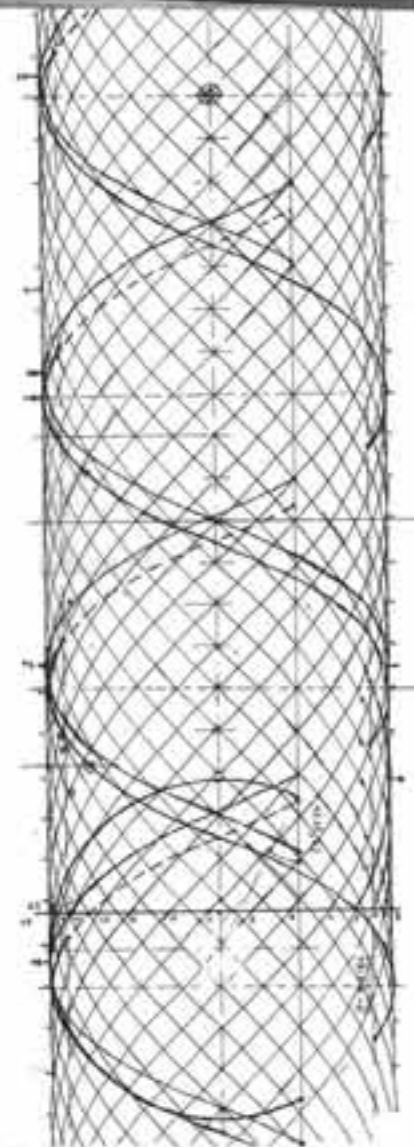


"Added to The Golden Ratio Pavilion and The Spiral Pavilion, other large spiral structures Olafur has been involved with are: The Spiral Tunnel standing in a private collection in Long Island and The Light-house at the end of the new bridge connecting Copenhagen and Malmö in Sweden.

As we have already seen here and will see more of in the coming pages, we have done much experimentation with the ancient life-giving form of the spiral. The nicest interpretation that I have heard of this symbol is of a snake spiraling around a tree, that illustrates the natural way of the human being, having his origin on earth and moving on in never ending spirals to the stars.

The spiral tunnel had a long story of coming into being. We started working on it in 2000. And for a considerable time the theme of the piece was similar to the folded forms as have now been realized in Your Spiral View and The Things That You Don't See That You Don't See.

But it was only planned to be a grid structure from the beginning. We first did some studies on non-spiraling forms and then on a curvy, zig-zag kind of tunnel standing in pool water but it did not work out in this case.





the lighthouse

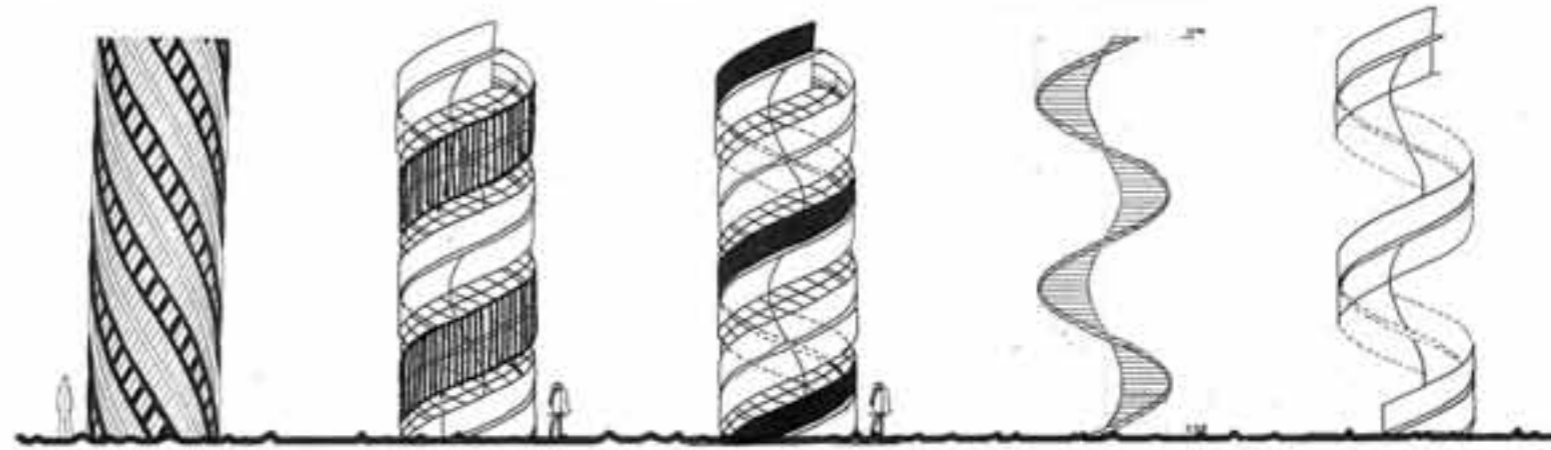
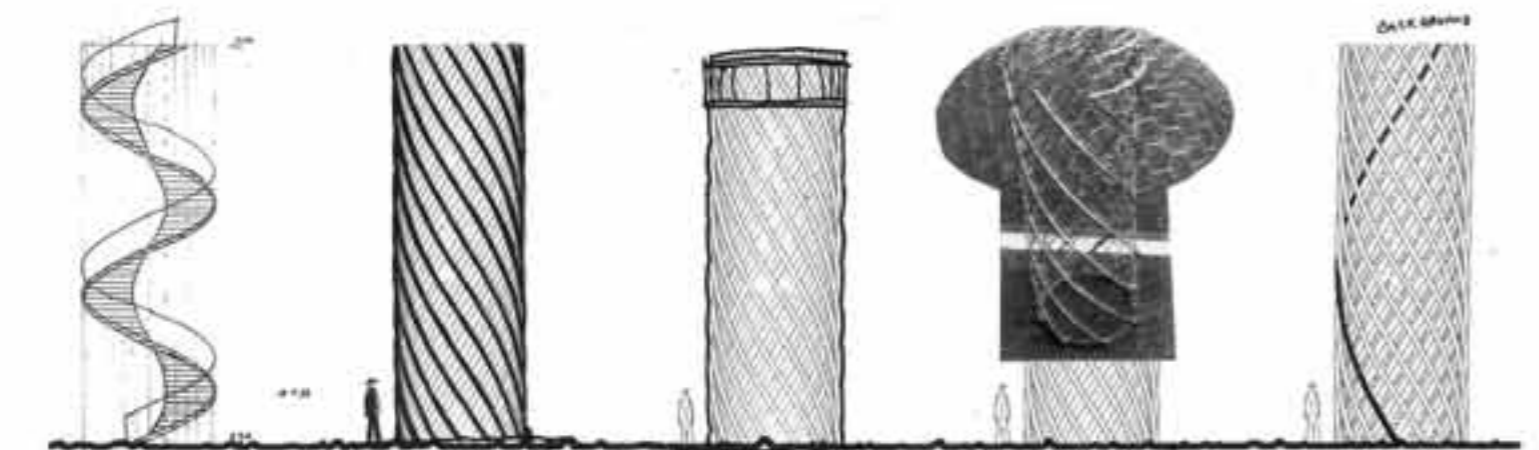
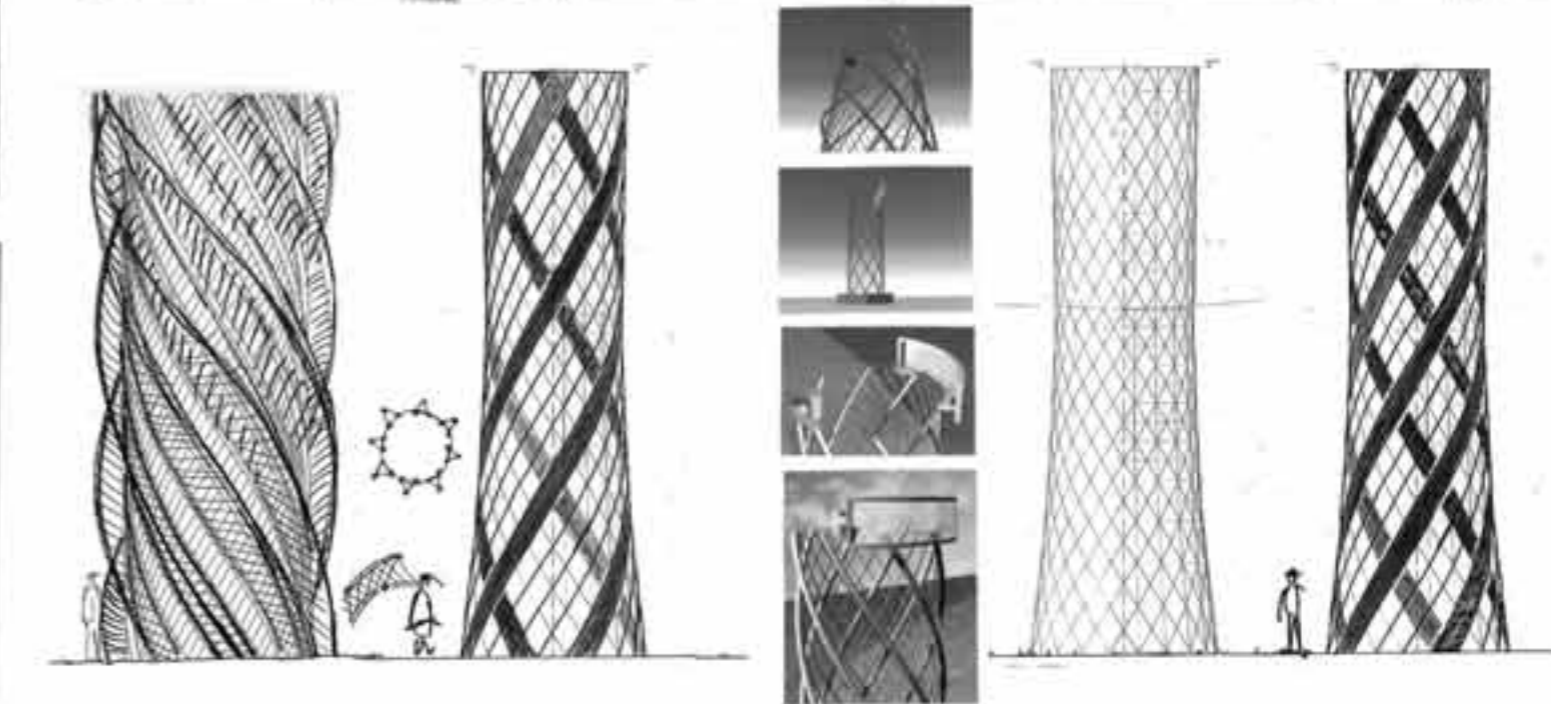
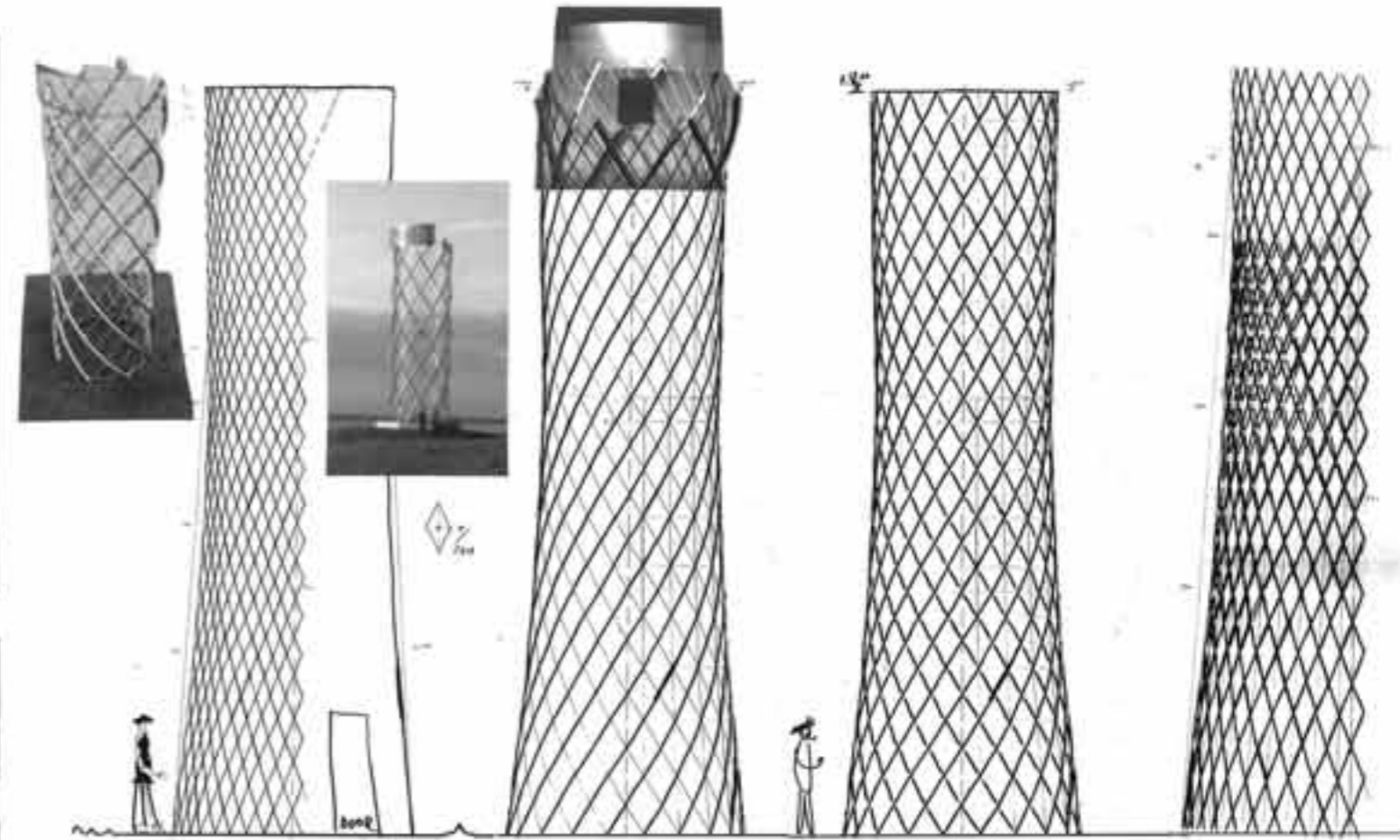


So finally we came to a spiraling open form structure that has its own environment inside it. The piece was finished in 2001.

The Lighthouse standing in Sweden is a twelve meters high and four meters in diameter tube grid formed of eight major tube spirals and 24 smaller ones. Each tube curves less than one circle around the tube form. The proportions of the hypotenuses in the rhombuses formed are in the golden ratio.

In the spring of 2000, I made some studies for this structure. But there is more to this piece. – On top of the structure is a light beam moving through a band of colored glass panels and thus giving the passers by – who are all traveling in cars at 60 miles an hour – a miniature light show in the night.

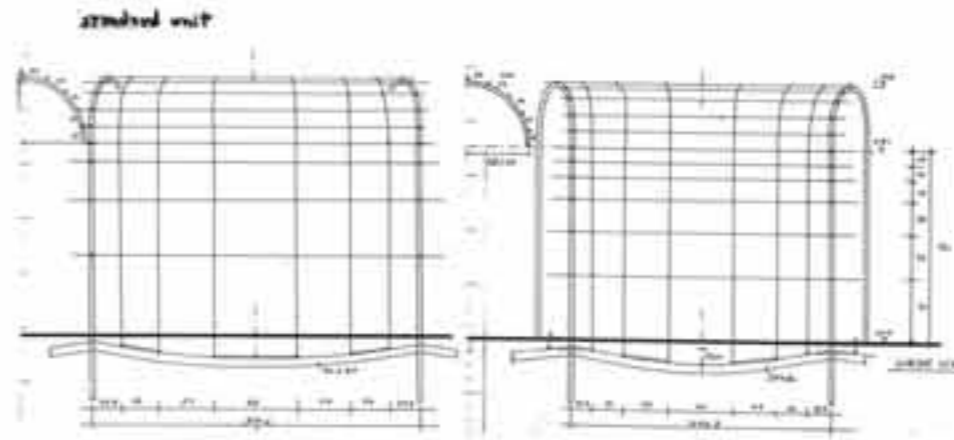
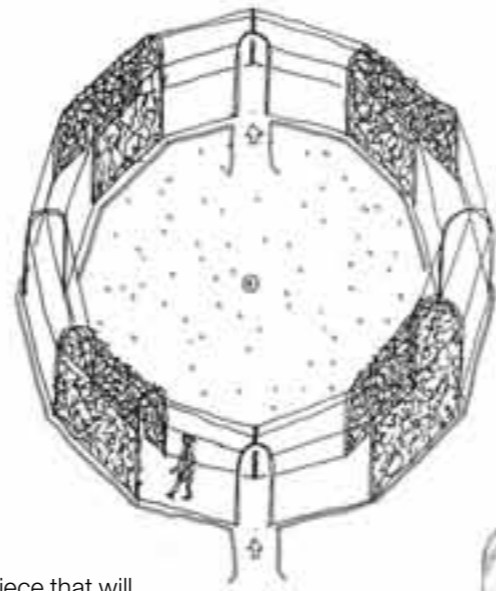
The art piece is a combination of light art and structural art. It was finished in record time in 2000, as the Øresund-Bridge was opened at just about the same time.”



