

Space

Our relation to our
environment & how we rate
it aesthetically



Introduction

Throughout my life, I've felt a deep connection to space and architecture. Just like music, architecture could move me, change my moods and stimulate me to think further or in different directions. The more I deal with film and Production Design, the more I ask myself where does that feeling come from? How can our environment influence us so strongly?

I am interested in the emotional power of space. The environment shapes our visual and psychological experience. It is always part of our existence, even a condition for our existence. I want to study the role that our environment plays in our lives. The first chapter of this work will deal with the questions: What is our relationship with space? And **what is space to us?**

Through film and especially the Production design I can see that space can evoke emotions quickly and communicate stories, too. So following my research on what space is for us, I'm going to study the emotional influence of space.

How do we read the visual language of a space? What is the 'language' of space? And **how does our environment communicate and influence us?**
How do we rate space aesthetically?

In order to find out how space communicates its atmosphere and mood, I wanted to first understand what is space and how do we perceive it. I've done research on my questions into various areas of philosophy and science to find out why the things I feel are the way I feel them. So this work is based on my personal experiences and the research I've done in the past year.

The scope of this topic is unfortunately too big for this work, so this work is only a touch on the subject that I would love to deepen in future works.

In order to answer my first question, I will firstly talk about our perception of space and how we use it. Furthermore, I will write about how our brain processes space and how we find our orientation. After an introduction into aesthetics, I will talk about a few different elements that come into play when we evaluate an environment. I'm going to deal with the subjective elements but mostly try to determine some general aesthetics. Understanding our relationship with space, and how it can influence us emotionally in real life, will help me (and I hope others, too) in my process of designing for film.

Content

Introduction	0-1	Individual aesthetics	17-18
Chapter 1:		Place attachment	19
What is space (to us)?	3	Aesthetic standards	20-23
The connecting creatures	4-5	Colour & Light	24-25
Perception of space	6-7	Patterns	26-29
Creating space	8-9	Symmetry	30-31
Orientation	10-11	Function & Form	32-33
The brain's spatial representation system	12-14	Symbolic & romantic beauty	34-36
Conclusion Chapter 1: What is space (to us)?	15	Conclusion Chapter 2: How do we rate space aesthetically?	37
Chapter 2: How do we rate space aesthetically? How do we get influenced by space?		Conclusion	38-40
Introduction Aesthetics	16	Epilogue	41-44
		Bibliography	45-46

Chapter 1

What is space (to us) ?

In order to understand how space is perceived and interpreted, I wanted to first understand what is space exactly.

The encyclopedia Britannica defines space as a boundless three-dimensional extent in which objects and events occur and have relative position and direction. ¹

The existence of space is seen as the condition for the existence of any matter.

Space is the containment of all perceivable things. Every matter/substance/being fills up a part of space and belongs to a particular place in that space. Once the matter moves, it will fill up another part of space and will have a new place as well. The space, however, is unmovable, fixed. ²



Chapter 1: What is space (to us) ?

The connecting creatures

In the beginning of humanity, space would have been simply nature. However, even without any artificial environments, all space is not only seen as the ominous, natural space, but also as different separated spaces. In the space of nature, the space of a forest and a beach are parts of nature at the same time as they are their own spaces.

So generally a space is made up of different components, that stand in relation to each other and together form a unity. ³

The fact that we separate space doesn't exclude the fact that space can still also be perceived as one unity. Just as there is only one general space, of which all other spaces are pieces, there is also every piece of space with a form of uniqueness.

For the practical use of it, we divide space into different unities which as a cause and outcome of this division, are framed with limitations. Only us humans are able

to connect and separate in this way. As we see two things as separated, in our mind we have already related them to each other, and separated them together from the rest or the in between. We can only perceive something as connected, if we have in some way separated them from each other before. In any case, the one is always the condition for the other.

Georg Simmel, a German philosopher illustrates this theory of separating and connecting in the concept of the bridge.

To be able to build the bridge, humans had to see the two banks of a river as separated, but also imagine them as pieces of one, as belonging together. Once the bridge is built, the idea of connection receives a body.

But before we would build the bridge, humans performed our first act of separation by inhabiting caves. ⁴ Now there was an inside and an outside space. By separating the spaces, we created our function/purpose and feelings for the two spaces. The inside became the refuge and protection and the outside the danger and vulnerability. The refuge is kind of the essence of any inside space still today. Without the inside, our lives would be an endless movement ruled by fear and constant fleeing. ⁵

In philosophy, inside and outside are often linked to being and non-being. In the space of inside and outside, our being seems to be confronted with the world's being. The French philosopher Gaston Bachelard says, that this separation carries the sharpness of yes and no . Here we can already see a glimpse of how strongly space and thought are linked. ⁶ With the creation of the primitive hut, we constructed our first, own space and with that changed the forms and shapes of the inside as well as the outside.

For Georg Simmel, the people who first built a way between two places, performed one of the biggest human accomplishments. Maybe they would have walked those paths again and again and through that in thought, subjectively connected the places, but only when the way was visibly built, were the two places unmistakably and objectively connected.

When we separate, we always create a border or an outline in some form. The limit/border marks the difference of spheres. It also becomes a more alive energy that pushes towards and at the same time encloses.