618 033 988 749 894 848 204 586 834 365 638 117 720 309 179 805 762 862 135 448 622 705 260 462 818 902 449 707 207 204 189 391 137 484
754 088 075 386 891 752 126 633 862 223 536 931 793 180 060 766 726 354 433 389 086 595 939 582 905 638 322 661 319 928 290 267 880 675
208 766 892 501 711 696 207 032 221 043 216 269 548 626 296 313 614 438 149 758 701 220 340 805 887 954 454 749 246 185 695 364 864 449
241 044 320 771 344 947 049 565 846 788 509 874 339 442 212 544 877 066 478 091 588 460 749 988 712 400 765 217 057 517 978 834 166 256
249 407 589 069 704 000 281 210 427 621 771 117 778 053 153 171 410 117 046 665 991 466 979 873 176 135 600 670 874 807 101 317 952 368
942 752 194 843 530 567 830 022 878 569 978 297 783 478 458 782 289 110 976 250 030 269 615 617 002 504 643 382 437 764 861 028 383 126
833 037 242 926 752 631 165 339 247 316 711 121 158 818 638 513 316 203 840 052 221 657 912 866 752 946 549 068 113 171 599 343 235 973
494 985 090 409 476 213 222 981 017 261 070 596 116 456 299 098 162 905 552 085 247 903 524 060 201 727 997 471 753 427 775 927 786 256
194 320 827 505 131 218 156 285 512 224 809 394 712 341 451 702 237 358 057 727 861 600 868 838 295 230 459 264 787 801 788 992 199 027
077 690 389 532 196 819 861 514 378 031 499 741 106 926 088 674 296 226 757 560 523 172 777 520 353 613 536 210 767 389 376 455 606 060
592 165 894 667 595 519 004 005 559 089 502 295 309 423 124 823 552 122 124 154 440 064 703 405 657 347 976 639 723 949 499 465 845 788
730 396 230 903 750 339 938 562 102 423 690 251 386 804 145 779 956 981 224 457 471 780 341 731 264 532 204 163 972 321 340 444 494 873
023 154 176 788 937 521 030 887 378 803 441 700 939 544 096 279 558 986 787 232 095 124 268 935 573 097 045 095 958 844 017 888 198 819
218 020 640 529 055 189 349 475 926 007 348 522 821 010 881 946 445 442 223 188 913 192 946 896 220 023 014 437 702 699 230 078 030 852
611 807 545 192 887 705 021 096 842 493 627 135 925 187 607 778 846 658 361 502 389 134 933 331 223 105 339 232 136 243 192 637 289 106
705 033 992 822 652 635 562 090 297 986 424 727 597 725 655 086 154 875 435 748 264 718 141 451 270 006 023 890 162 077 732 244 994 353
088 999 095 016 803 281 121 943 204 819 643 876 758 633 147 985 719 113 978 153 978 074 761 507 722 117 508 269 458 639 320 456 520 989
698 555 678 141 069 683 728 840 587 461 033 781 054 443 909 436 835 835 813 811 311 689 938 555 769 754 841 491 445 341 509 129 540 700
501 947 754 861 630 754 226 417 293 946 803 673 198 058 618 339 183 285 991 303 960 720 144 559 504 497 792 120 761 247 856 459 161 608
370 594 987 860 069 701 894 098 864 007 644 361 709 334 172 709 191 433 650 137 157 660 114 803 814 306 262 380 514 321 173 481 510 055
901 345 610 118 007 905 063 814 215 270 930 858 809 287 570 345 050 780 814 545 881 990 633 612 982 798 141 174 533 527 312 080 928 972
792 221 329 806 429 468 782 427 487 401 745 055 406 778 757 083 237 310 975 915 117 762 978 443 284 747 908 176 518 097 787 268 416 117
632 503 861 211 291 436 834 376 702 350 371 116 330 725 869 883 258 710 336 322 238 109 809 012 110 198 991 768 414 917 512 331 340 152
733 843 837 234 500 934 786 049 792 945 991 582 201 258 104 598 230 925 528 721 241 370 436 149 102 054 718 554 961 180 876 426 576 511
060 545 881 475 604 431 784 798 584 539 731 286 301 625 448 761 148 520 217 064 404 111 660 766 950 597 757 832 570 395 110 878 230 827
106 478 939 021 115 691 039 276 838 453 863 333 215 658 296 597 731 034 360 323 225 457 436 372 041 244 064 088 826 737 584 339 536 795
931 232 213 437 320 995 749 889 469 956 564 730 007 295 999 839 128 810 319 742 631 251 797 141 432 012 311 279 551 894 778 172 691 415
891 177 991 956 481 255 800 184 550 656 329 528 598 591 000 908 621 802 977 563 789 259 991 649 946 428 193 022 293 552 346 674 759 326
951 654 214 021 091 363 018 194 722 707 890 122 087 287 361 707 348 649 998 156 255 472 811 373 479 871 656 952 748 900 814 438 405 327
483 781 378 246 691 744 422 963 491 470 815 700 735 254 570 708 977 267 546 934 382 261 954 686 153 312 095 335 792 380 146 092 735 102
101 191 902 183 606 750 973 089 575 289 577 468 142 295 433 943 854 931 553 396 303 807 291 691 758 461 014 609 950 550 648 036 793 041
472 365 720 398 600 735 507 609 023 173 125 016 132 048 435 836 481 770 484 818 109 916 024 425 232 716 721 901 893 345 963 786 087 875
287 017 393 593 030 133 590 112 371 023 917 126 590 470 263 494 028 307 668 767 436 386 513 271 062 803 231 740 693 173 344 823 435 645
318 505 813 531 085 497 333 507 599 667 787 124 490 583 636 754 132 890 862 406 324 563 953 572 125 242 611 702 780 286 560 432 349 828
373 017 255 744 058 372 782 679 960 317 393 640 132 876 277 012 436 798 311 446 436 947 670 531 272 492 410 471 670 013 824 783 128 656
506 493 434 180 390 041 017 805 339 505 877 245 866 557 552 253 915 823 970 841 772 983 372 823 115 256 926 092 995 942 240 000 560 626
678 674 357 923 972 454 084 817 651 973 436 265 268 944 888 552 720 274 778 747 335 983 536 727 761 407 591 712 051 326 934 483 752 991
649 980 936 024 617 844 267 572 776 790 019 191 907 038 052 204 612 324 823 913 261 043 271 916 845 123 060 236 278 935 454 324 617 699
757 536 890 417 636 502 547 851 382 463 146 583 363 833 760 235 778 992 674 161 858 395 903 639 981 838 458 276 449 124 598 093
704 305 555 961 379 734 326 134 830 494 949 686 810 895 356 963 482 817 812 886 203 394 653 812 441 945 714 266 682 371 839
491 832 370 908 574 850 266 568 039 897 440 662 105 360 306 400 260 817 112 665 995 419 936 873 160 945 722 888 109 207 788 227 720 363
668 448 153 256 172 841 176 909 792 666 655 223 846 883 113 718 529 919 216 319 052 015 686 312 228 207 155 998 764 684 235 520 592 853
717 578 076 560 503 677 313 097 519 122 397 388 722 468 258 057 159 744 574 048 429 878 073 522 159 842 667 662 578 077 062 119 430 400
542 550 158 312 503 017 534 094 117 191 019 298 903 844 725 033 298 802 450 143 679 684 416 947 959 545 304 591 031 381 162 187 405 679
978 663 661 746 059 570 003 445 970 113 525 181 346 006 505 535 203 478 881 174 149 941 274 826 415 213 556 776 394 039 071 038 708 818
233 806 803 350 038 046 800 174 808 220 591 096 844 202 644 640 218 770 534 010 031 802 881 664 415 309 139 394 815 640 319 282 278 548
241 451 050 318 882 518 997 007 486 228 794 215 589 574 282 021 665 704 218 809 057 808 805 032 467 699 129 728 721 038 707 369 404 643
566 745 892 025 865 657 397 856 085 956 653 410 703 599 783 204 403 363 464 854 894 976 638 853 510 455 272 982 422 906 998 488 536 968
280 464 597 457 626 514 343 590 509 383 212 437 433 338 705 166 571 490 059 071 056 702 488 798 580 437 181 512 610 044 038 148 804 072
524 406 164 290 224 782 271 527 241 120 850 657 888 387 124 936 351 068 063 651 667 432 223 277 677 557 973 992 703 762 319 147 047 323
955 120 607 055 039 920 884 426 037 087 908 433 442 618 384 135 970 781 648 295 537 143 219 611 895 037 977 146 300 075 559 753 795 703
552 271 449 319 132 172 556 440 128 309 180 504 500 899 218 705 121 186 069 335 731 538 959 350 790 300 736 727 023 314 165 327 401
553 741 442 687 154 055 116 479 611 433 230 248 544 040 940 691 145 613 987 302 603 951 828 168 034 482 525 432 673 857 590 07 3 202
453 727 192 912 486 458 133 344 169 852 993 913 574 786 989 579 864 394 980 230 471 169 671 573 622 839 120 181 273 129 165 899 543 209
192 203 183 723 568 272 793 856 373 312 654 799 859 124 632 750 300 605 925 674 549 794 350 881 192 950 568 549 325 935 531 872 914 180
113 641 218 747 075 262 810 686 983 013 576 052 471 944 559 321 955 359 610 452 830 314 883 911 769 301 196 585 834 314 424 894 898 505
584 250 834 109 429 502 771 975 833 522 442 912 573 649 380 754 171 137 392 437 601 435 068 298 784 932 712 997 512 286 881 960 498 357
751 587 717 804 106 971 319 667 534 771 947 922 636 519 016 339 771 284 739 079 336 111 191 408 998 305 603 361 060 987 171 783 055 435
403 560 895 292 908 184 641 437 139 294 378 135 604 820 389 479 125 745 077 075 575 103 002 420 726 629 001 809 042 293 424 942 590 606
061 413 322 872 269 806 901 459 945 119 954 780 163 991 514 126 125 257 282 806 643 312 616 574 693 881 951 064 421 673 871 800 011 004
218 483 025 809 165 433 837 492 364 118 388 856 468 514 315 006 373 190 429 514 814 694 243 146 089 525 470 720 374 055 669 130 692 209
908 048 194 529 751 106 504 642 810 541 775 525 909 518 713 188 835 914 765 996 041 317 960 209 415 308 7 238 772 538 023 272 763
297 737 214 312 796 821 671 623 442 118 320 180 288 141 274 744 316 884 721 845 939 278 143 547 409 999 907 223 320 305 926 297 661 123
832 798 331 698 825 393 126 200 650 370 288 447 828 666 940 447 307 947 104 761 255 865 837 529 862 362 509 998 232 335 971 550 723 383
833 244 081 525 778 193 364 262 630 433 026 589 581 708 004 512 788 731 159 355 877 472 172 564 516 366 725 771 539 209 840 950
327 451 121 536 873 009 121 996 295 227 659 131 637 093 968 607 271 342 692 623 154 753 304 155 811 073 696 431 421 719 794 340
563 915 512 108 108 136 262 688 856 974 806 806 011 691 894 175 027 229 874 158 699 179 145 349 946 244 419 401 219 785 860 137 366 082
869 072 236 514 771 391 268 742 096 651 378 756 205 918 543 288 883 417 429 209 015 631 332 831 935 756 220 897 137 656 309 785 015 631
549 824 564 458 654 247 929 357 228 287 506 084 814 533 513 521 817 295 879 329 32 476 222 052 194 645 105 362 450 512 988 430
871 344 439 507 244 267 351 462 861 799 183 233 645 983 696 376 327 225 756 915 972 395 438 305 208 664 747 423 815 110 792 734 948 369
523 964 792 689 936 983 249 179 995 027 895 000 604 596 613 134 633 630 249 499 514 808 053 290 179 029 751 825 158 750 490 074 351 879
835 118 360 327 227 726 017 174 045 355 716 588 555 782 972 910 619 581 935 171 055 482 579 307 091 005 763 586 990 192 972 179 951 687
311 755 631 444 856 481 002 200 142 545 405 542 927 345 883 711 602 099 479 457 208 237 804 368 718 944 805 636 891 825 802 444 996 318
783 420 274 910 153 357 910 727 336 253 289 069 334 741 238 022 210 116 262 771 193 085 448 502 954 191 320 040 099 988 566 665 177 566
409 536 561 978 978 183 804 510 303 565 101 315 894 589 028 718 010 869 058 939 471 368 014 845 700 183 664 956 472 032 943 343 742 989
464 274 125 514 359 058 434 840 919 548 701 523 614 031 739 139 036 164 401 984 550 510 491 211 697 920 012 019 996 050 699 496 640 303
508 636 929 039 410 070 194 505 320 162 348 727 632 327 324 494 396 304 808 905 542 513 797 233 147 518 520 709 102 506 368 598 167 953
048 181 007 394 245 317 002 388 047 598 343 234 504 142 584 314 063 612 721 096 022 824 233 782 280 902 797 659 607 771 084 939 151 748

618 033 988 749 894 848 204 586 834 365 638 117 720 309 179 805 762 862 135 448 622 705 260 462 818 902 449 707 207 204 189 391 137 484
754 088 075 386 891 752 126 633 862 223 536 931 793 180 060 766 726 354 433 389 086 595 939 582 905 638 322 661 319 928 290 267 880 675
208 766 892 501 711 696 207 032 221 043 216 269 548 626 296 313 614 438 149 758 701 220 340 805 887 954 454 749 246 185 695 364 864 449
241 044 320 771 344 947 049 565 846 788 509 874 339 442 212 544 877 066 478 091 588 460 749 988 712 400 765 217 057 517 978 834 166 256
249 407 589 069 704 000 281 210 427 621 771 117 778 053 153 171 410 117 046 665 991 466 979 873 176 135 600 670 874 807 101 317 952 368
942 752 194 843 530 567 830 022 878 569 978 297 783 478 458 782 289 110 976 250 030 269 615 617 002 504 643 382 437 764 861 028 383 126
833 037 242 926 752 631 165 339 247 316 711 121 158 818 638 513 316 203 840 052 221 657 912 866 752 946 549 068 113 171 599 343 235 973
494 985 090 409 476 213 222 981 017 261 070 596 116 456 299 098 162 905 552 085 247 903 524 060 201 727 997 471 753 427 775 927 786 256
194 320 827 505 131 218 156 285 512 224 809 394 712 341 451 702 237 358 057 727 861 600 868 838 295 230 459 264 787 801 788 992 199 027
077 690 389 532 196 819 861 514 378 031 499 741 106 926 088 674 296 226 757 560 523 172 777 520 353 613 536 210 767 389 376 455 606 060
592 165 894 667 595 519 004 005 559 089 502 295 309 423 124 823 552 122 124 154 440 064 703 405 657 347 976 639 723 949 499 465 845 788
730 396 230 903 750 339 938 562 102 423 690 251 386 804 145 779 956 981 224 457 471 780 341 731 264 532 204 163 972 321 340 444 494 873
023 154 176 788 937 521 030 887 378 803 441 700 939

smell tunnel



“One very interesting art piece that will have a long time before coming into full blossom, literally speaking, is The Smell Tunnel in Gütersloh.

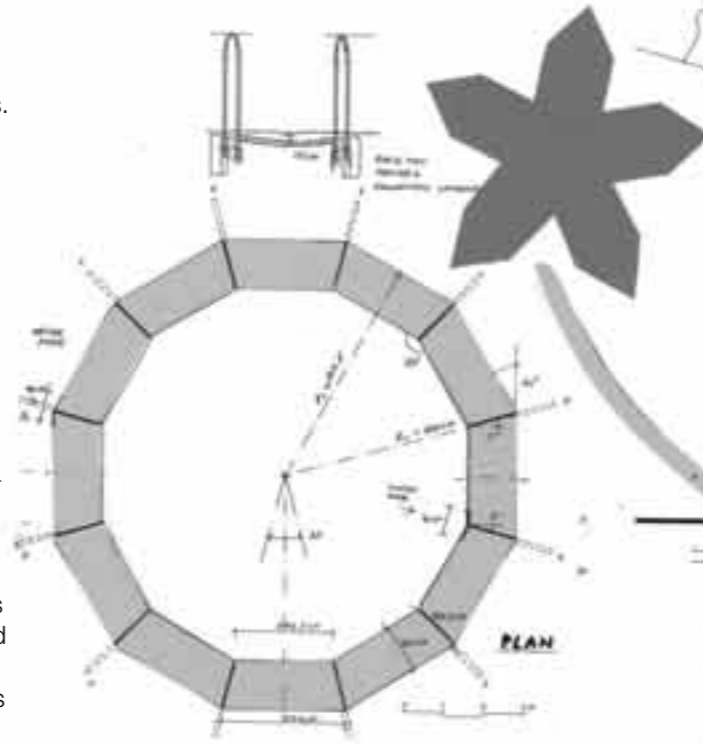
Olafur made a proposal for it in 2000 and I just advised him on the construction. It is a tensile structure, even though there is no membrane involved. It takes the form of a decagonal tunnel with a diameter of 15 Meters. One can enter at one end and reach the center through a second door to the inside.

Here, the idea is to arrange various plants in such a fashion that one can recognize where one is at, just by smelling. As of now, only the structure is finished and the first plants can be seen climbing onto the grid made for them.

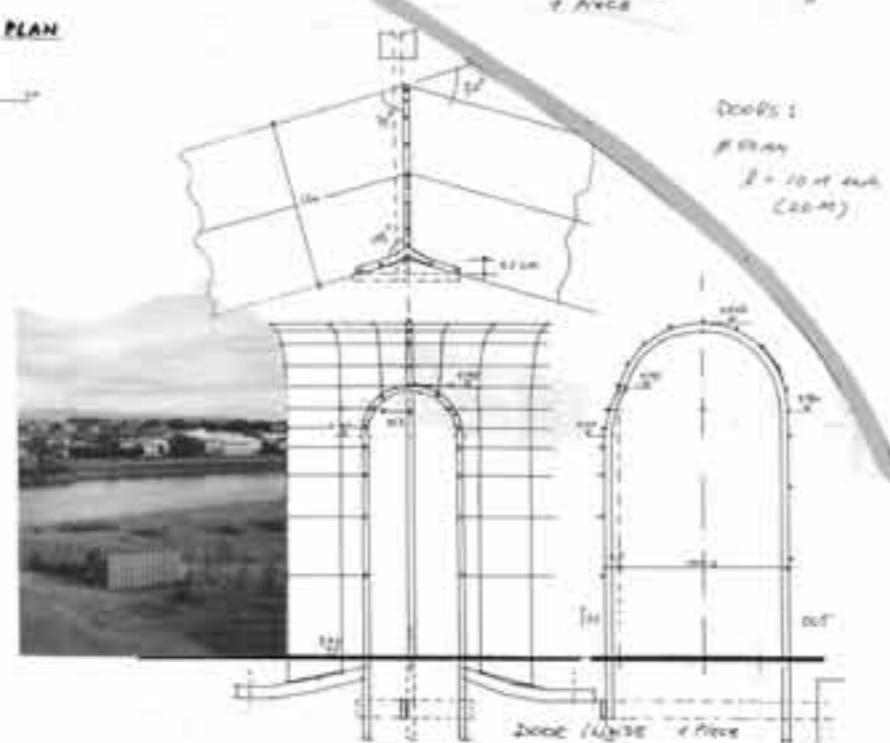
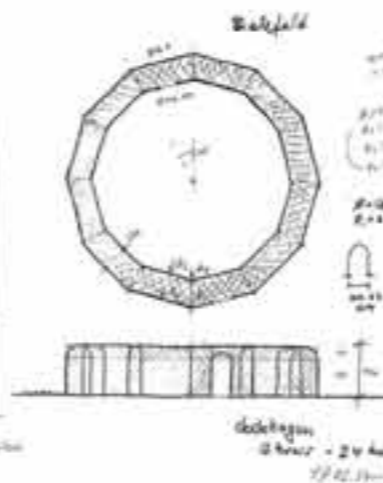
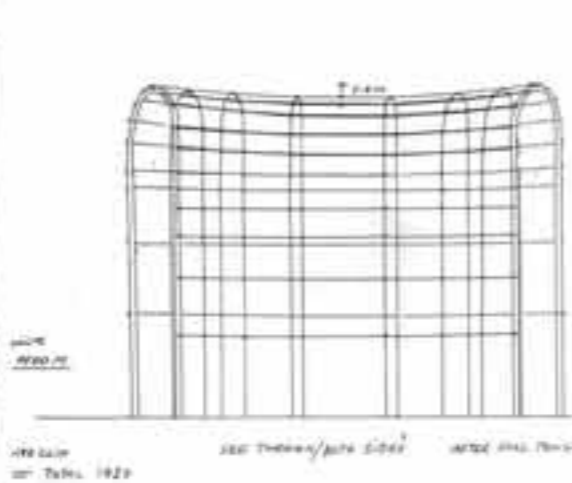
It will take some years, even decades, to have all this life in harmony in this way. But the foundations are ready for that. And every day this art piece is going to look – and smell – differently.

An interesting note on the side: the old hedges in England that are now regrettably growing less and less in number, have various plant societies in them. “Scientists have found out” – and this sentence here exceptionally does not mean that you should disbelieve this – that it takes about 100 years for a new plant species to be accepted into the hedges. So one with 12 types would be 1200 years old.

I hope that The Smell Tunnel is going to match this.”



smell



the tent tunnel project



ROCK FALL PROTECTION



"Before the Spiral Pavilion came into discussion early in 1999, Olafur had proposed the idea of having a long tensile tunnel placed as his art piece in Venice in the spring of 1999. This was not the first time, as we talked about tensile structure projects also for Pittsburg, Pennsylvania in 1999. For the pavilion in Holbæk starting in 1998, it was also an option.

Now this was pretty near to my home territory as tensile structures have been my specialty in structures ever since I worked and learned with Frei Otto at the end of the sixties and early seventies.