We can already see, that since the beginning of humanity, space has been created by humans. It is at the core of our being to create and change our environment. And doing anything with a space is only possible for us, because we can separate *and* unify.

Every border brings an offensive and defensive force, a state of tension.

Additionally, a border also creates the space of the ,in between'.

The ,in between' is a neutral space as long as there is no (human) movement/ action inside it. The bigger the in between space between two spaces, the less tension there is. Simmel gives us the example of the Egyptian deserts that lie in between cities. This in between space, the desert, is meaningless (there is no movement/living in it) and thus forms a neutral ground to meet.

The opposite effect can be seen when we look at neighbours that live so close to each other that the in between space is almost non existent. Here, the tension can grow very high.

By enclosing a space, we give it a frame that works in the same ways as the frame of an artwork.

The frame of an artwork has 2 functions that actually are just 2 sides of one: The artwork vs the surrounding world, and the affiliation of his own body. The frame tells us that it contains its own world with only its own rules. The frame symbolizes the self-sufficiency of the artwork and at the same time intensifies the reality of it.

7

The invention of the door brought our concept of separating and connecting into one form/body. A piece of space was now connected and separated from the rest at the same time.

The door enabled humans to isolate themselves and to connect to others *when* they wanted. It is an essential need for the human to set a border, to isolate but always with a sense of freedom and choice. And the door, functions as the embodiment of choice.

Because it functions as a kind of joint, it sets *and* lifts the separation between inside and outside. Because the door can be opened, when closed, it can give a bigger feeling of closedness (because it is a choice) than just a wall. The wall is silent, but the door talks. 8

The borderless and the restricted come together in the door, in the possibility of continuous exchange and at the same time, the possibility of isolation.

Also, the human is a separating creature that knows no limits. The door represents the possibility to always get out of the separation and walk into free space.

The door also is another good example for how we can see space as one big space and at the same time can understand divisions inside that one big space as smaller spaces that together form that one big one. Everything is in relation to and at the same time part of one big cosmos.

Setting limits or borders, and being able to cross/travers them, is one of the biggest skills that make us human, according to Georg Simmel.

Simmel calls us humans the connecting creatures that always need to separate because without separation we can't connect.

Any creation with and of space is based on this concept of connecting and separating. We make arrangements or groups of materials and/or objects that connect with each other and as one separate themselves from the rest. Whatever we do in space or what we create, always holds the theory of connecting *and* separating. This duality of limiting and liberating, inside and outside is the basis for the human life itself (and the spaces that occurs in).

Chapter 1: What is space (to us) ?

Perception

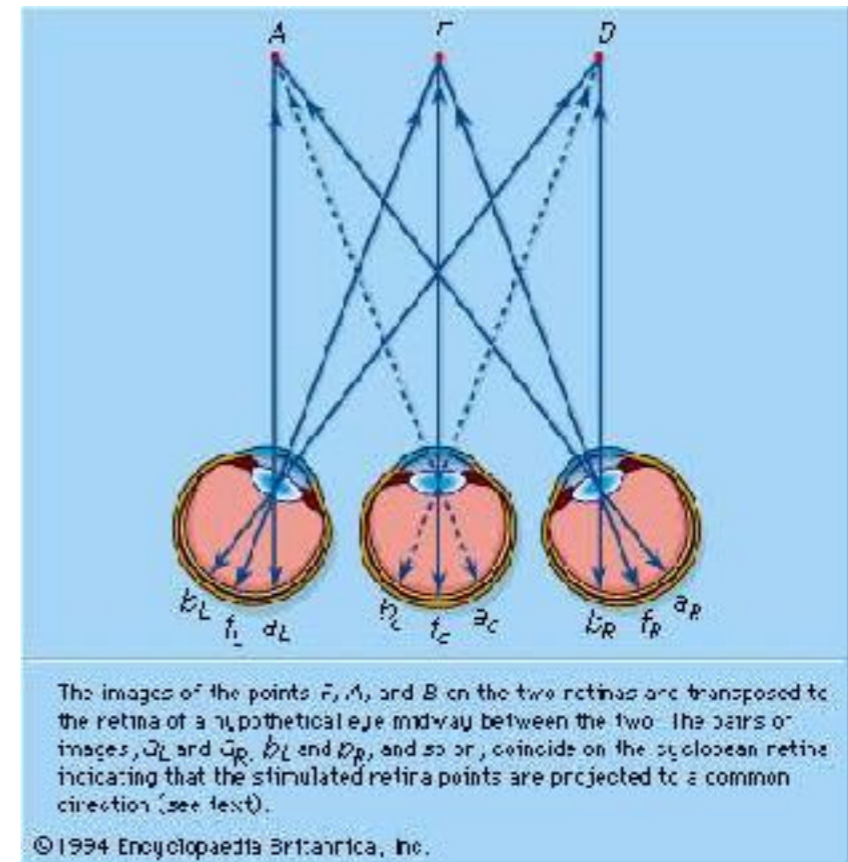
The process of perception is categorized into 3 steps. The first step would be sensations, that in the second step, the organisation process, are given a meaning. The last step is subdivided into the deep perception, the ordering of areas and the Gestaltgesetze. (rules of shape) These rules try to describe how the human experience of space is shaped.¹⁰

Psychologists found out that all perception starts between our eyes. This can be seen as the starting point for our experience of space and in Gestaltpsychology would be the first step of perception, the sensation. Space has the three dimensions, width (horizontal plane), height (vertical plane) and the depth (sagittal plane). These dimensions we divide again into different sectors: above or below, in front or behind, etc. The three dimensions meet our eye in one single axis.