It was a memorable and exciting time at Frei's Atelier Warmbronn and IL, the Institute for Lightweight Structures at the University of Stuttgart. We were both learning something new every day from Frei and then it was the company of something like eighty people working for the Olympic project in Munich that made it well worth it. It was a project that in the end turned into the 32 acres large tensile structure for the famous and tragic 1972 Olympic Games.

Now, Frei Otto is the father of tensile structures that we can see spread all over the world. He is also today considered to be one of Germany's top architects of the twentieth century. This is what I read somewhere. For me, he is another top idea producer similar to Bucky. And I am very grateful for having had the opportunity to learn from them both.



WINTER COVER for building sites

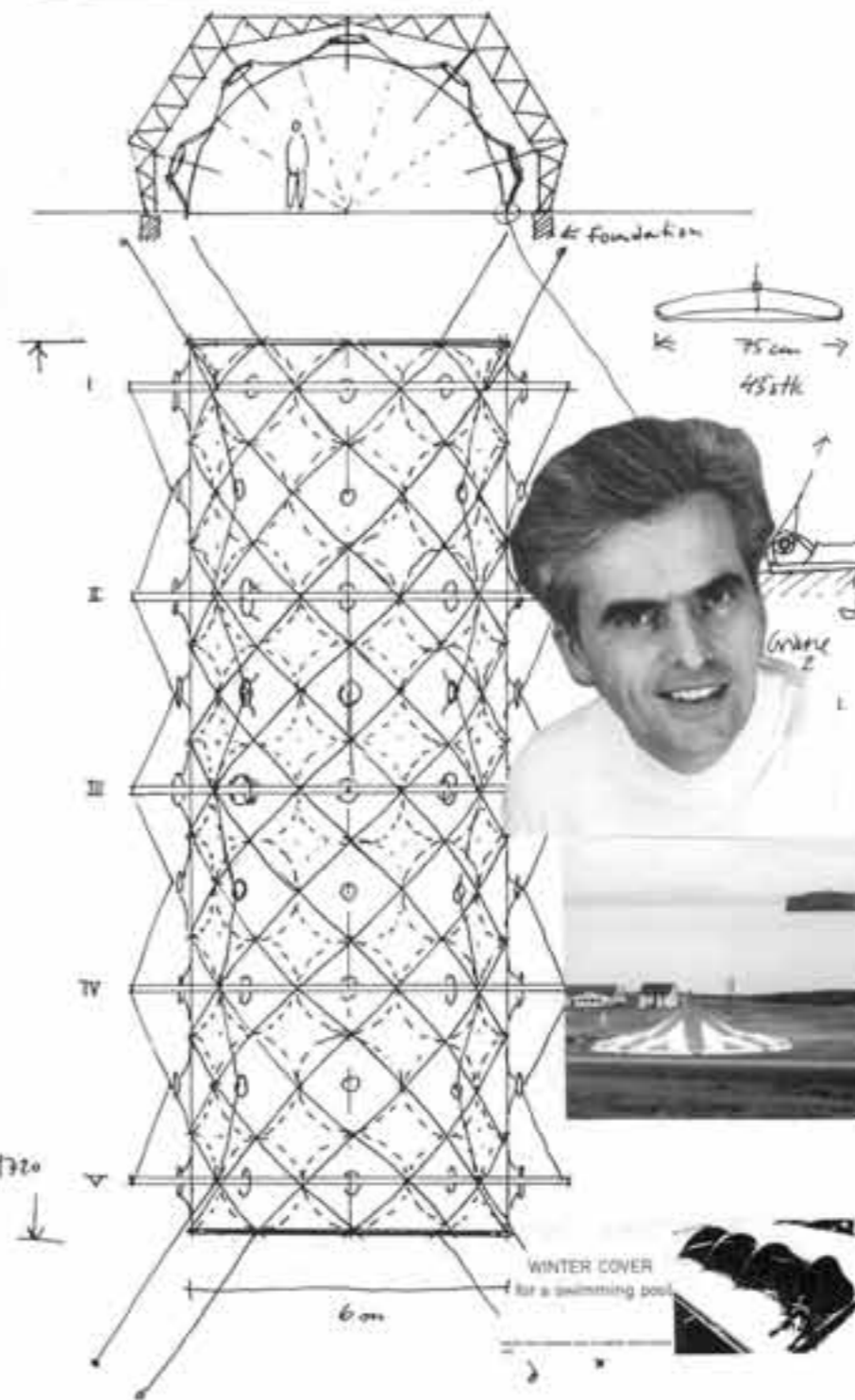


CONVERTIBLE ROOF for hay storage

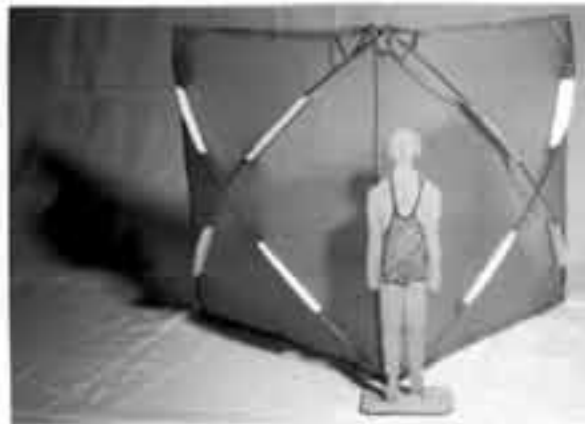
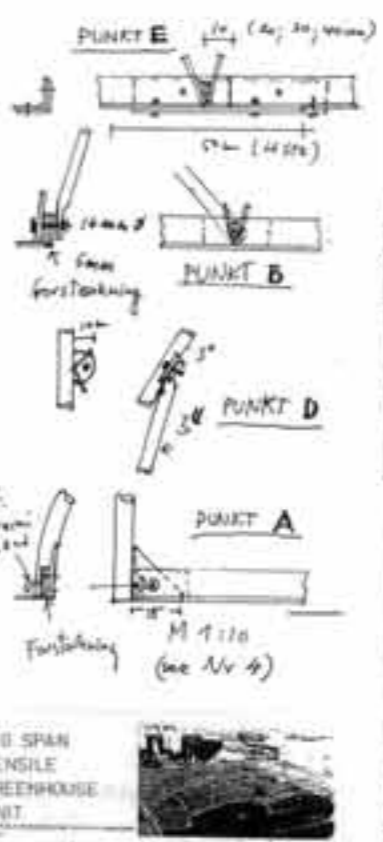


TENT TUNNEL

② EXPENSIVE TO ERECT



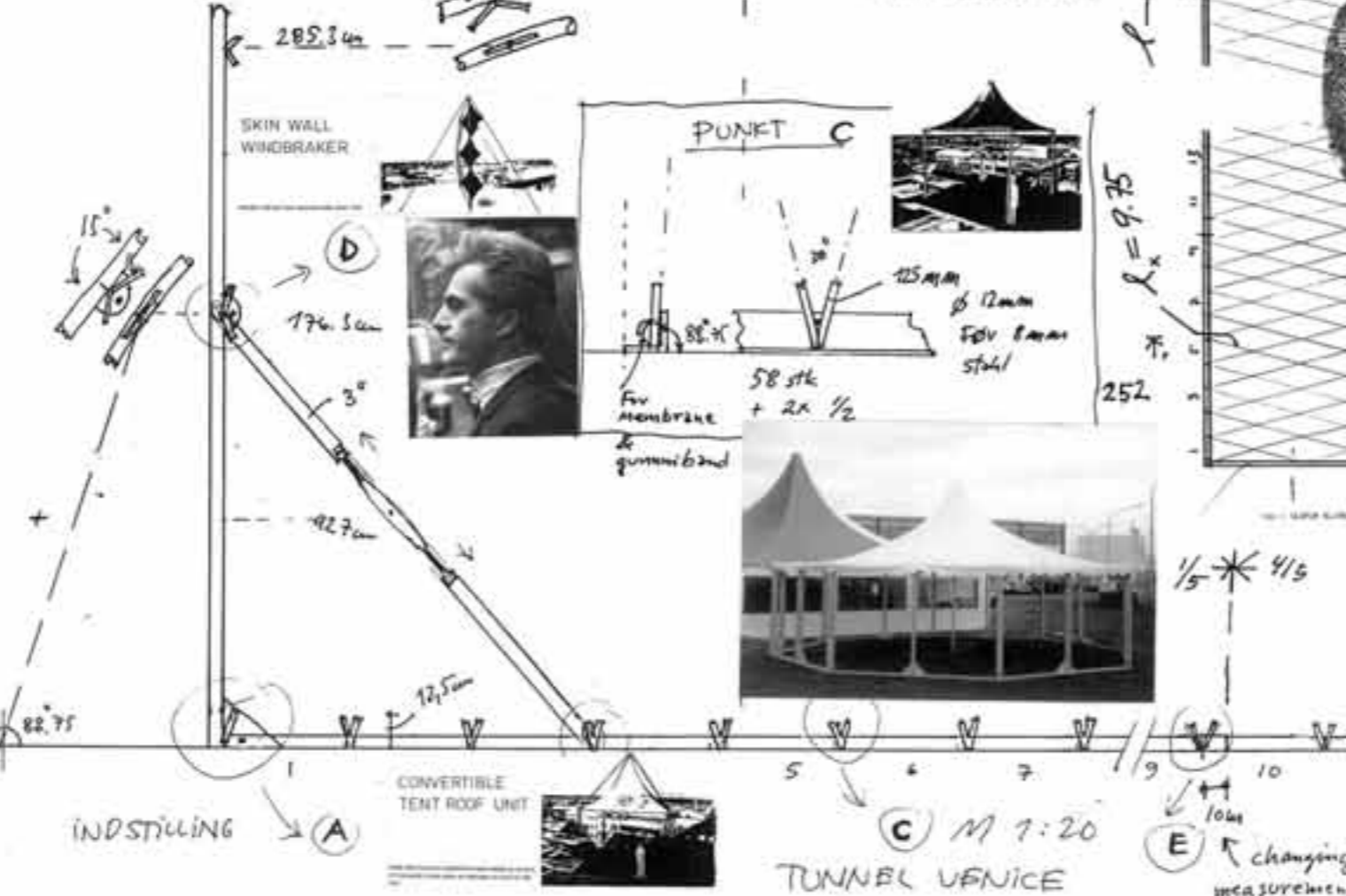
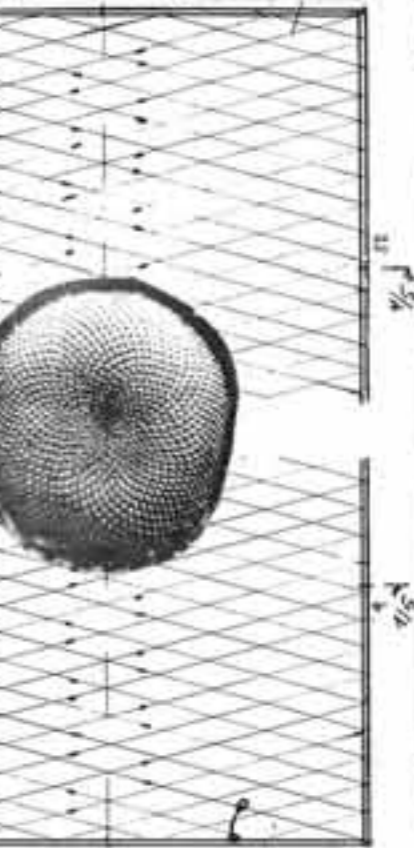
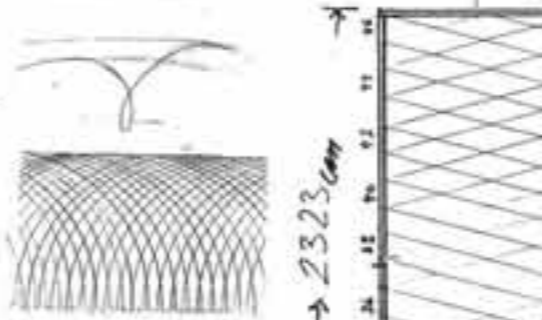
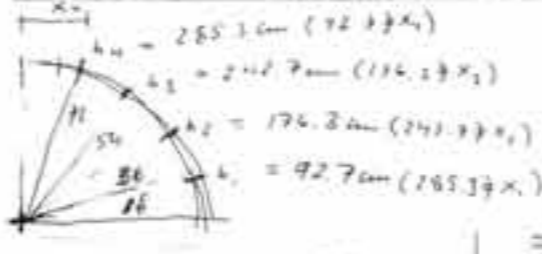
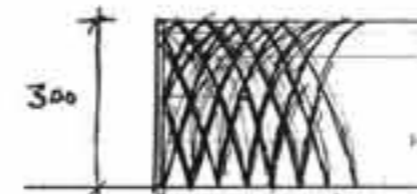
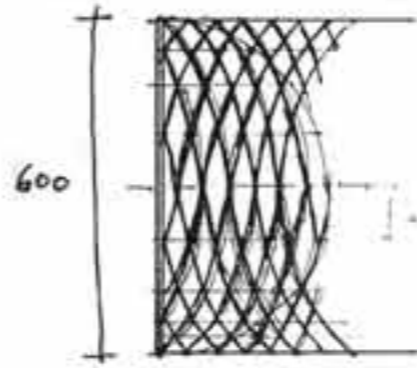
tensile structures

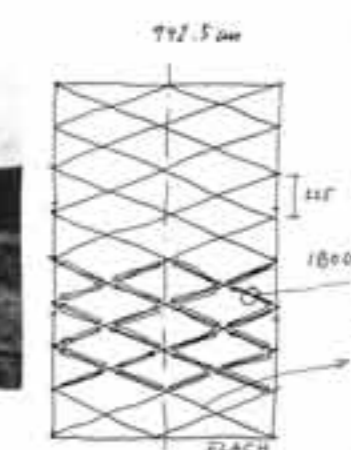
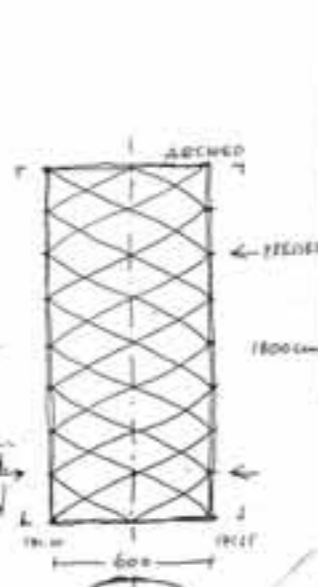
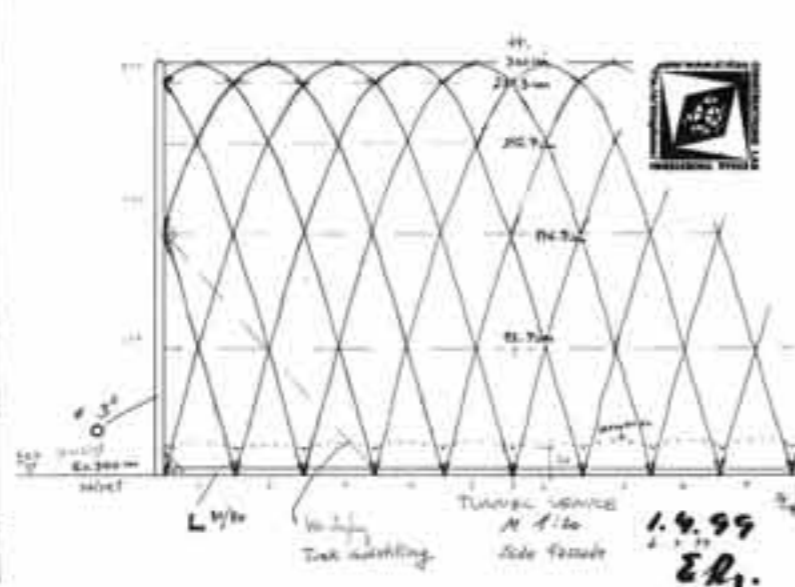


The Tent Tunnel Project for Venice that did not come off is shown here on these pages along with some projects I worked for and with Seglagerin Ægir in Reykjavik, a sail makers firm, from 1974 to 2000.

The customers for these tents, large or small, were of an extremely wide range, from individuals with tourist firms or restaurants, to the city of Reykjavik for which we worked three times. Sometimes we worked with architects and sometimes not. And after a slow start for festival tents, we ended doing whole year tents, which is really something for Icelandic weather conditions.

In the process of building whole-year tents, one of our tents made as a series production was lost in an Icelandic winter storm. At the same time, a whole airplane maintenance hall was destroyed. Now, guess which of the two made it into the TV news that evening? As a matter of fact, that was one out of two times that this news office mentioned our tent production.



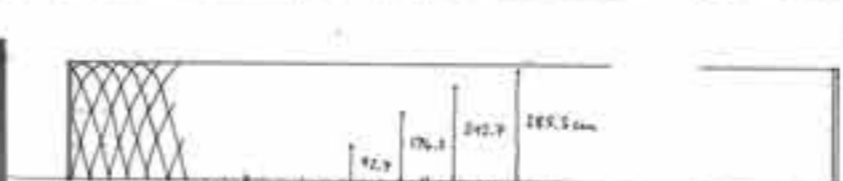
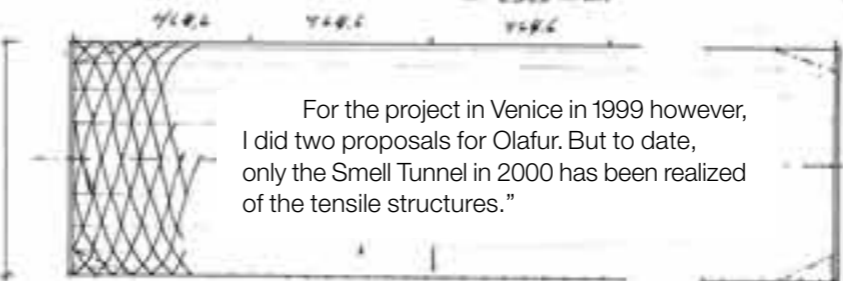


This was indeed a very special wind as one of its gusts was kicked off a neighboring hill and straight down on top of the tent. It tore down the membrane. So then, we put some steel wires, top to bottom, parallel to the membrane.