We don't see a different world in each eye, but instead see a so-called Cyclopean space, as if the images from each eye fuse to produce a single visual field.¹¹

Usually, our eyes start to 'read' a room from the centre of the space. But our feet actually make the first step in the perception of space. We literally feel the ground underneath us. It can immediately give us a sense of security or do the opposite. From that, our eyes wander to the centre of the space, to the restrictions of it (e.g walls). We might go to furniture, that is connected to the ground. View the restrictions and come back to the centre. At the end, we look up at the ceiling, and either back to the centre or the ground.¹²

Now we have assessed and interpreted the distances, shapes and possibilities to move.



Sidenote: We may start with our eyes, but the position of our body in the space can change our perception of the space completely. Perspective is also an influential aspect when we perceive space.

Distance can't actually be measured by our eyes, we need to have experiences to learn it. (Soldiers that have been in a submarine for long enough, will not be able to see depth anymore because their brain got used to only seeing short distance. These soldiers or marines would have lots of road accidents after their time in submarines because of that) **13**

Perception: Perception is a process by which we organize and interpret our sensory impressions in order to give meaning to the environment. (Stephen P. Robbins)

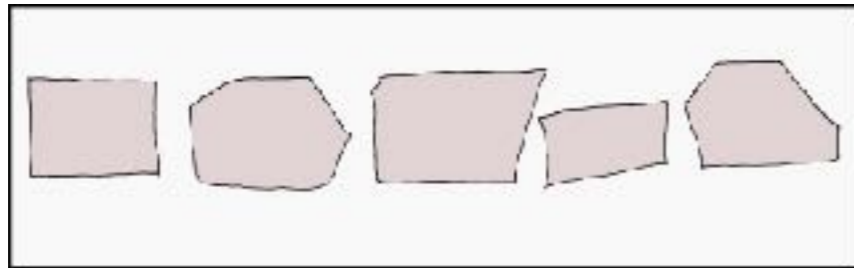
Sensation: A sensation occurs when energy of the external environment or the body stimulates receptors in the sense organs.

„Space perception provides cues, such as depth and distance, that are important for movement and orientation to the environment.“ ¹⁴

After our eyes have read the room, we might be quick to explore it as well. Usually when we come into an unknown space, we open all the doors and drawers until (through this movement) our brain has fully understood the space and we can come to an interpretation of it. ¹⁵

Gestaltpsychology is discipline dealing with our perception. Gestaltpsychologists believe that our brain doesn't see reality as it is, but makes images of it as we interpret it. The rules of shape (Gestaltgesetze) describe the different things our brain does to understand, organize and interpret our environment.

The rule of conciseness says that various elements set themselves apart and at the same time are perceived in front of a background and thus also seen as a group. Furthermore, it includes the human tendency to simplify shapes or objects or anything we see, into geometrical elements.

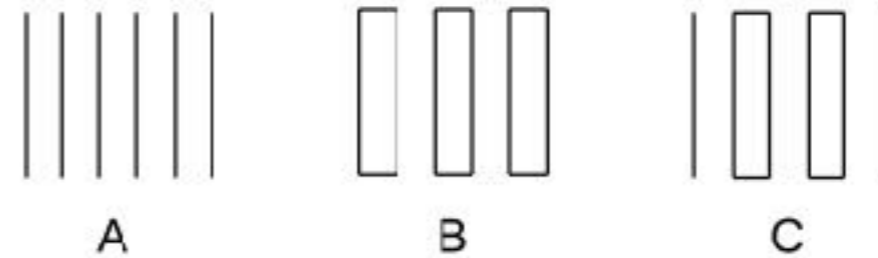


The rule of similarity and proximity says that things that are close to each other (and in similar circumstances) are perceived as associated/belonging together.

This rule illustrates **the rule of shape** too. According to which the whole means more than the sum of its pieces/parts. The rule of proximity and similarity concludes which elements will be merged as shapes and which won't be perceived as part of that shape.

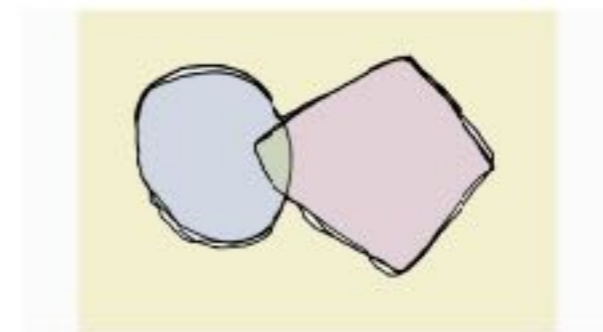
The rule of continuity proves that people tend to see elements like dots in a row as together, as a unity. Also we would connect two lines that cross each other as a continuous whole.

The rule of nothing without the rest shows that humans require a certain degree of harmony and unity in our perception. They show that we don't find it easy to see elements isolated. Here we see 6 vertical lines with different sized gaps in between them. We tend to not see 6 lines, but 3 columns, which we see in B. C gives us an uncomfortable feeling because we can't connect the outside lines to anything, a rest stays. It evokes a certain disharmony.



The rule of closeness

This rule says that areas that are enclosed by lines as well as build a greater outline, are seen both as independent elements and as a bigger, closed shape/ whole. ¹⁶



These rules show us how deeply rooted the concept of separating and unifying is in us. Space and how we see it often carries a duality in it. We understand it on a deeper level than simply visually understanding it. Whatever we perceive is immediately interpreted with the surrounding parts and also the 'background'. Already in our process of perception, we try to make a coherent image of everything.

Chapter 1: What is space (to us) ?

Creating & inhabiting space

Scientists believe that it is through the building of shelters that we were more and more protected from natural predators and so were able to advance intellectually. Our forebrain (cerebral cortex), which is the center of executive thinking, planning and emotion, evolved a lot more than that of any other animal. This shows that the building of our own homes is a key part of our evolution. Without the house we would have not been able to evolve thought and imagination. ¹⁷

Building our homes and inhabiting them has been a human trait for hundreds of thousands of years. Space gives us this opportunity to move and interact. But we also use space to create space again.

Our creation of space is very linked to our development of an identity. The possibility for us to form a personal identity originated with the possibility to isolate ourselves from the rest of the world. Without this spatial ordering, we wouldn't be able to see ourselves apart from the group.

To create is to control our destiny, to satisfy our need for order.

Our creations express an identity towards the rest. Objects and clothes are part of this as they can serve as ways of communication and expressing an identity (for example part of a football club). Creating our own space is another form of wearing the inside on the outside and through that we influence our environment and the people around us. ¹⁸

In our thoughts we have already created another space or object, but by creating it in reality, we give *our* inside a form/body.

Building a home, means to be able to live in the deepest world-creating and world-preserving sense.

The anthropologist Mircea Eliade says that to be able to live in the world, one has to create.

In any case, the beginning to build anything a house starts with taking a part of the chaos, giving it order and proclaiming it as a sacred space in comparison with the rest. ¹⁹

Inside our home, we create and order again and again as well. Filling a space means giving each item that we use in life a certain spot. The human space is a functional, organized system of places and spots where our things belong. This is the same for our own selves. We need to have a place where we feel we belong. Where we can ,order' ourselves. ²⁰

Martina Löw in her book ,Raumsoziologie', gives us 2 processes that also influence each other in space. The first is the placing of things and the second is the ordering or making categorized groups of things. ²¹

This supports the theory of our deep need to create and recreate all the time. In our house, we create order and chaos all the time. This means, we don't see our spaces or space in general as an unchanging entity. We can ,lose' our space in the chaos, and we can create our own space again and again. This is the human space, or as the German philosopher Otto F. Bollnow describes it, the ,lived space' meaning the space we live and create (in). ²²



The first buildings by Sir William Chamber (1759)

Chapter 1: What is space (to us) ?

But without inhabiting anything, we would be lost in the stream of time, we would have no ground to hold on to, nowhere to fix our identity onto or represent it by. This is one of the reasons why the house, specifically the home, is so connected to our identity.

Creating and inhabiting our creations is expressing our identity. This created space of identity we call home. The walls of our home shelter us. It's the space where the non-I protects the I. And because of that, the ,I' can develop freely. The home portrays a sense of freedom of thought. Furthermore, it is an image of security and protection. And us humans, but also animals, we like to withdraw into our corner of the world. It even gives us physical pleasure to do so. ²³

This feeling of the refuge is something we share with all animals. When we escape the storms of nature in the protection of the house, this feeling comes to us just as it does to the rabbit in its burrow.

And even if today's dangers are very different, the outside still carries that feeling of chaos and danger in comparison to the house.

The home/house and the temple are essentially the same for the dutch religion-philosopher van der Leeuw. ²⁴

And the philosopher E. Cassirer also writes about a „healing that starts with, that from the whole of space a particular piece is separated, differentiated from the rest and cared for religiously.“ ²⁵

The home, even in our atheist time, keeps a certain sacral character.

Bachelard writes: „The house allows one to dream in peace. (...) The values that belong to daydreaming mark humanity in its depths.“ ²⁶

For Gaston Bachelard, it's not so much a conscious plan of the mind to daydream. The daydream comes to us in the solitude of the house.

When we create our own spaces, we also enable our imagination to visualize virtual plans and thoughts. The creation and arrangement of space and objects inside it lets us order our thoughts, too.

Space motivates creation and movement. But before the human action comes the imagination. ²⁷

The total (but temporary) solitude/isolation the house offers us, makes us be able to think, reflect and imagine. We can desire solitude or suffer from it, but it will always be the time and place of our most deep thoughts.

The places we can go to in our imagination can let us feel free and give our dreams and goals images. Once we have visualized our dreams, we can come back to reality and create them. By escaping space completely (through thought), we can become more aware of our existing and dependance of space for that existing.

Like on a boat in the middle of the ocean, once the mind can fully escape the boat and fly over the oceans, it realizes it needs the boat to come back to, and maybe then one can fully feel one's identity/existence. ²⁸

The home is the space of thought and dream, the space of identity.

But even if the home gives us security and freedom, staying in all the time would make our home a prison.

Both, the intimacy and security of the home and the danger of the outside, are part of us as our identity. We need to cross the borders of the house just as much as we need to set them.