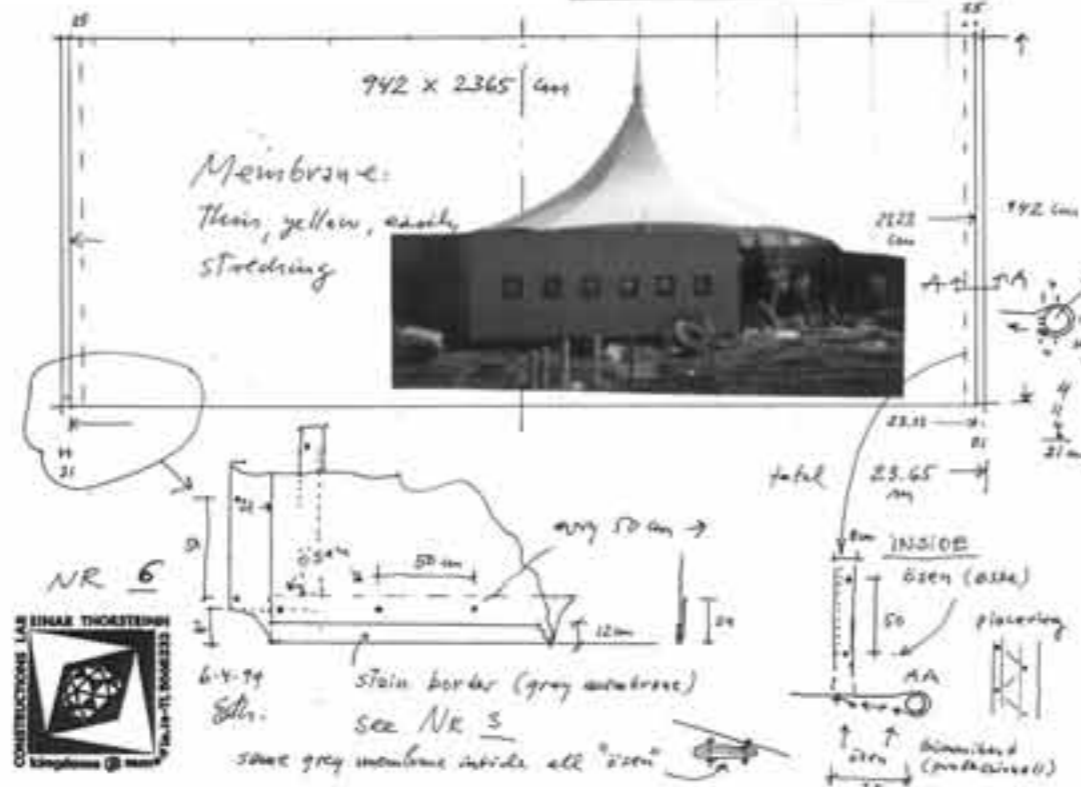
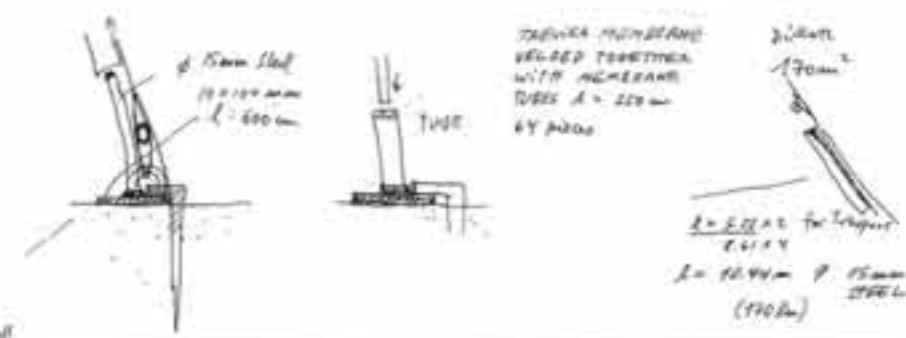
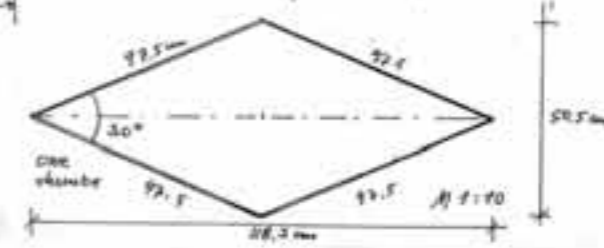
But regardless, the company sold more tents of this type after this happened than before.

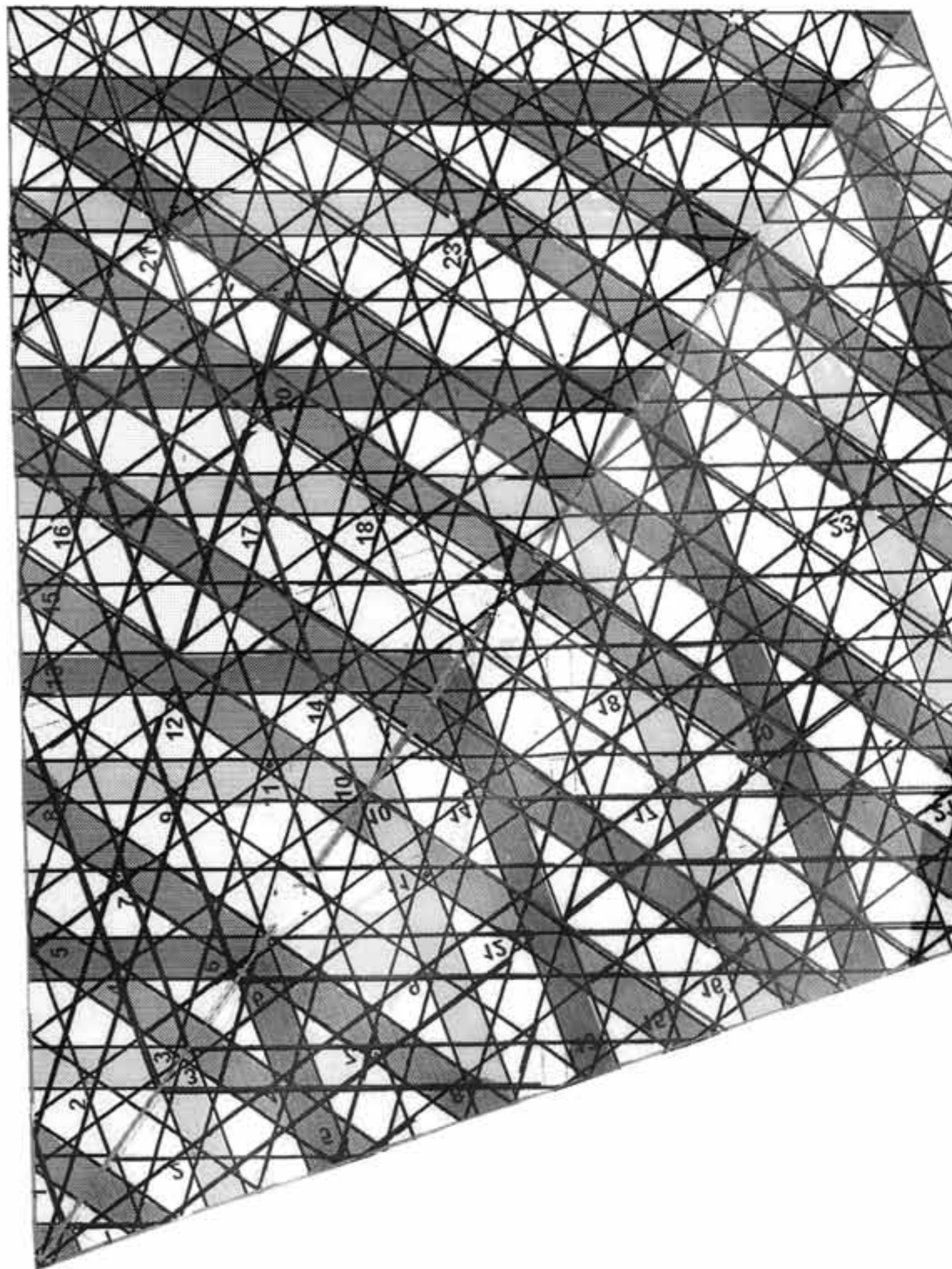
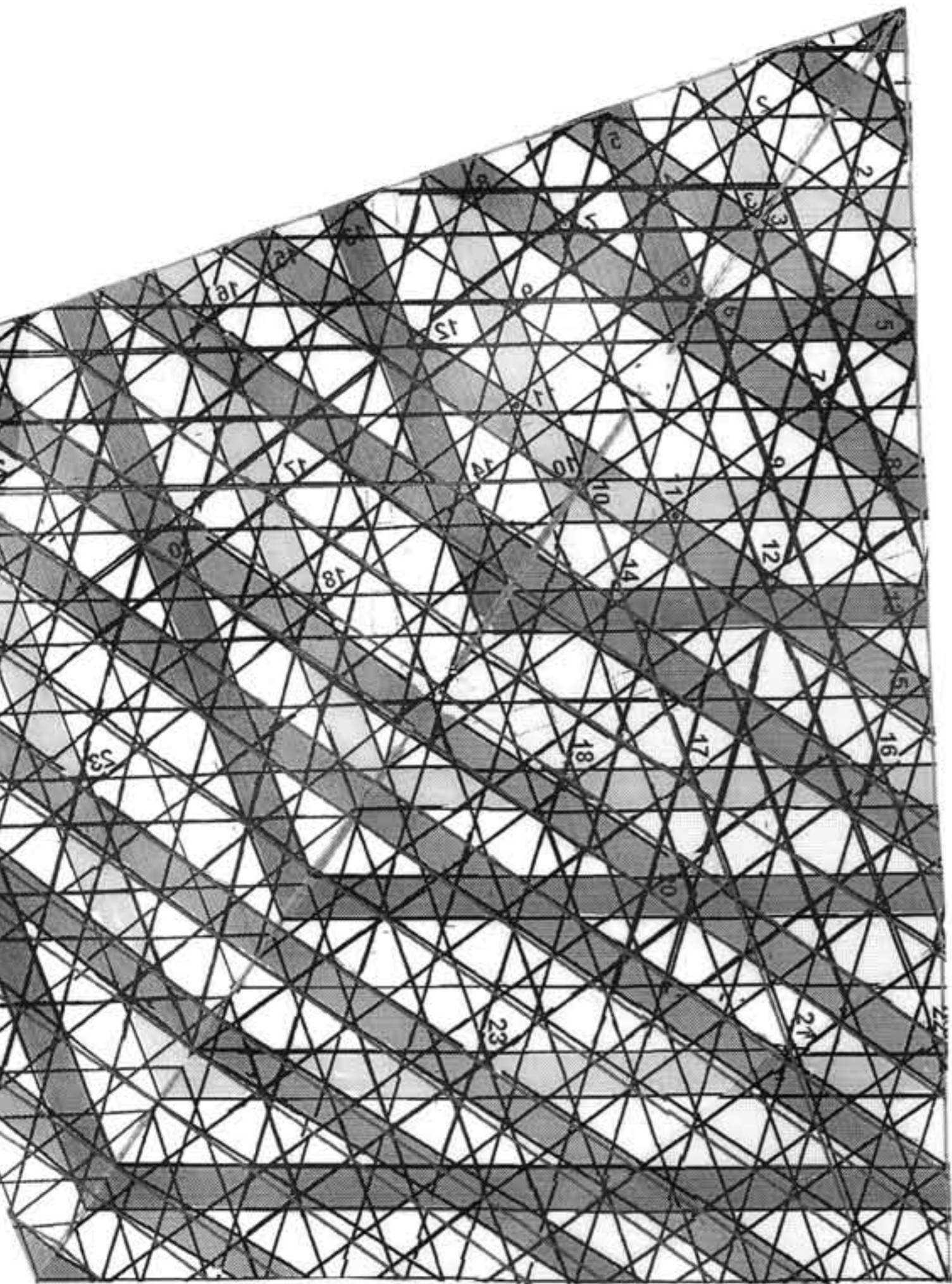
It is great to do tents – the larger the better. There has been a quiet revolution in building tensile structures of all kinds. This is based on a new technology of producing membranes that have elongated molecules in them similar to the ones in a spider's thread and therefore extremely strong and durable.

Between you and me, this technology came into being in the Sixties by nameless persons at the De Point company. The story goes that they got the basics of the know-how delivered from the US Army that found some pieces of this to show in the desert in New Mexico in July 1947.



TUNNEL VENICE
6-4-1999 E.R.







various research projects and art pieces

“More research projects and some art pieces that are in a delicate phase or have not been finished yet, follow on the next pages.

We start here on the right with The Spiral Stairs that is planned to be erected next Summer (2003) in an interior garden or entrance space of a new building for a company in Munich.

The concept is formed around a 888 CM diameter spherical space outlined with a spiraling staircase that goes up to the top and then down again on the opposite side.

The spectator can climb the stairs and experience the entrance space of the building from various points of view from the air.

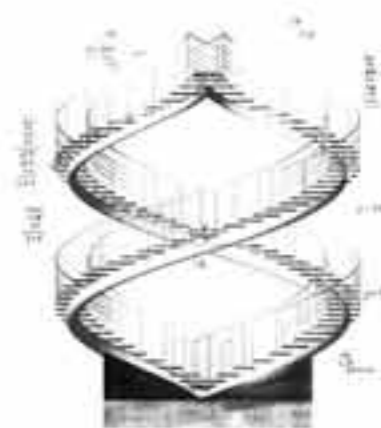
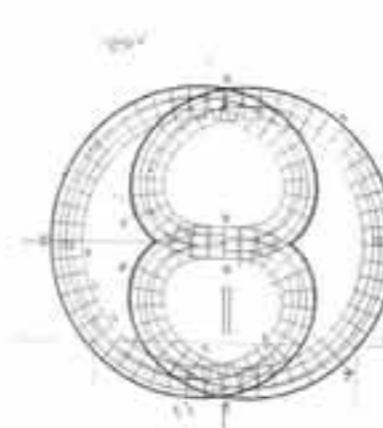
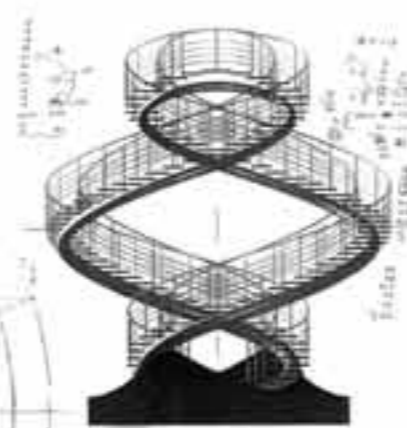
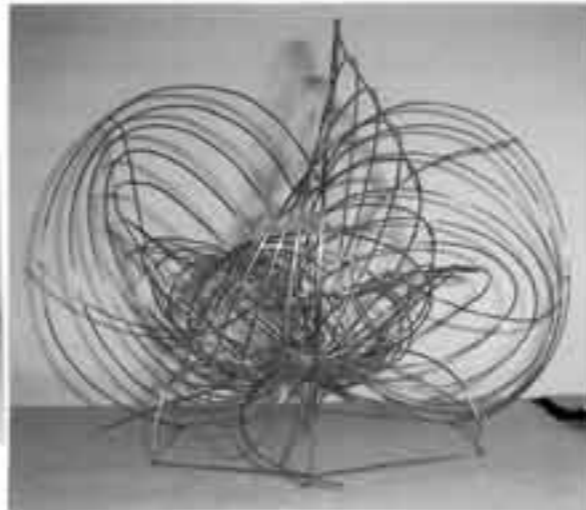
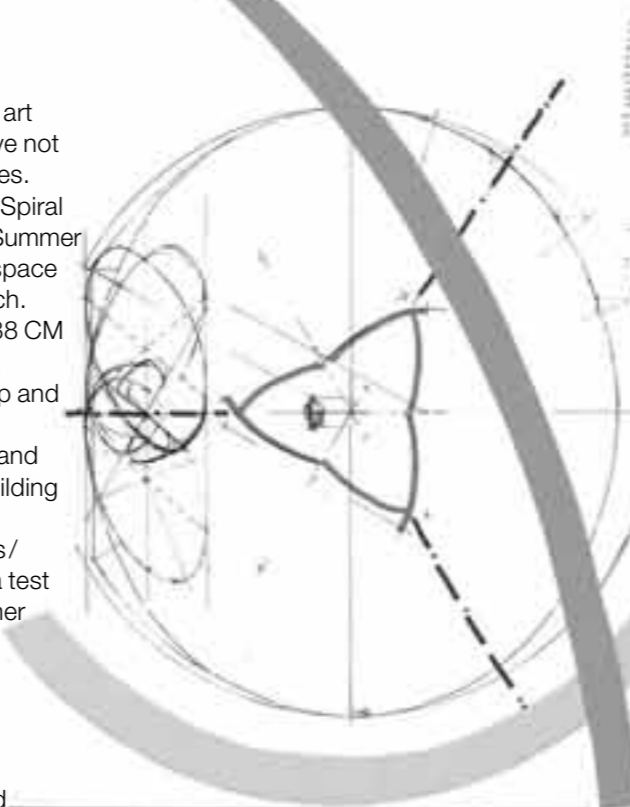
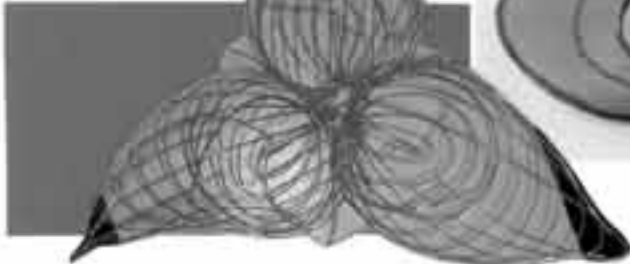
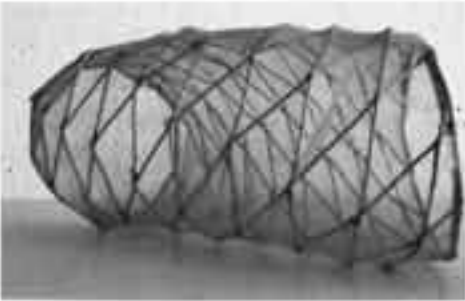
He will also experience the stiffness/ vibrations of the structure which will be a test for many. But this is just how life is: a rather tedious test.

Many of the models here are just possible art pieces in the preliminary stages of a rough sketch-idea and have not even gained a working title yet.

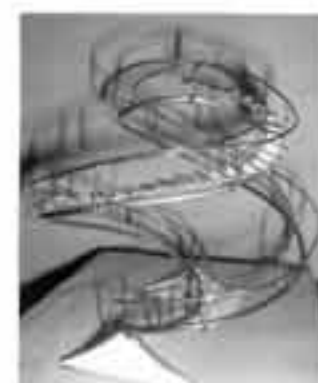
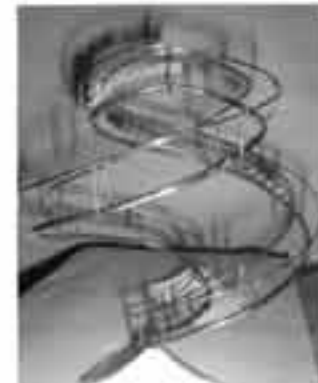
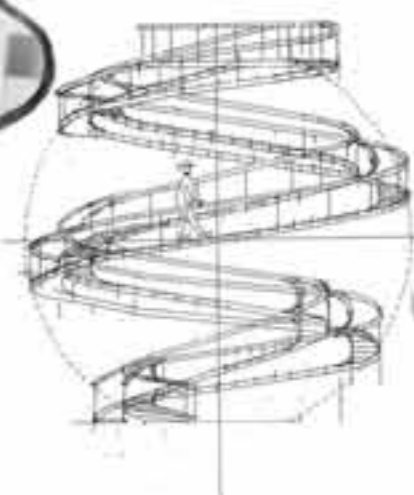
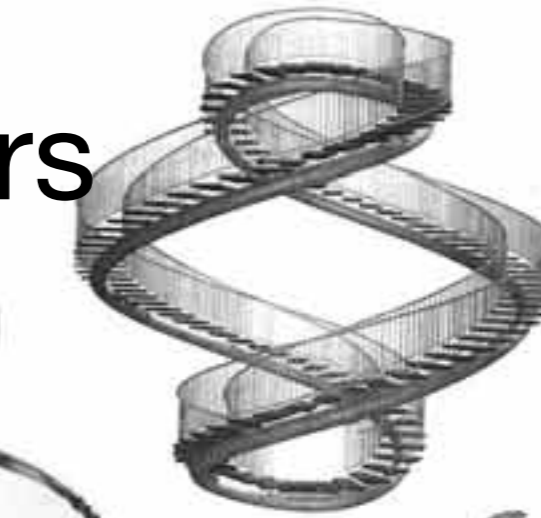
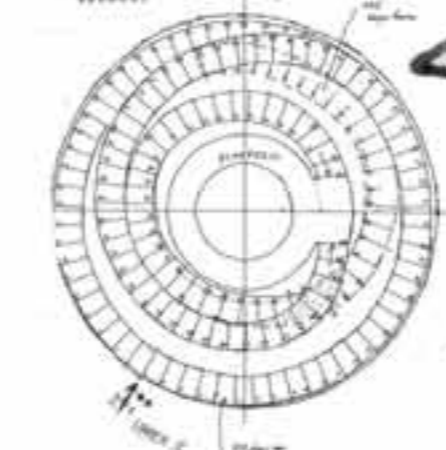
Others are variations of already executed pieces. Such is the model here left, that is formed by a membrane covered metal outlines of the folded spiral tunnel, which has now been built as The Things That You Don't See That You Don't See and Your Spiral View. It was the purpose to bend the tunnel thus formed.