A city or village usually has space of a group identity, usually a centre that doesn't mean a geographic centre. This is the space where the group identity finds its fixation. In the middle ages the space of the group would have been the church or a castle. The space of interaction and group-movement. But even today, wherever we live in a city, we have a connection to one, maybe not always possible to exactly pinpoint, middle in the city. (middle not meaning the exact middle but a point that we connect to as a ,heart') ²⁹

This is the spatial identity we share with a group, the identity where we *want to* be part of the rest.

Still today, all roads in Italy have signs showing how many kilometers it takes to Rome. Everything is connected or looking for a connection to that middle, that place of togetherness. We see again, where we separate, we always connect. The creation of space and human activity in it, defines the ,lived' space.

Chapter 1: What is space (to us) ?

Orientation



Orientation has always been one of the most important element in our perception of space. When looking for a shelter, or building one, a sense of overview and orientation was key. This sense of orientation was so important that the monkey at one point in our evolution even stood up on its two feet, even though that used up a lot more energy than moving around on 4 feet.

But how do we find our way around in an environment?

The ethnologist A. E. Jensen found out that the native people of an elongated Polynesian island with one strip of not really accessible forests in the middle, formed their system of orientation with 'in the direction of the forest' and 'the direction of the sea'. They would never think of crossing that forest and getting to the other side through there. The inside of the island wasn't even part of the 'lived space'. For them space was thought in ring-form. ³⁰

Our outside life is mostly directed by paths and streets. They guide us through space and define its accessibility.

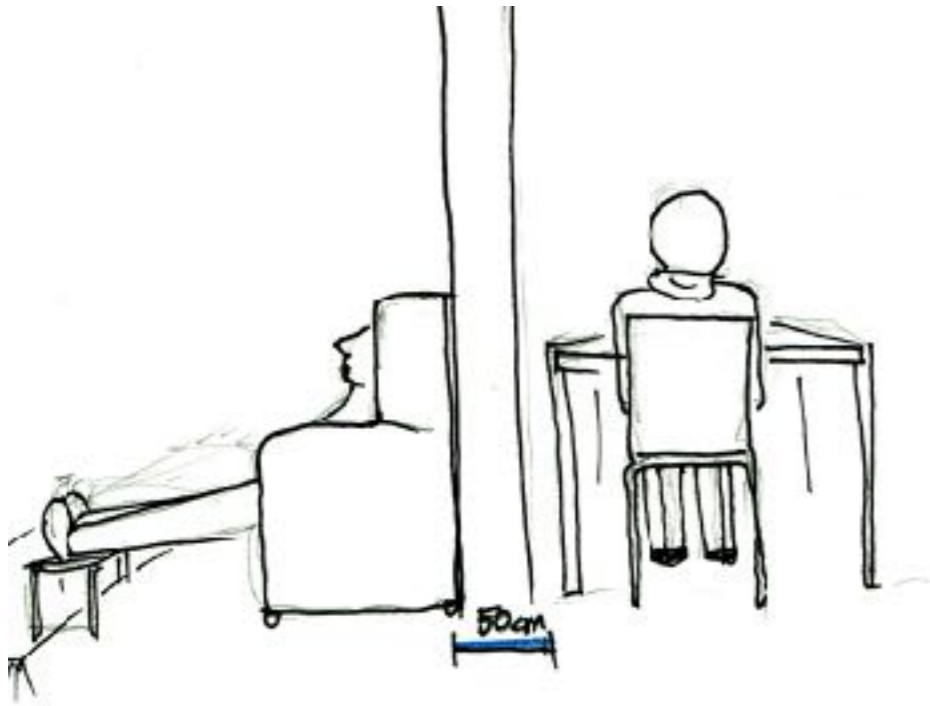
Bollnow finds it astonishing how fast a path is engraved into our behaviour and how long it stays there.

Most paths are formed out of a need. They are not necessarily planned. Once they are visible, everybody will use them, no one will be quick to vary from the visible path. If someone would want to modify a street/path or make a new (maybe even better) one, it will take great effort and planning. Even animals use the same paths, which are not always visible like the human's paths, but are also used throughout hundreds of years. ³¹

A native people in the South American jungle, gave an image of space that was based on their practical way of moving around which was the river. Their maps were all based on river upwards or downwards, not north and south. Left and right is each side of the river and the river itself is drawn a lot straighter than it would be in reality.

When we are on a boat on a river, we don't feel the curves and corners we take as much as we would when we walk.

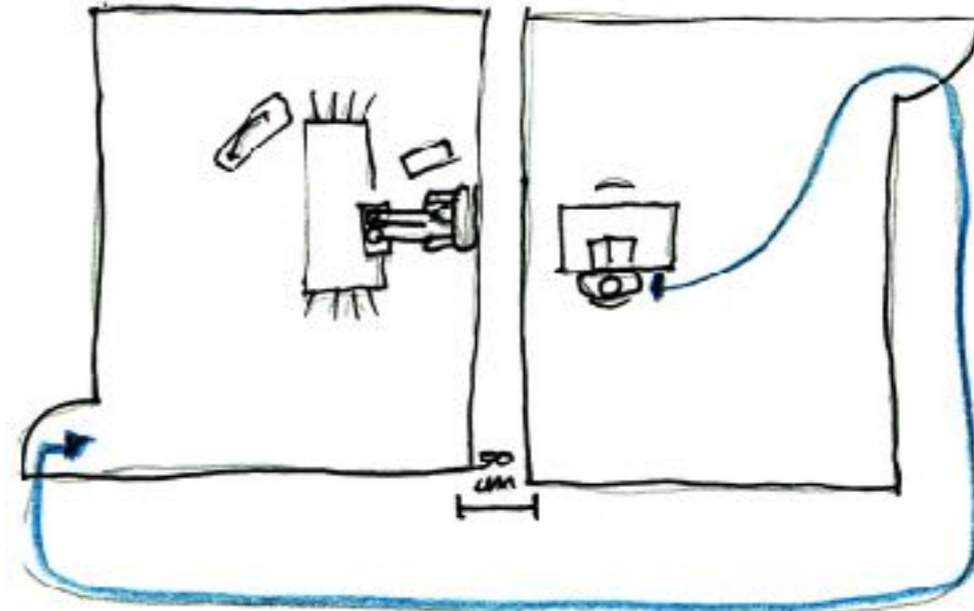
So the map is almost a map of the experience of space, it's based more on feeling and practicality than theory (nothing was measured). Our brain orientates in space through the storing and monitoring of our *movement* in a space. ³²



We create our reality of space through its accessibility.

Even if we know that in theory, the distance, for example, between us and our neighbour might be just 50cm (the width of the wall), in practical terms there is a lot more distance between us since we would have to get up out of our house, knock on the neighbour's door and go into that room to overcome the theoretical 50cm distance. (see drawing above)

Antje Flade, a psychologist specialized in environmental behaviour, even categorizes space by our physical use of it. She categorized space into 4 distances. A proximity of 0-45cm is called an intimate distance (kissing or fighting). He adds the personal distance from 45-120cm and the social distance is our interactions on work levels that he gives 120-360cm. Everything beyond 360cm is classified as public distance. The personal space supports us mostly in



communication and control. It's thus not only about security but also our ability to act, evolve and learn from each other. ³³

How we move and orientate in a space, is completely dependent on the form, function and accessibility of the space. Through our movement and activity in a space, we also always change the space.

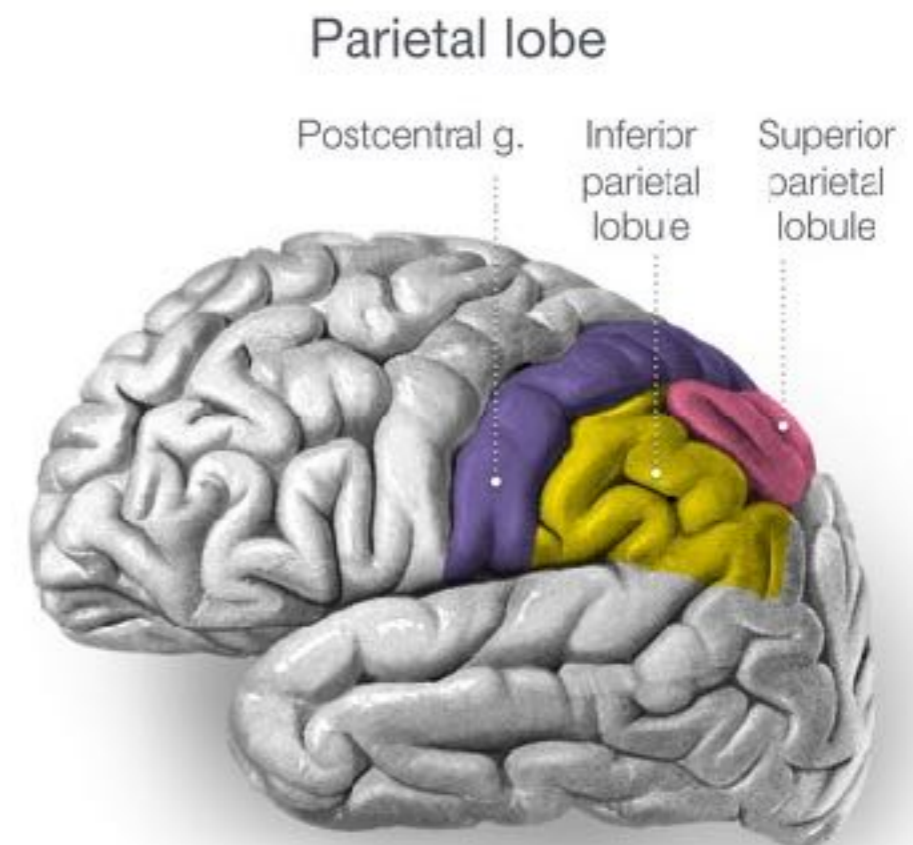
The practical use of space will always overrule the theoretical knowledge. So we know our action in space has a lot to do with how we process it. But how do we process space? What is happening in our brain as we experience it through exploration and visual perception? How do these discrepancies between reality and our interpretation of it occur?

The brain's spatial representation system

In recent years, neuroscientists have found out more and more about how our brain processes space. Two different techniques made it possible to follow neurons in the brain and see which parts of the brain are active when. Researchers could read signals of brain cells by using micro electrodes positioned close to the cell bodies.