Other models are outlines from simple to complex “go-through” pieces, or outdoor installations like the one here at the bottom of the page.

It has a triangular shape and circles in spiraling positions through which a passage is possible.”



spiral stairs



double bubble



"One of the diehards of Olafur's projects is the Double Bubble. It was an idea already early in the year 2000 which originally came from a newspaper clip that Susanne, who is an art historian working for Olafur's gallery in Berlin, neugerriemenschneider in the Linienstraße, sent to him.

This is the reason I have so many sketches of this project in my drawers. We have been reviving this project from time to time as it has a rather obstinate geometrical problem. However someday it will get its chance, I guess.

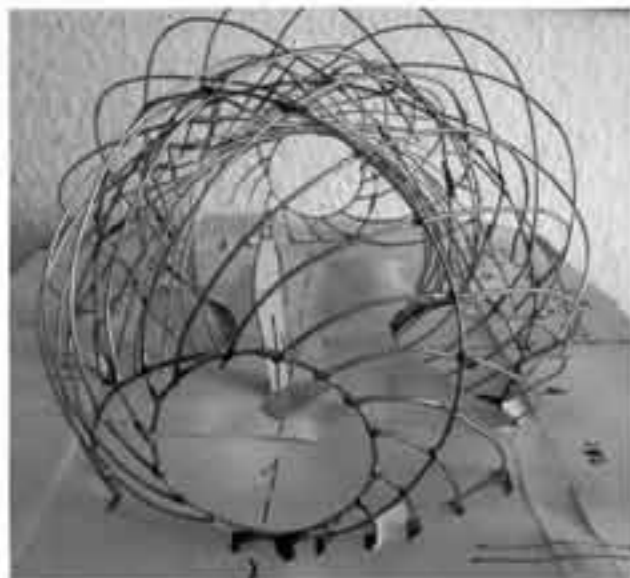
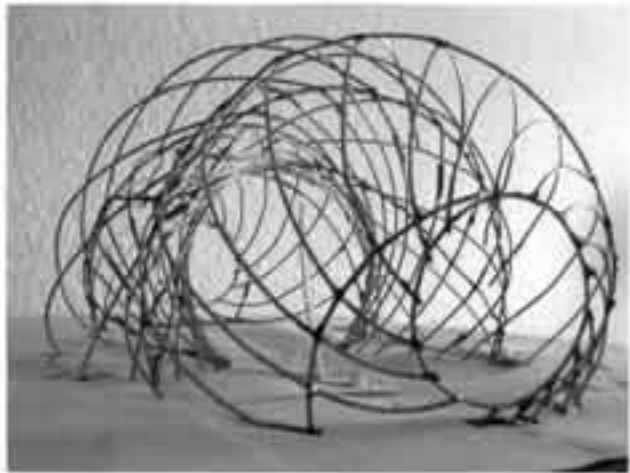
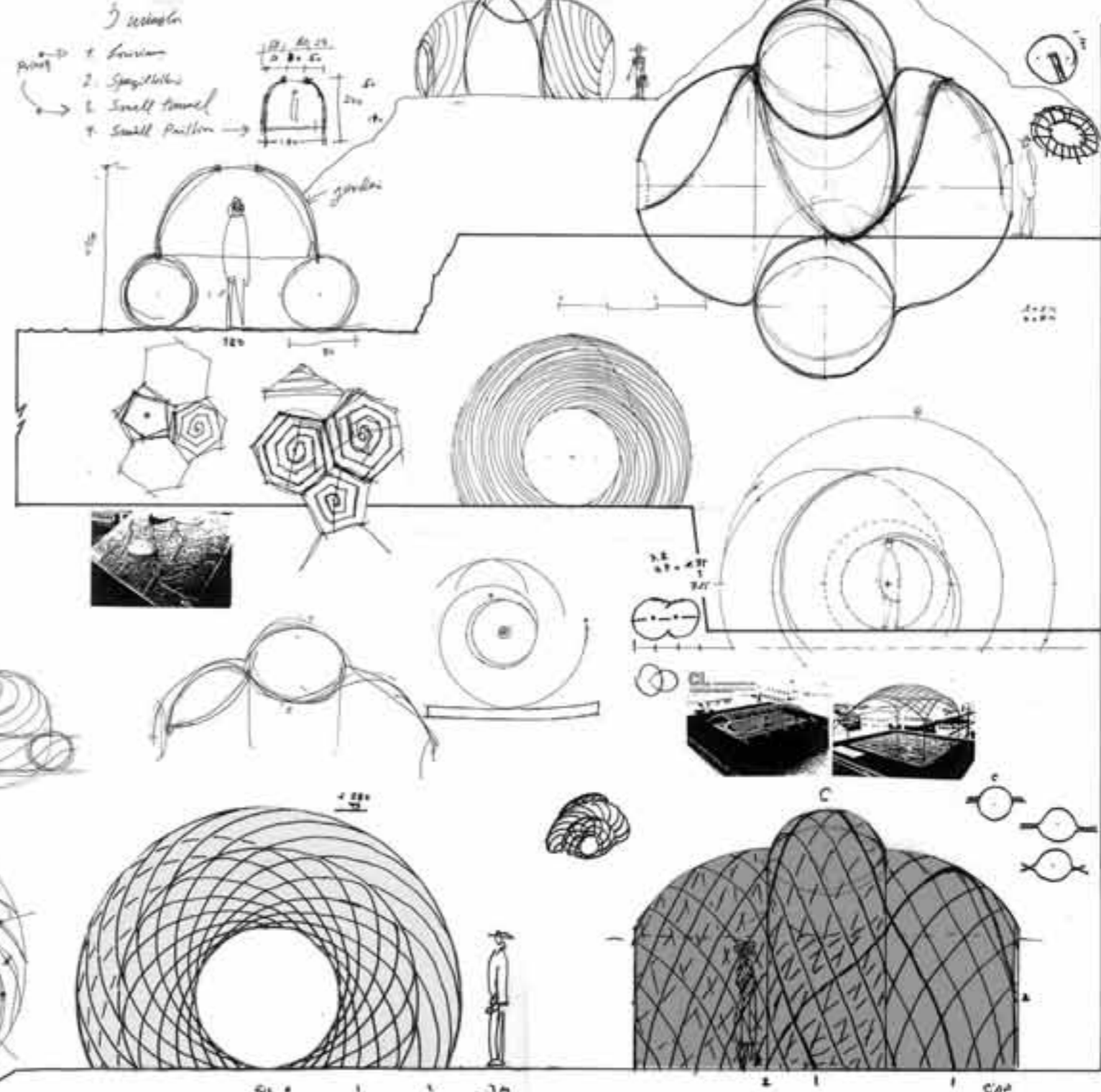
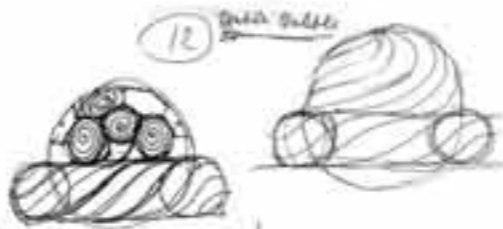
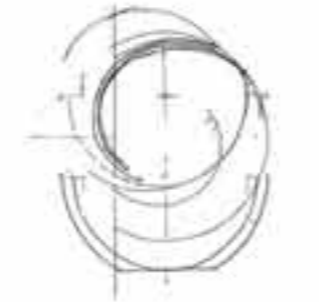
The concept here is a minimal surface soap bubble with an unusual form. The trick is to exchange the soap surface with structural integrity and spiraling metal tubes.

Ever since 1969, I have been introduced to minimal surfaces, which was one of Frei Otto's research areas. The soap bubble surface is good for forming them, as the surface is fluid it tends to self-organize a uniform tension all over.

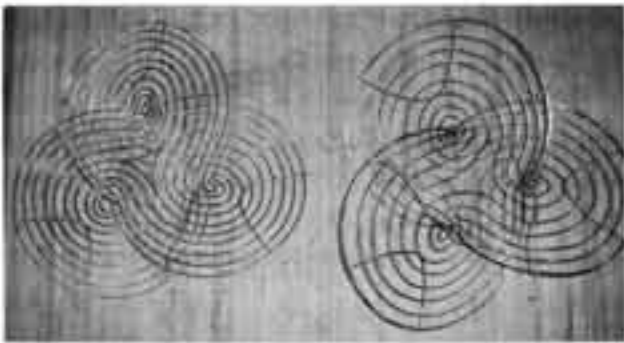
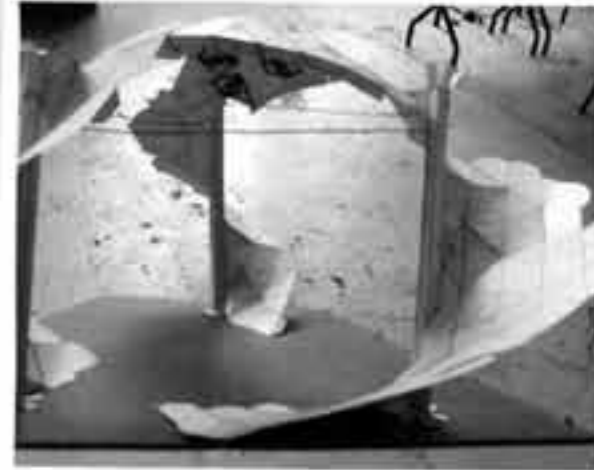
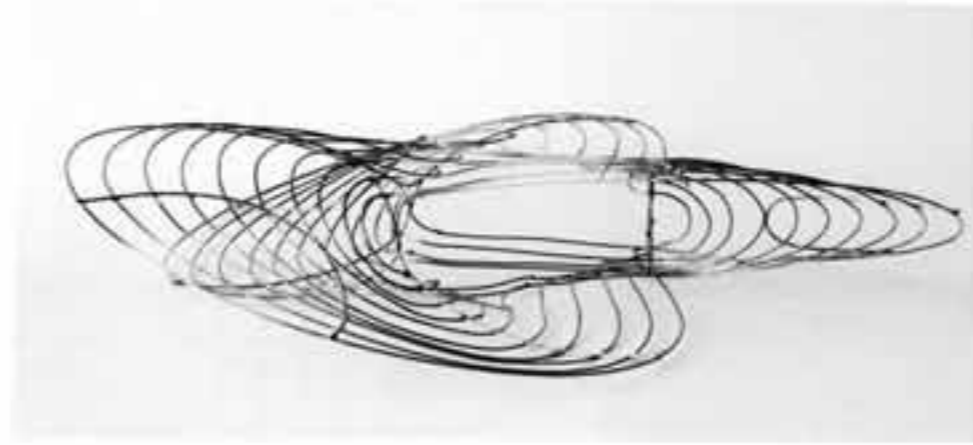
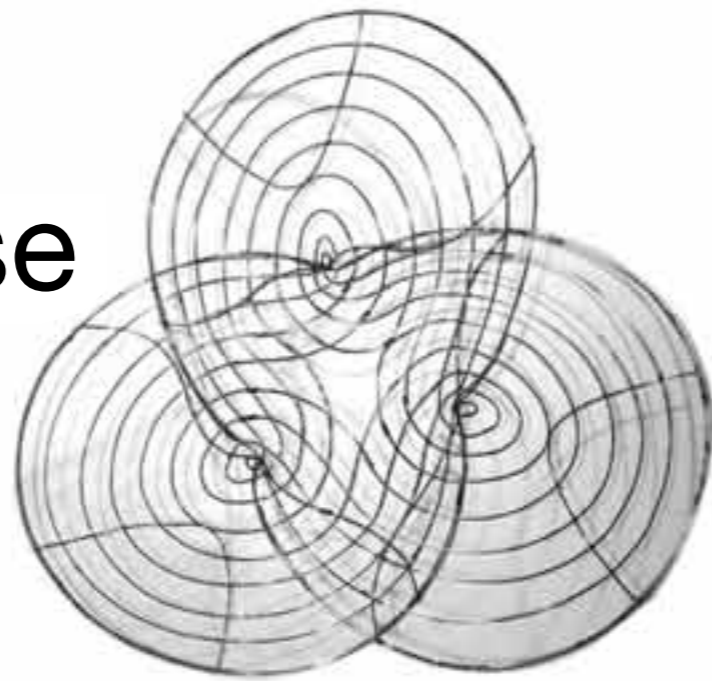
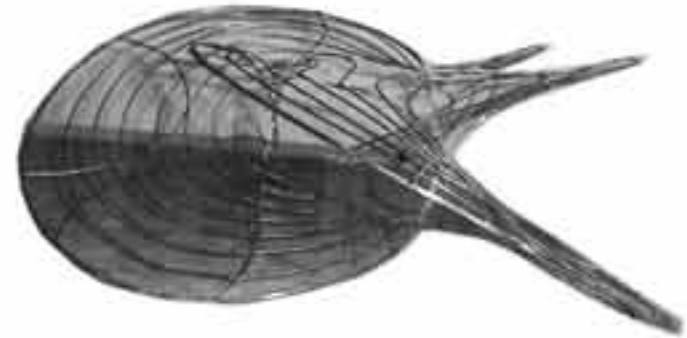
This can be a problem with prefabricated membrane surfaces like the ones used for irregular "balloons" or inflated toys of all kind, where the "thick" volumes need different air pressures than the "thin" volumes attached.

We are now looking into a number of minimal surface forms. Another project we will be coming to next is one: The Knot House.

However the Double Bubble will become an interesting "walk-through" piece in the next years to come."



knot house

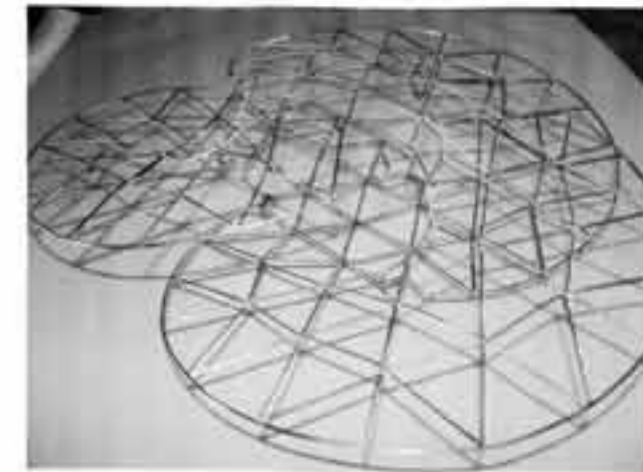
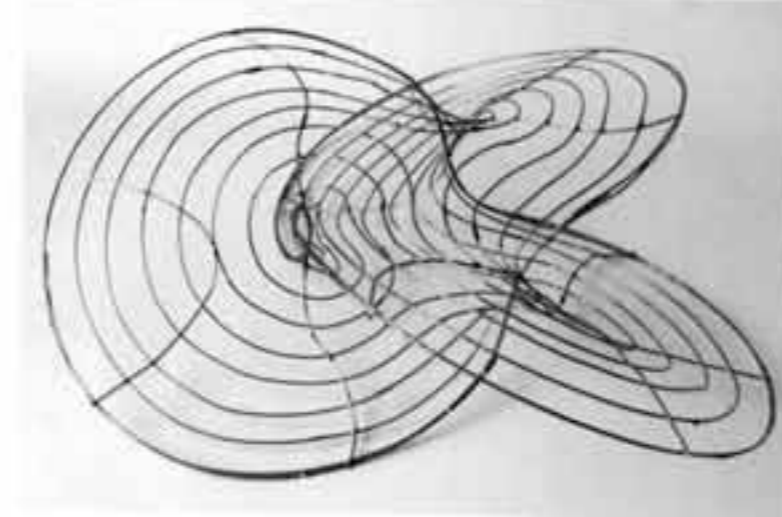
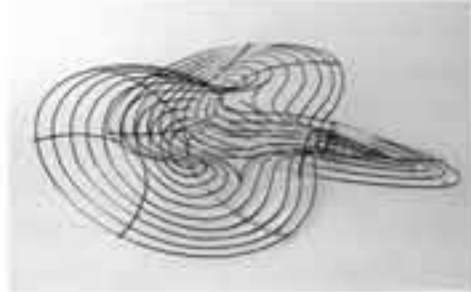
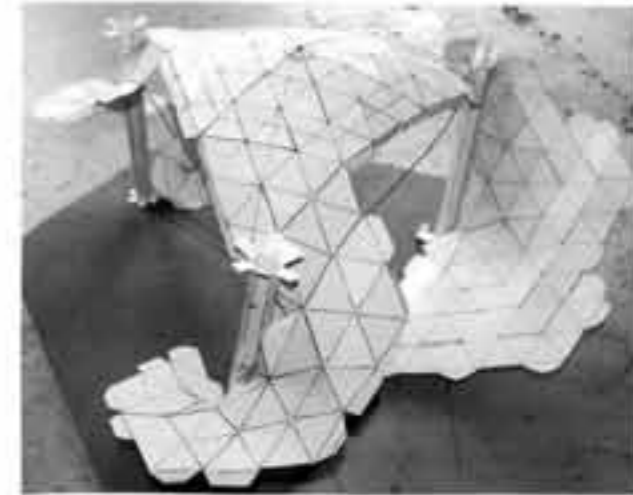
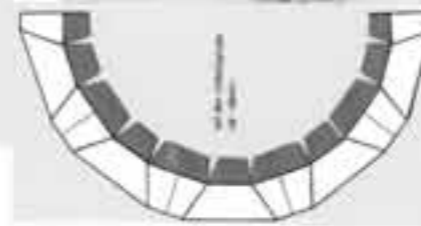
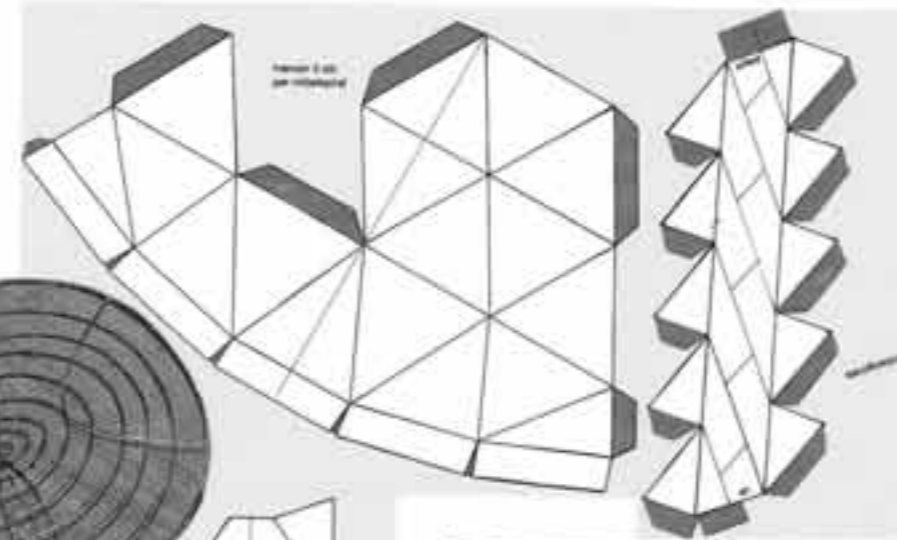
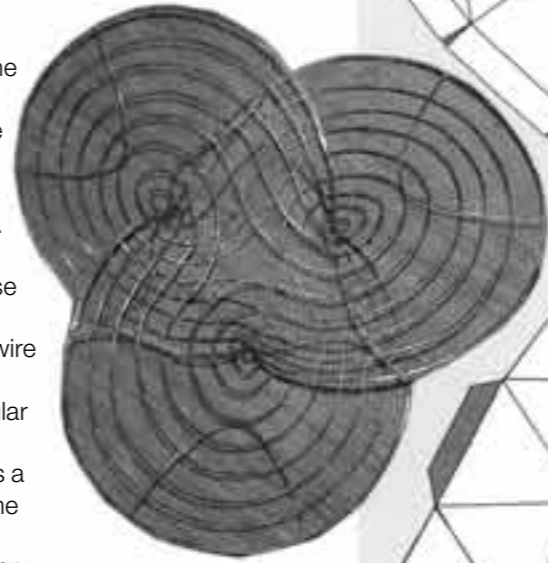


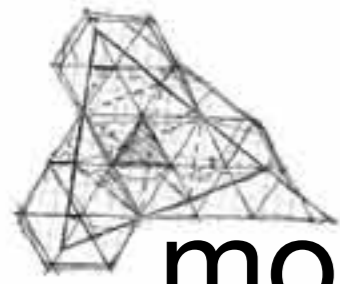
“The Knot House is a minimal surface form where three circles are sectioned in one radial line and the ends are pressed up and down and are joined to the other two where all meet in the middle horizontal axis.

This gives an interesting geometry and also a kind of a pavilion when enlarged. For some time now, I with Sebastian have been looking into this project for the purpose of erecting a 37 Feet diameter pavilion.

The first model sketch was a copper wire model, and then another one. But we then decided it was more sensible to use triangular grid pattern for the structure. So next came a paperboard model made of triangles. Plus a copper wire one again. All of those and some more in between stages are shown here.

This project is likely to be built in the very near future both of timber and then of concrete.”





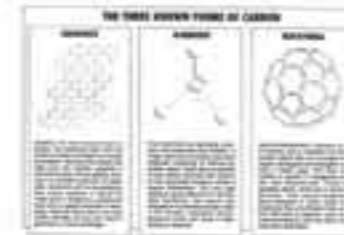
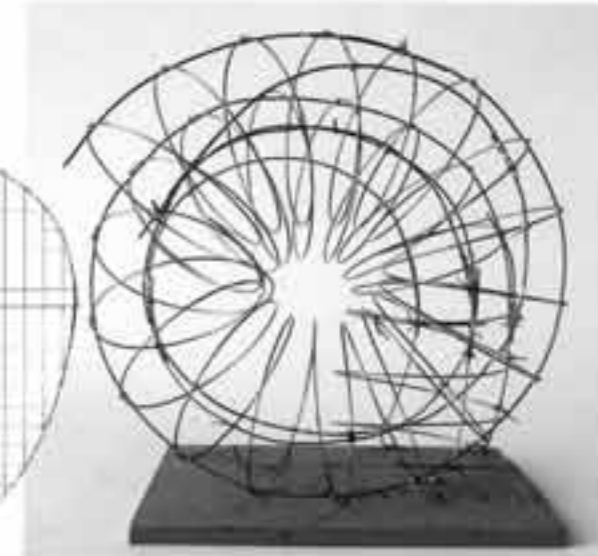
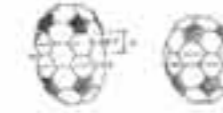
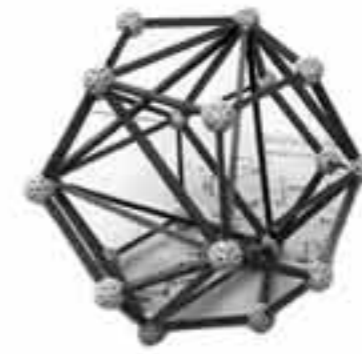
more research

“There are always many research projects in the works here at Olafur’s studio in Berlin. On the next four pages we will present some of them but others we can’t show here as they are being used in exhibits and so brand new that no photographs yet exist of them.

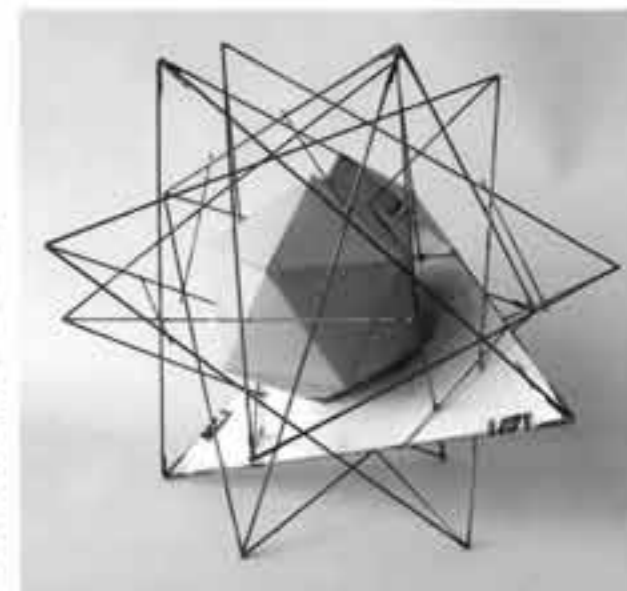
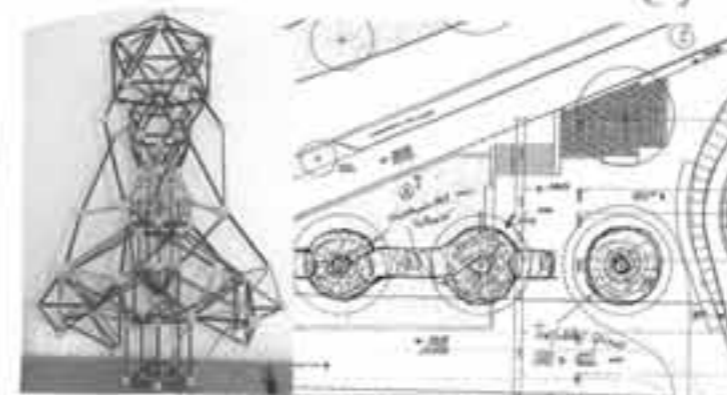
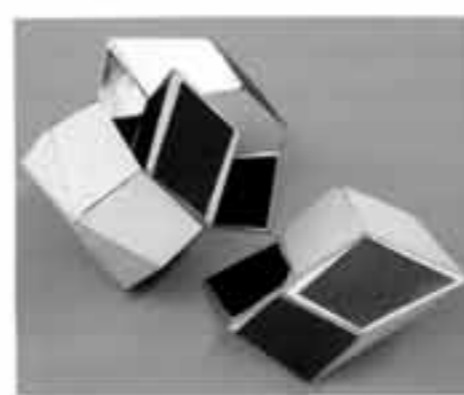
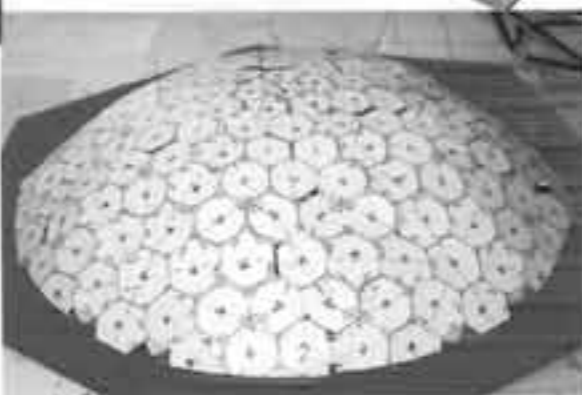
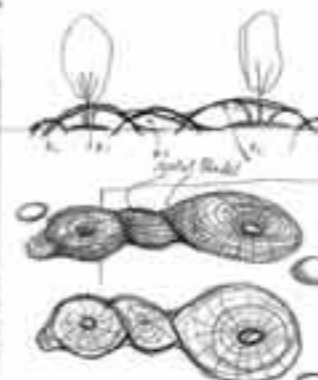
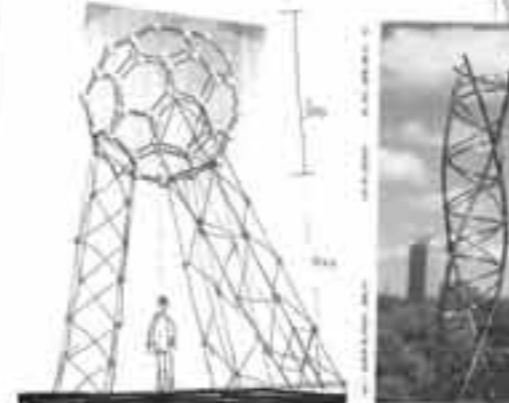
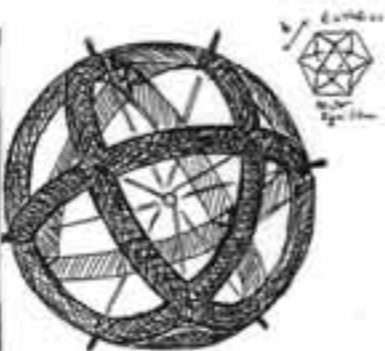
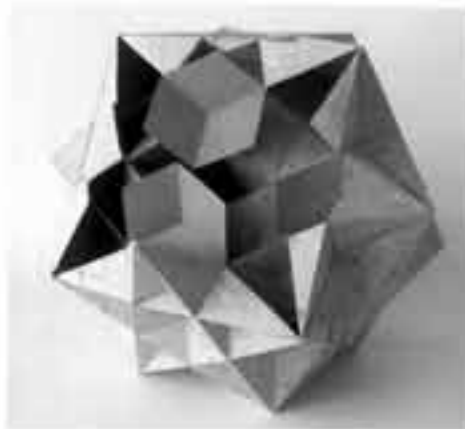
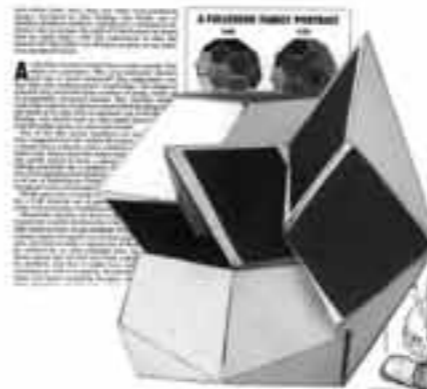
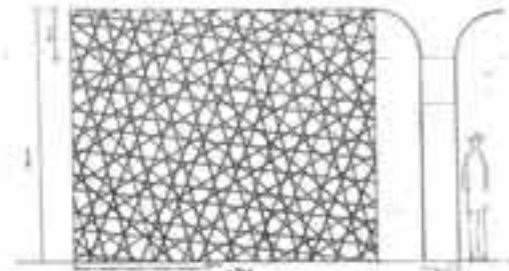
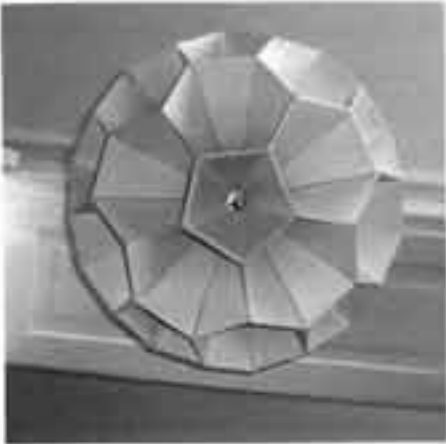
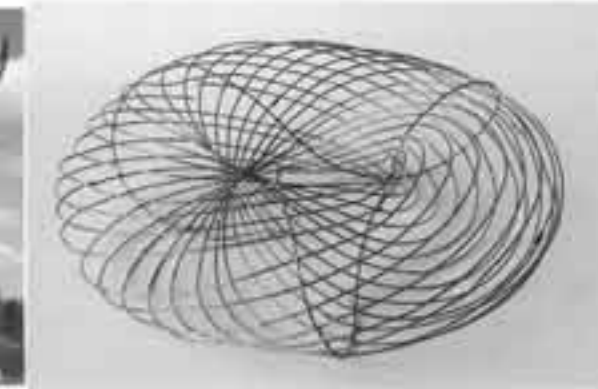
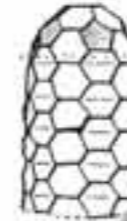
As this book has been coming along, some new model studies have been added to these pages on a daily basis, but somehow we need to come to an end.