The brain has 3 systems for processing space. The first one lies in our parietal lobe, which controls our left-right coordination and everything we do in reachable distance. The reachable space is also the space we use mostly.

The second system is the kind of auto pilot we can go on when we commute to places we already know the way to. This happens in the Striatum. When you do spatial behavior over and over, it becomes a habit and so the Striatum takes over and we might not even remember how we got somewhere. 34

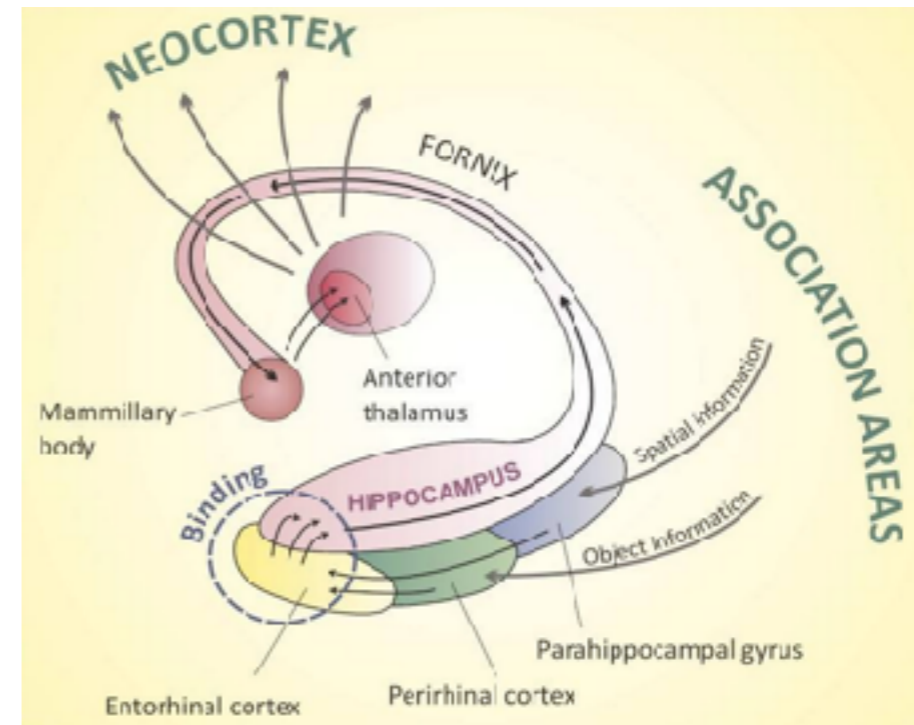
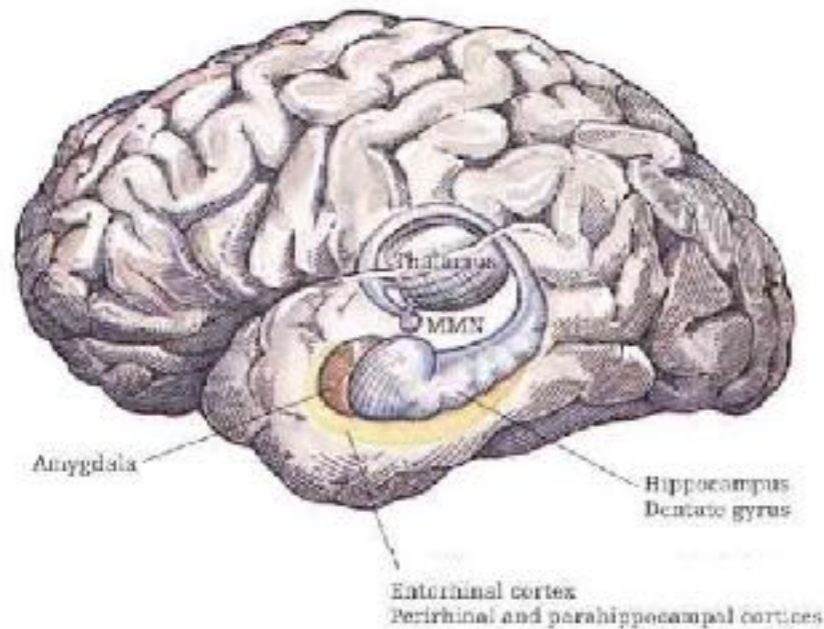


The hippocampus, the third system, is the part that has to react to changes in our environment. If an obstacle pops up in our usual way, the striatum turns to the hippocampus. Together with the entorhinal cortex, the hippocampus provides memories and navigational information. Also it is the part that has a lot to do with memory, although we don't know exactly how yet. It is the part of our brain that is responsible for coding memories. It has a complex and specialised system of cells that continuously updates position and direction, generating cognitive maps of our surroundings as we move in a space. ³⁵

It seems to make a map of memories inside our brain so we can plan a new way around something that maybe just came up in our usual way. It's closely connected to our imagination and memory so that it can 'fill in the blanks' to help us move forward.

The brain is very dependent of our physical exploration of space to fully understand it. When we go into a new place we first of all go everywhere, open all the doors. We have a need to feel comfortable and know the spaces we are in.