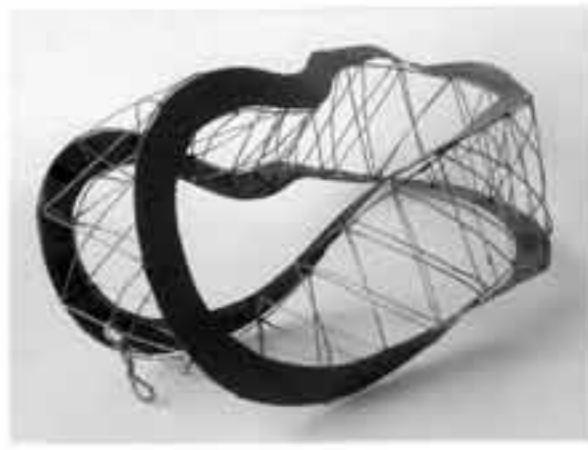
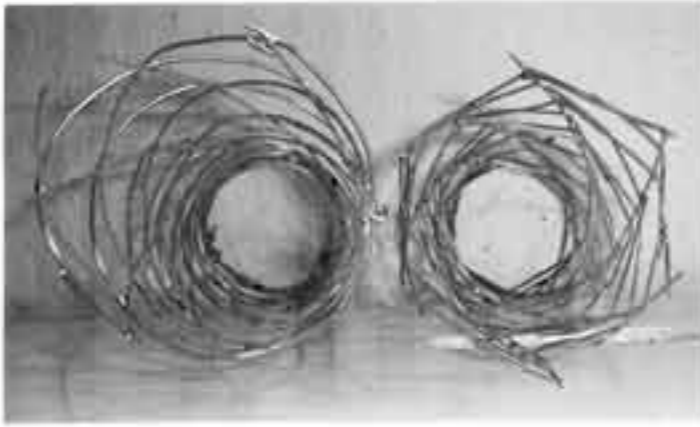
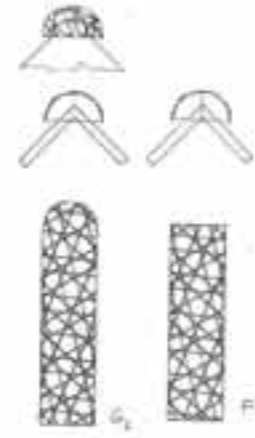
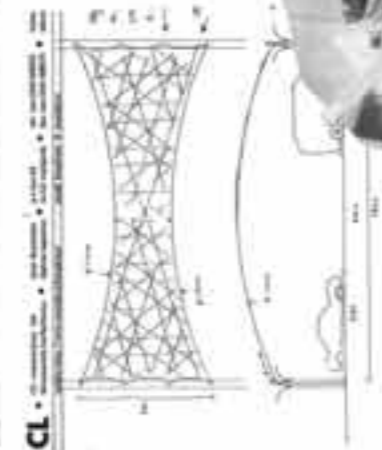
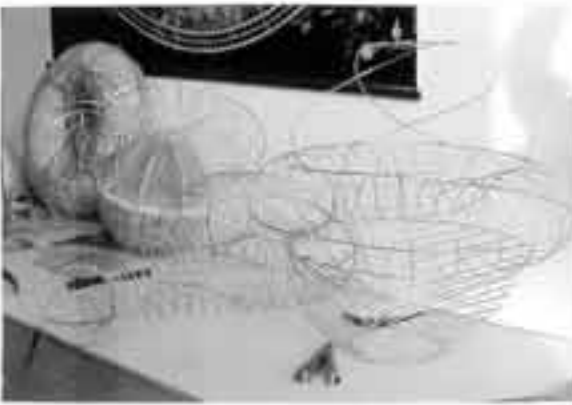
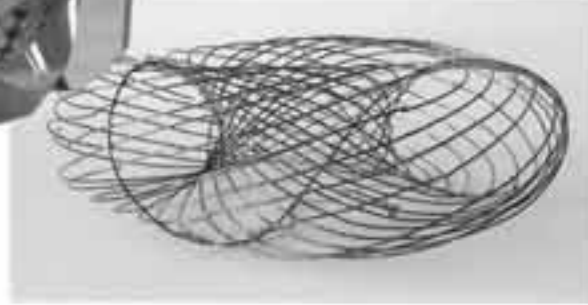
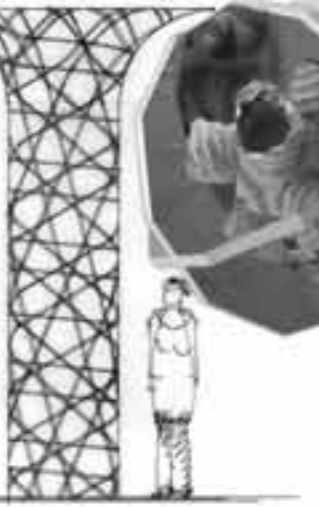
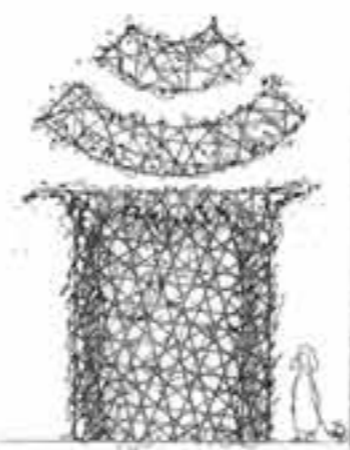
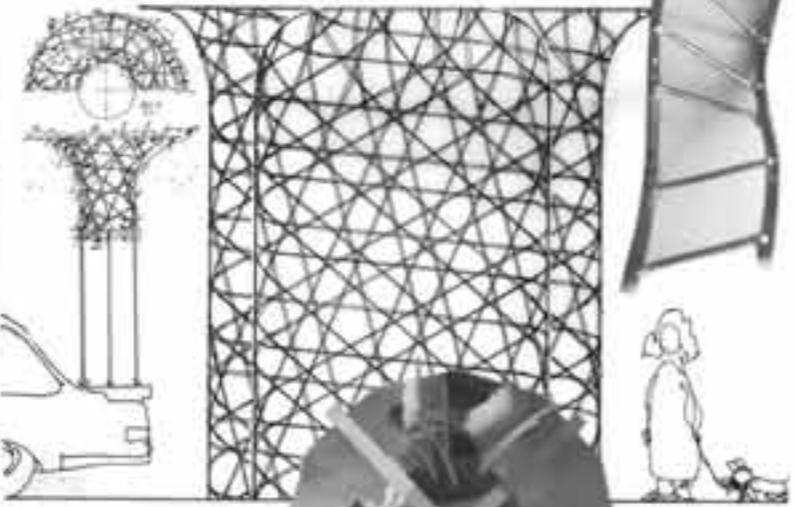
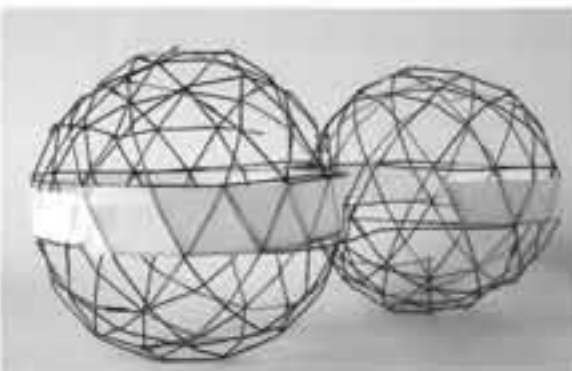
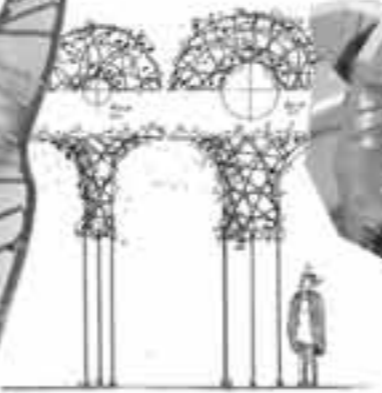
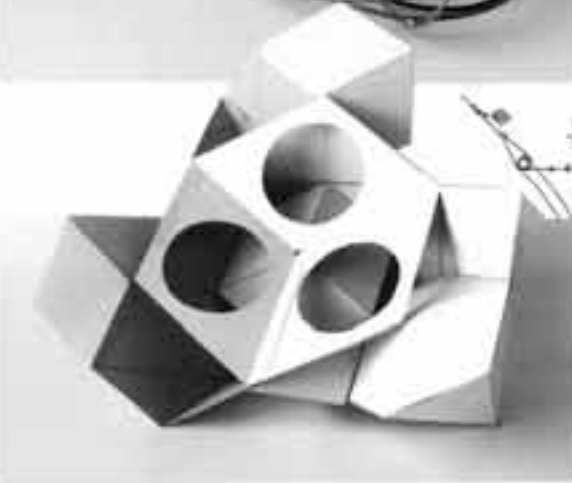
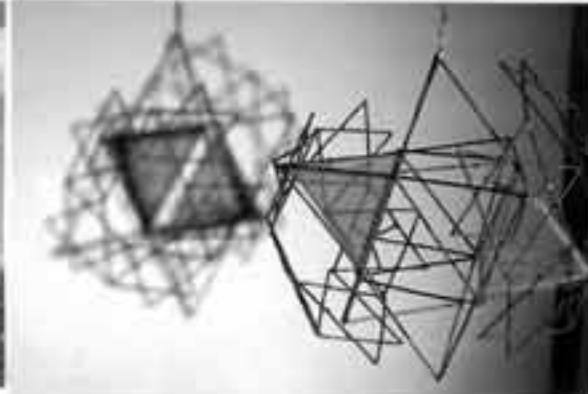
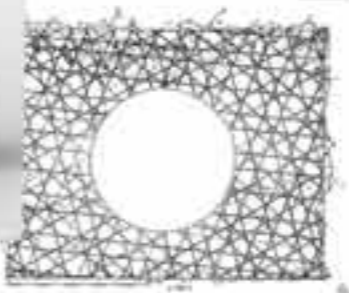
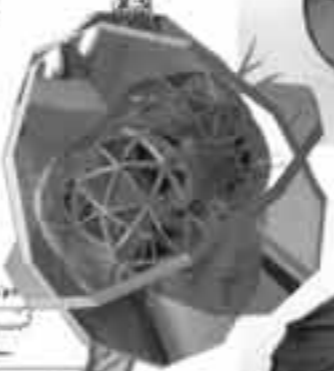
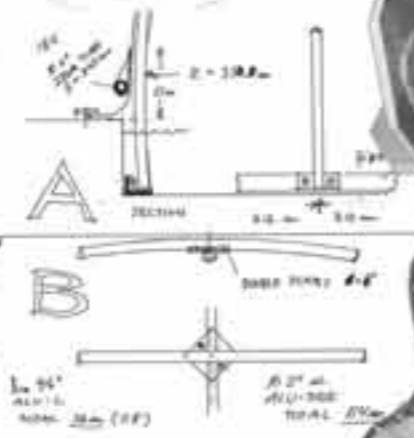
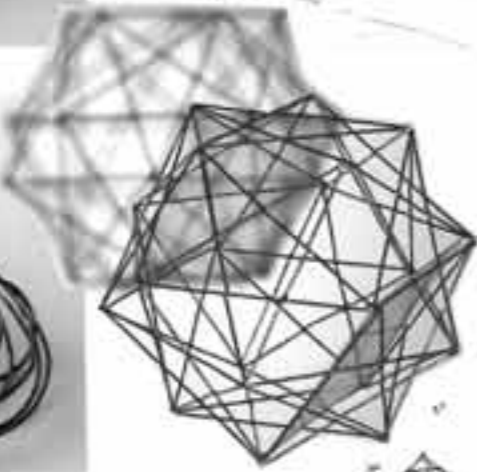
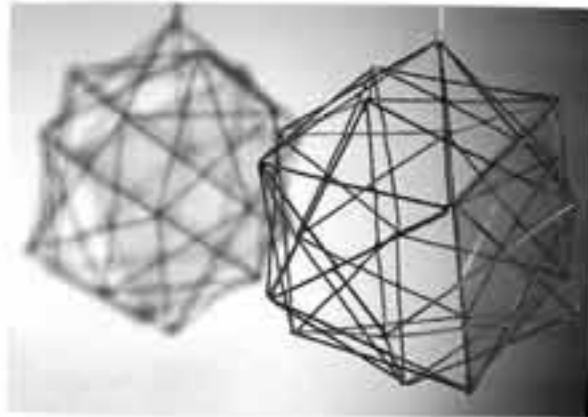
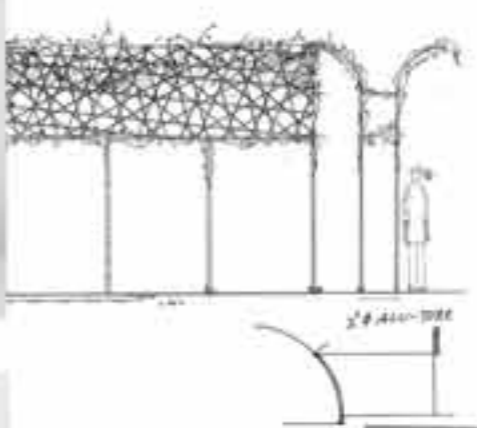
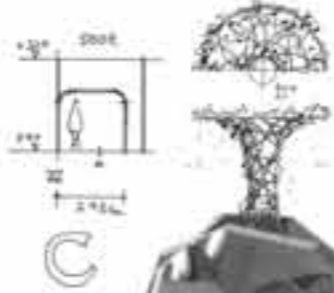
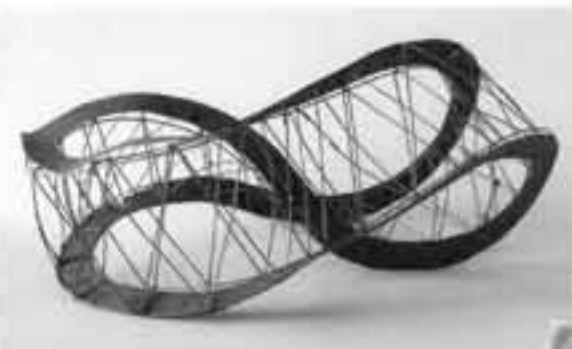
Others shown here are up to five-year-old studies or proposals for various occasions.

Some working titles are for instance: One Surface House, Double Moebius I and II, Geoscope, Five-fold Glass Cubes, Jewish Compound, Folded Doughnut, BBC Tower, The Adaptor Brick, Icosa Spaces, Tetra Spirals, Double Spheres and Five Tetras in One.”

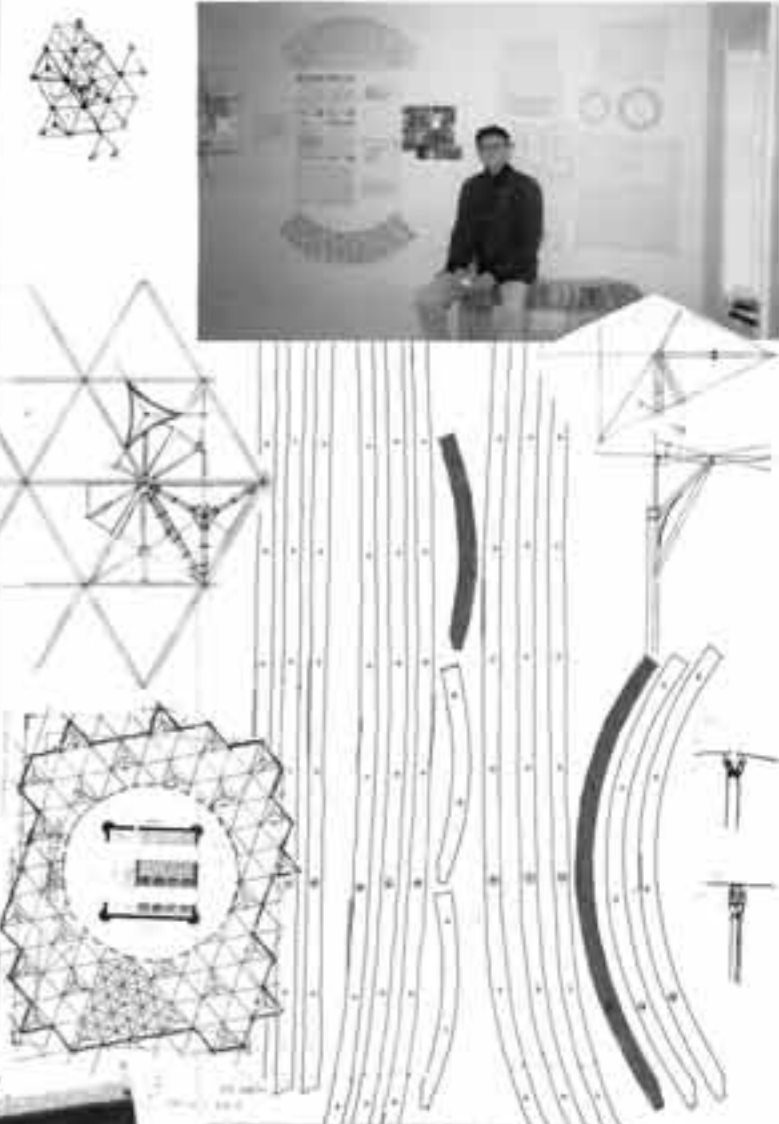
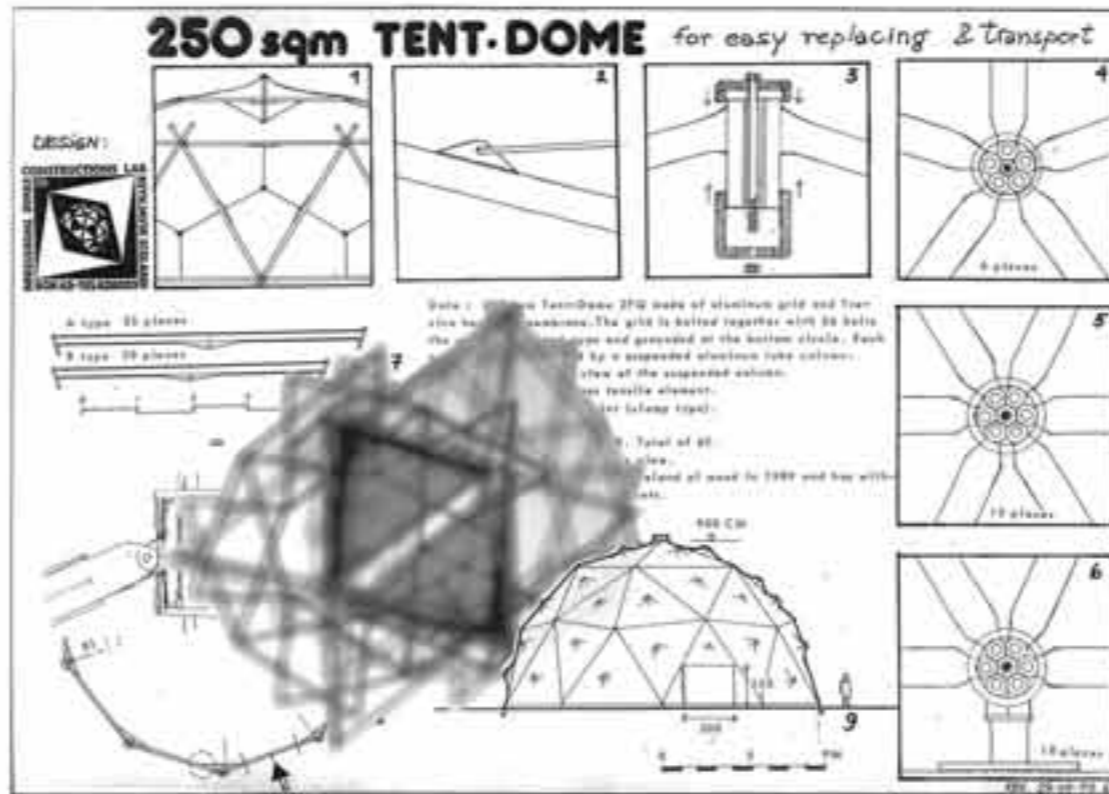
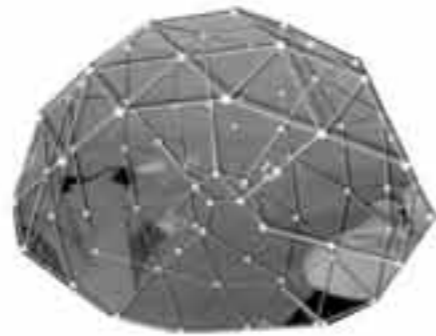


TARN





last pages



"In the Fall of 1999 Olafur was the curator of an exhibition I was invited to show at Gallery Kambur in Southern Iceland some 50 miles from Reykjavik.

This was an exhibit of our structural collaboration to that time. Very similar to this book now, except we had selected to show only seven projects there.

One of them, The Yellow Geometry Boxes, had a different origin. It was a collection of some 120 paperboard geometrical figures I had modeled after my book Nature's Forms was published in 1977. It is now an art piece with us both as artists.

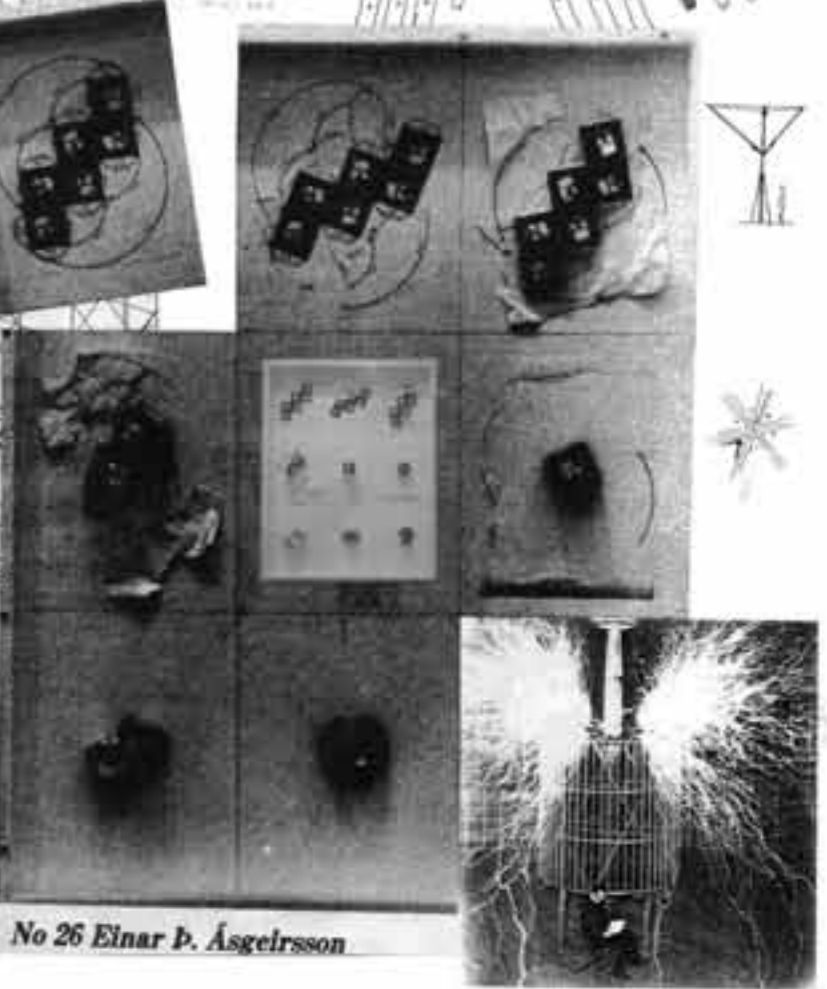
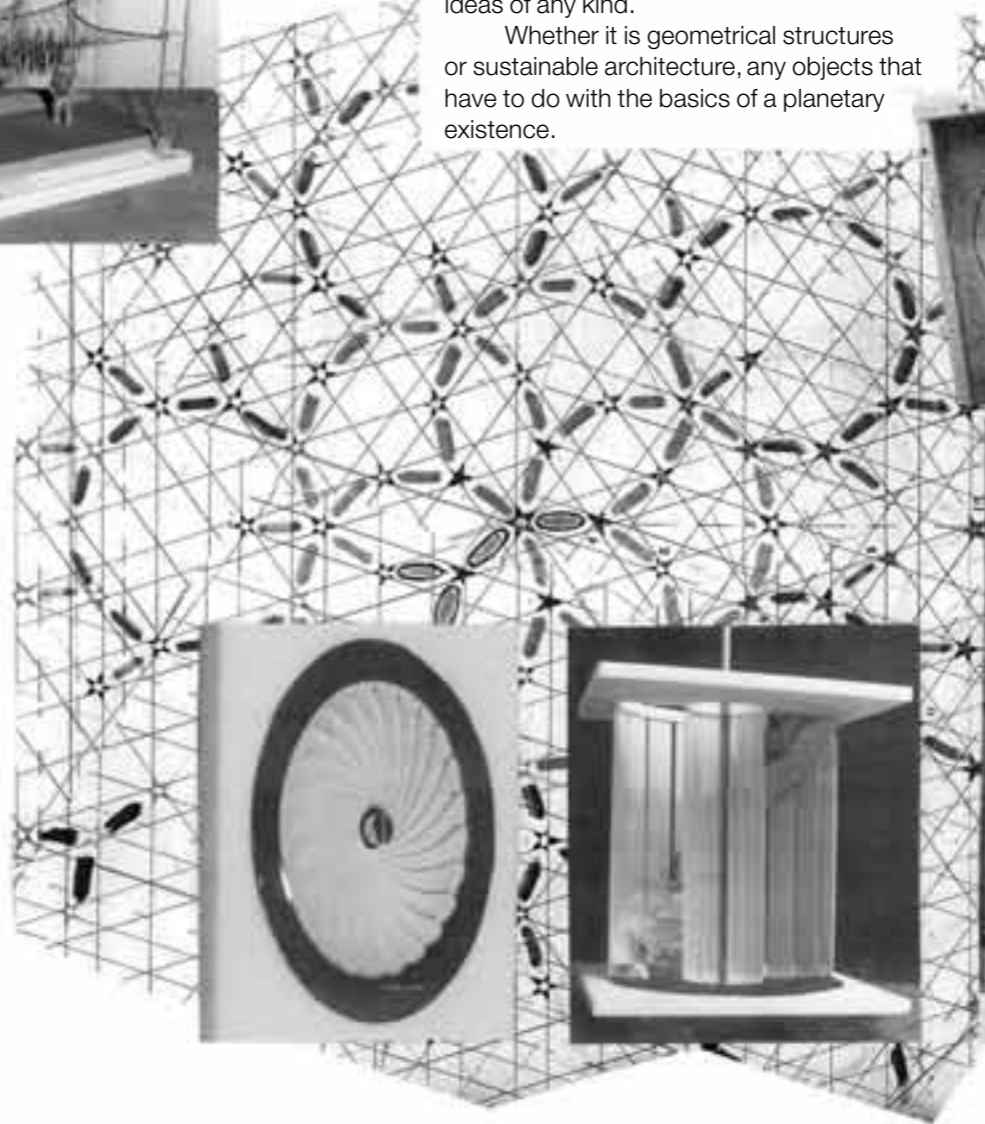
The gallery owner at Kambur is the well-known Icelandic artist Gunnar Örn who by the way was Olafur's father's, Elias Hjörleifsson, best friend. Elias moved on in April 2001.

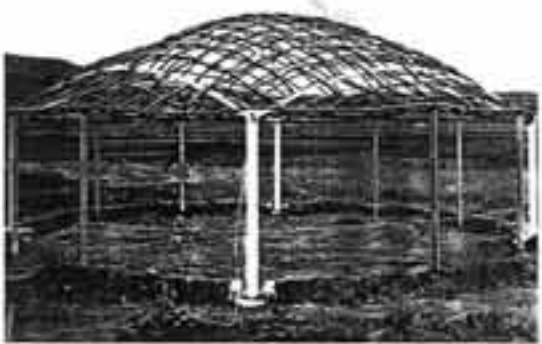
I have very fond memories of this small gallery and the fall exhibition. It is a traditional Icelandic timber house covered with corrugated iron. The same kind Bucky became so found of once in Iceland.

The smell of Icelandic country fall from there is still lingering about my nose. The peace and quiet of the surroundings is giving away such real values, that no banker would understand. Not to mention the friendliness of the proprietor and his wife Thordis Ingolfsdottir."

"Although it is interesting to take a look at the past to see what has been done and how it all adds up, such as working on this book for Olafur's art's structural integrity, I personally prefer to keep on working at new designs or ideas of any kind.

Whether it is geometrical structures or sustainable architecture, any objects that have to do with the basics of a planetary existence.





Tubular dome

Einar Thorsteinn's 10.15m diameter experimental dome is constructed of 50mm polyethylene pipes, interwoven at 300mm intervals. Steel columns and arches across the base, square on plan, support the dome.
 Executed in conjunction with the Institute for Building Research in Iceland, the structure cost £12 per sq m.
 Thorsteinn's next project is to investigate the use of snow-supporting structures over roads in the highlands of Iceland.



Tesla's work there in the field of electricity and high voltage shocked the citizens of Colorado Springs so thoroughly that they could only understand it as black magic of some sort.

My feeling is that since that time very little has changed in the minds of men. Our culture is still placing everything that can't be nailed to the floor into a cultural waste basket marked: Illusions. And getting nowhere with it.

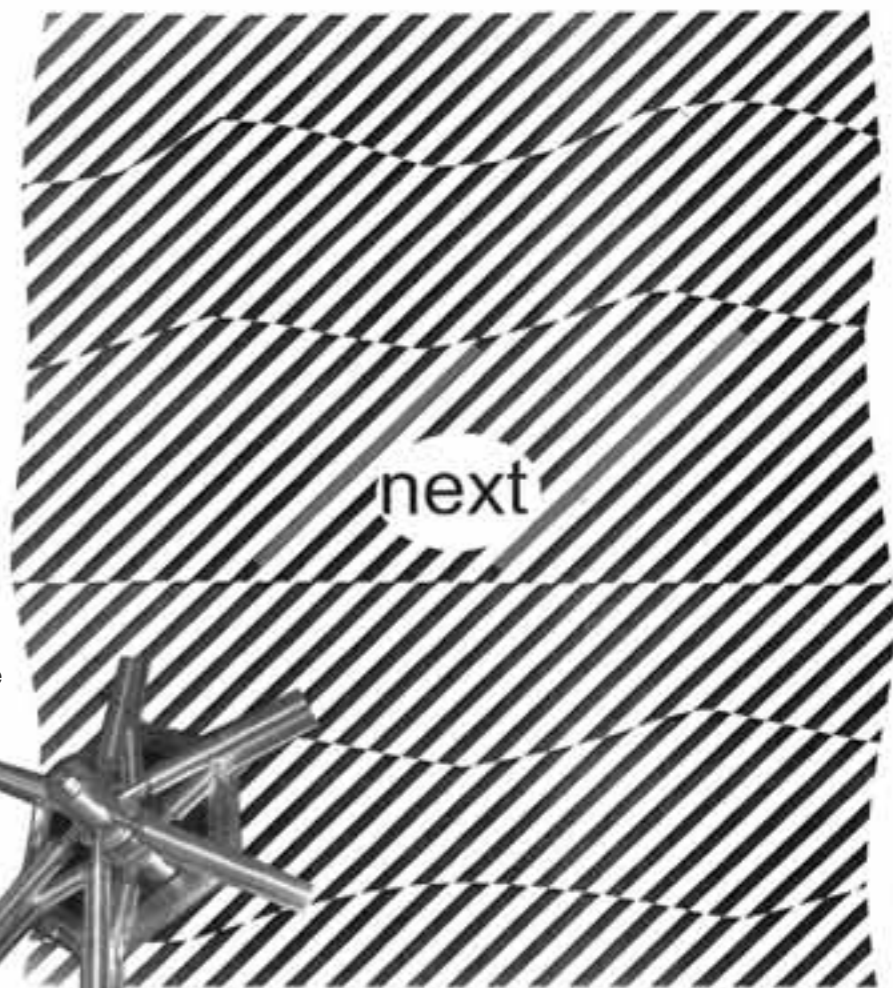
When instead the basis for humanity's next big step in technology lies right there. The technology for multi-dimensional connections, is a way out of our self-inflicted isolation on this small planet, and a way to solve some of our planetary existential problems.

Now this is some new field where we, the designer-scientists of the world, can have our heyday. And a field where art is slowly moving along into, as it should. Then who is going to open our eyes to obvious matters if not a combination of people from this group?

Well, I have put a button sign here marked NEXT on the last page in here, and if the reader feels this is a good idea, then press your finger on the button and I'll get back to you. – Some magic!

Or if that does not work contact me through <http://www.mmedia.is/kingdome>

The end



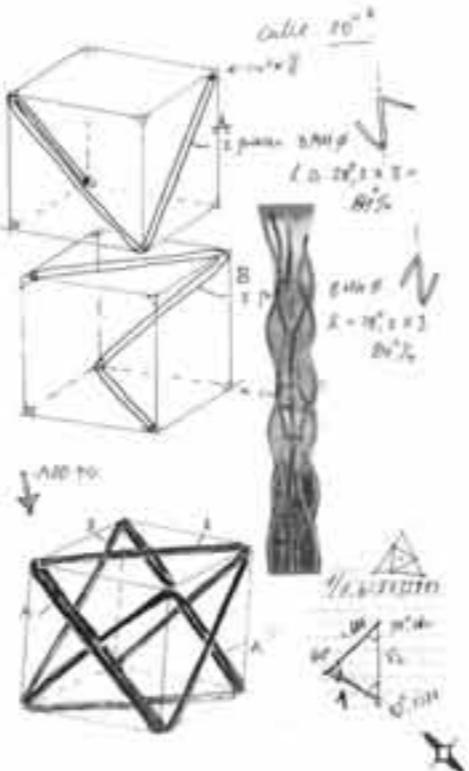
COLLECTORS · ITEM

Also to "build" new theories about how the visible Universe functions and particularly to examine our true relationship to the Grand Design. – Well, I might as well mention it in passing that my solution-approach to this last question is through multi-dimensionality. So far, so good.

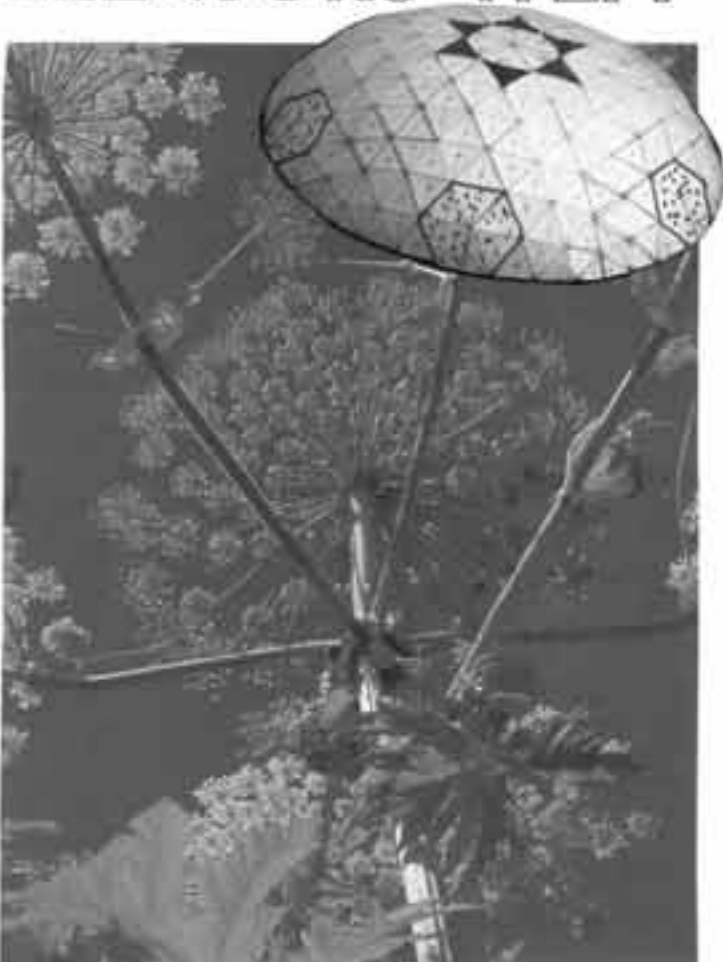
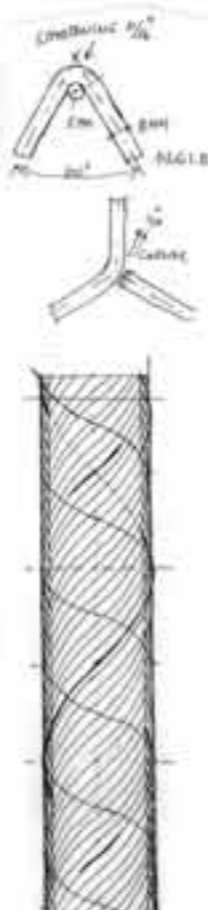
In this relationship I might further add that I feel a certain kinship to people like Nicolai Tesla, the greatest unknown scientist the world has born, of the last two centuries.

In May 1989 I think it was, I was driving through Colorado and stopped in Denver where I happened to find an open bookstore on a Sunday. There I found the book: "Man out of Time" about his life. And as I was not so far away from Colorado Springs anyway, where he had a famous two years stay in 1899 to 1901, I drove down there the same afternoon.

It surprised me when I looked at the correct dates that I came to that place exactly 90 years to the day Tesla first arrived there from New York. Another interesting thing was that what is now central Colorado Springs, where his institute was built that long time ago, there still was no building standing. It was some kind of a curse on that ground a friendly person there told me.



Volcanic eruption can be seen in the... Many people think of volcanic eruptions as an early something that serves to provide the earth with...
Einar Thorsteinn
VOLCANOES & COMMUNITY
 Nature forces a community change - Or does it?
 mobile housing platform



epilogue

Notes on my overlap with Einar Thorsteinn

Over the last 5 years, the involvement of different people in the development of the projects I am working on has become a central aspect.

One of the most central persons in this, has, since I first met him in 1996, been Einar Thorsteinn. His skills and understanding of my work is and has been extremely important for the creation of a large range of ideas.

The multiple fields in which Einar is, and has been, active has given him a sense of space which in its various combinations has proven extremely productive. His field of research and consequently some knowledge range from areas of mathematical dimensionality to multi-dimensionality of living beings, from 2D and 3D geometry to crystallography and quasicrystallography.

From gravity in relation to cosmic zero-point energy fields and then as described by Global Scaling to anti-gravity, and consequently to free energy mechanics. From modern medicine to alternative and Asian medicine. From architecture and sustainable housing to Sick-Building-Syndrome and the effects geomancy and microwave fields have on the biological and ecological integrity of buildings. From geodesic dome building, tenserity and synergetics to tensile structures and ergonomic-design. Toy and furniture design. Space-architecture and free fall urinal technology. And then from science history to modern frontier-science development. From local and global politics and journalism to conspiracy theories. From cultural history and archeology to alternative archeology. And finally cosmology and within it particularly extraterrestrial intelligence both within and without terrestrial reach.

One fact that fascinates me in particular is that Einar has a gift: an ability to think spatially – and this – without his thoughts being based on the dominant Cartesian or Euclidian space-time conception.

By thinking spatially, I mean that he is able to construct a more complex dimensional shape in his thoughts alone, with high precision – while discussing and developing it. This ability would not be so impressive in terms of the traditional 90° degree boxes that have dominated spatial relations throughout our Western history. But when the spatial coordinates become more complex – involving spherical or crystalline forms, where all angles are different this ability becomes something far more potent.

In a way, it is like playing blind chess – not having the board in front of you while playing – to construct complex spatial progressions and then

reverse them horizontally, or cover them with mirrors creating a kaleidoscopic equivalent of the same structure, and this while communicating to the normal earthlings including myself.

I am not trying to romanticize this, saying that being momentarily out of the Cartesian reach is any closer to truthfulness than elsewhere – the point is: that I have found great inspiration in using different spatial ideas to expose that the so-called Cartesian spatial culture – is a construction – and not a source of higher (spatial) relations. This would promote an acceptance of hierarchy – and lead to power structures – leading finally to exploitation and ignorance... taking things for granted the way they are.

Here I should also mention that, any other model of thought (including my own) is a construction as well – I believe.

So finally, the very inspiring discussions and projects I have had with Einar was never based on the idea to lay out a “new” value system proposing a better space to replace the currently dominant one. – No, the aim has foremost been to use the spatial questions as a source of reflection on, or of, the already existing surroundings – and, as said, to show that our surroundings (defined as broadly as possible – which in Einar’s terminology is very broad) – is not naturally given.

Behind this, of course, lies an ideology that despite its romantic reminiscence is very crucial to me. So my interest in revealing the so-called “cultural” constructions, is fundamentally motivated by my value of transparency of our surroundings as a source of freedom. Freedom in how we orient ourselves and relate to ourselves.

(Here I should note that what I discuss above is my opinion and even though I write it in this book, it doesn’t necessarily mean that Einar shares the same beliefs – In fact I sometimes have reason to believe that Einar is in contact with someone/something, who might suggest a different matter of space that inevitably cannot be submitted to my mentioned idea. – In contrary, at times, he seems to hold relevant information that proves my mentioned ideas to be wrong. – But fundamentally, I consider the overlap of his and my beliefs significant enough to have a critical and creative discourse.)

Some notes on changes

First – I was not sure if I was confused, which I guess meant nothing other than I was confused indeed. But this confusion was not linear, or at least not recognizable with its usual mix of surprise and doubt. Some confusions, I guess, are so famil-

iar that you recognize them as a “typical” confusion knowing approximately to what realm they are taking you. No – this particular feeling was different. Its way of organizing itself, or rather – the way it didn’t organize itself – had left me wondering – not about the particular situation I was in, nor the structure of this confusion (which I anyway rarely or, to be honest, never think about). No at this moment – I was wondering about myself. It occurred to me that, though very subtly, something had just changed.

So as said, a bit confused, I was thinking about this little shift which had struck me, and without any particular spectacle, it became obvious to me that the confusion was not due to any sudden changes in my surroundings. No, what I had just experienced was how I – myself – had changed.

We all change – as we know – more or less, all the time. We get older and equally wise or ignorant. We expect to change, so to speak. We anticipate change and the whole idea of doing so is part of our culture – the concept of changing has long been cultivated, or should I say modernized to the more progressive term “developing”. Thus the whole idea of developing is to a certain extent predetermined, or at least somewhat predictable – just like “confusion”, as said earlier, can be familiar.

The discrepancy field, or so-called buffer zone, between what we expect-to-get and what we-actually-get, is a complex playground where most of our cultural history can be found and told. But more important, since this particular area, by definition, always is connected to our time, it inevitably holds a strong position as the central link between our emotions and our surroundings. I can call this area, or time zone, protention.

Using time as glue, our protention constructs experiences with our senses and surroundings as building blocks. It is somewhere around here, or rather “there”, that we are constructed as subjects – in a constantly changing progression.

Due to the overall modern rationalistic dominance, mental bastards such as “confusion” have been eliminated or reduced to existing only as sub-conscious guerilla concepts, attacking only when the established, more well-acknowledged ideas, such as logic and expectation, crashes and time/space are momentarily out of sync.

Back to changes. From down around our feelings – the best kept construction we have – up to the sensation of our emotions being something given by the so-called nature.

Throughout history you can observe how different models of seeing and relating to space – that is man’s relation to his surroundings – have

replaced each other, parallel with social, ideological, technical and other changes. Values of a given time will always determine the models and relations through which we choose to conduct our lives. If the values change, the relations change as well.

For the single person these models and relations can seem so natural that one can make the mistake and think that they are actual characteristics of our surroundings. Through a given time’s system of values we structure our surroundings in such a way that they appear meaningful and as an understandable entity.

However, at the same time this specific relation also sets up a kind of limitation for what we perceive and understand from our surroundings, because it excludes or surpresses any knowledge which clashes with its meaningful entity.

When I met Einar

When I first met Einar Thorsteinn seven years ago in Iceland I was working on a project and needed his advice. Soon after my initial meetings with Einar, my family and friends in Iceland started talking to him as well. First this left me with some confusion – not that I was directly uneasy about it but it just came with some surprise.

My father Elias and my friend Gunnar both started spending some time with Einar then. So after being slightly ashamed due to my own petit-bourgeois jealousy – that “my” Einar was seeing my friends without needing me to be involved – I was extremely thrilled to realize that I in fact was like a bird hit by two stones at the same time – (thus the earlier mentioned confusion). One stone: that I saw my own social ignorance, and the other: that I had gained a great friend. The fact that Einar’s virtue was spreading radiantly proved already in the early stage of our relationship what should later become a central issue: That all known (and unknown) physical structures, models or relations exist as socializing potential.

The square root of the end.

Olafur

List of credit

Sebastian Behmann
Dirk Buddenberg
Caroline Eggel
Bo Ewald
Sebastian Fessel
Thilo Fuchs
Switbert Greiner
Gretar Gudmundsson
Frank Haugwitz
Haukur Halldorsson
Jürgen Hennicke
Tony Huang
Pat Kalt
Andreas Koch
Susanne Küper
Manuela Loeschman
Ilse Schmall
Vinsenz Sedlak
Ethan Sklar
Ian Stewart
Henrik Suhr
Ole Vanggaard

Seglagerdin Ægir
Trefjar hf
Malmsteypan hf
Morgunbladid

References

Life's Other Secret – New Mathematics of the Living World, Ian Stewart
On Growth and Form, D'Arcy Wentworth Thompson
The Pursuit of Perfect Packing, Tomso Aste and Denis Wearie