The Amygdala talks very closely to the hippocampus. It is the part that controls fear in us. The other strong connection is with the anterior hippocampus which is responsible for threat, anxiety and other emotions. ³⁶



To understand memory (the hippocampus) John O'Keefe implanted a little thing into the hippocampus of a mouse in 1997 and put her into a new environment. And while the mouse was walking around and eating rice, certain hippocampal cells fired only when the animal was in a specific location in the environment, but never elsewhere. So this part of the brain was totally inactive except for when the mouse went to that one point in her cage, then that particular part of the brain lit up. O'Keefe and Dostrovsky found that hippocampal cells responded specifically to the current location of the animal. They called these cells 'place cells'. Different place cells were found to have different firing locations, which working with grid cells make place fields. ³⁷ The place-fields show up in a skeletal map from the moment we experience an environment for the first time and evolve further with our experiences. (see Figure 2 on next page) The findings suggest that the first, skeletal maps are drawn from preexisting maps in our brain. Through experience they change to fit the specifics of the space. ³⁸ Along with place cells, our brain uses grid cells, head-direction cells and border cells, that fire up only for border of our environment. ³⁹

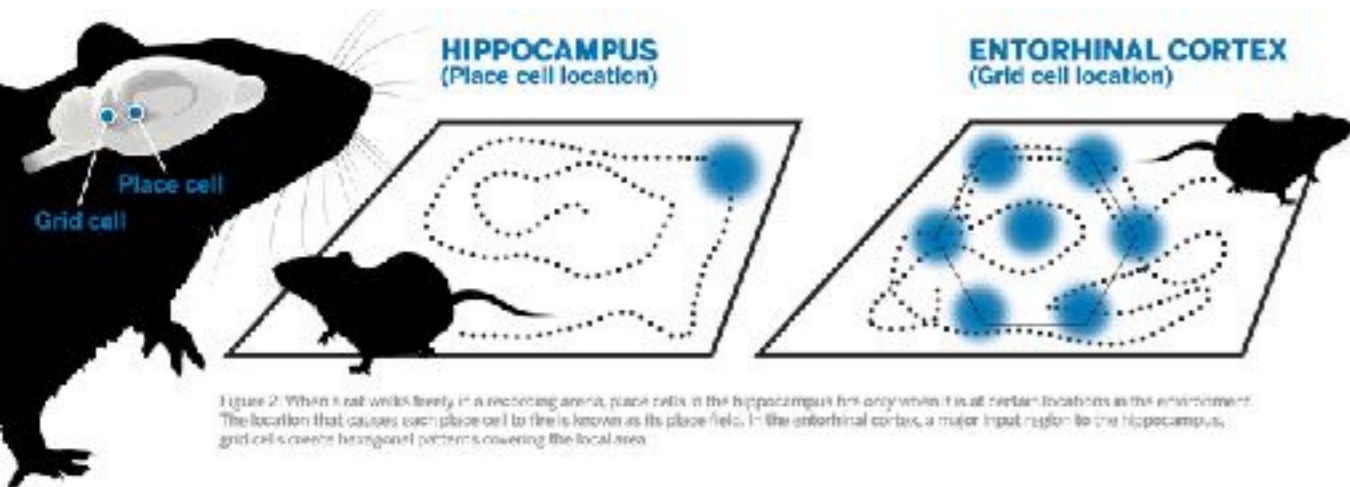


Figure 2: When a rat walks freely in a recording arena, place cells in the hippocampus fire only when it is at certain locations in the environment. The location that causes each place cell to fire is known as its place field. In the entorhinal cortex, a major input region to the hippocampus, grid cells create hexagonal patterns covering the local area.

Head direction cells are cells that become active whenever we face a different direction. If our body switches to the opposite wall, the head direction cells, as well as grid cells turn to 180 degrees. ⁴⁰

It seems like an inner compass, but these cells use our movement and different visual changes in our environment to know when we turn. So when we physically turn, these cells will tell our brain that it needs to turn the grid too so that our map stays accurate. Our brain is able to generate thousands and millions of maps of our environment.

These cells always have a little bit of a mismatch, so we need to have visual things that indicate space and orientation. For example in a car, it is visual features of our environment that the hippocampus has to rely on because our body isn't physically moving in different directions.

The exploration, but also the visual landscape is what the brain bases its map on. But through our experiences and memories we evolve this network of maps as we recreate them. This is how we can understand virtual space in videogames or films. ⁴¹

Another discovery was that the place cells also do remapping. When we think of a place of our past, the place cells fire up the same spots to evoke the memory of the space.

When we recall a memory of a situation the place cells bring to our mind the spatial context of those situations. But Place cells may begin firing, stop firing, or change their firing location. So when we recall a memory, a new map is actually produced. These changes, scientists believe, could be induced by changes in our mood and motivation (why we go back to that memory) or also our behavioural

context at that moment. ⁴² Remapping is thus a necessity if place cells express memories.

The number of place fields stored in the hippocampus is not known, but if place maps are expressions of individual memories, that number should be very large. Studies in human subjects show that overlapping hippocampal networks are also activated during sleep and imagination of fictitious experiences. ⁴³

These findings show that our experience of space is closely connected to our memory and dreams. We use space not only in reality but we virtually utilize it to store and express information.

Neurologists also found out that place cells can even respond to nonspatial inputs like odors when they've learned relationships to locations. And at times, the brain can let place cells respond to information about the spatial environment (the function or purpose of a space). ⁴⁴

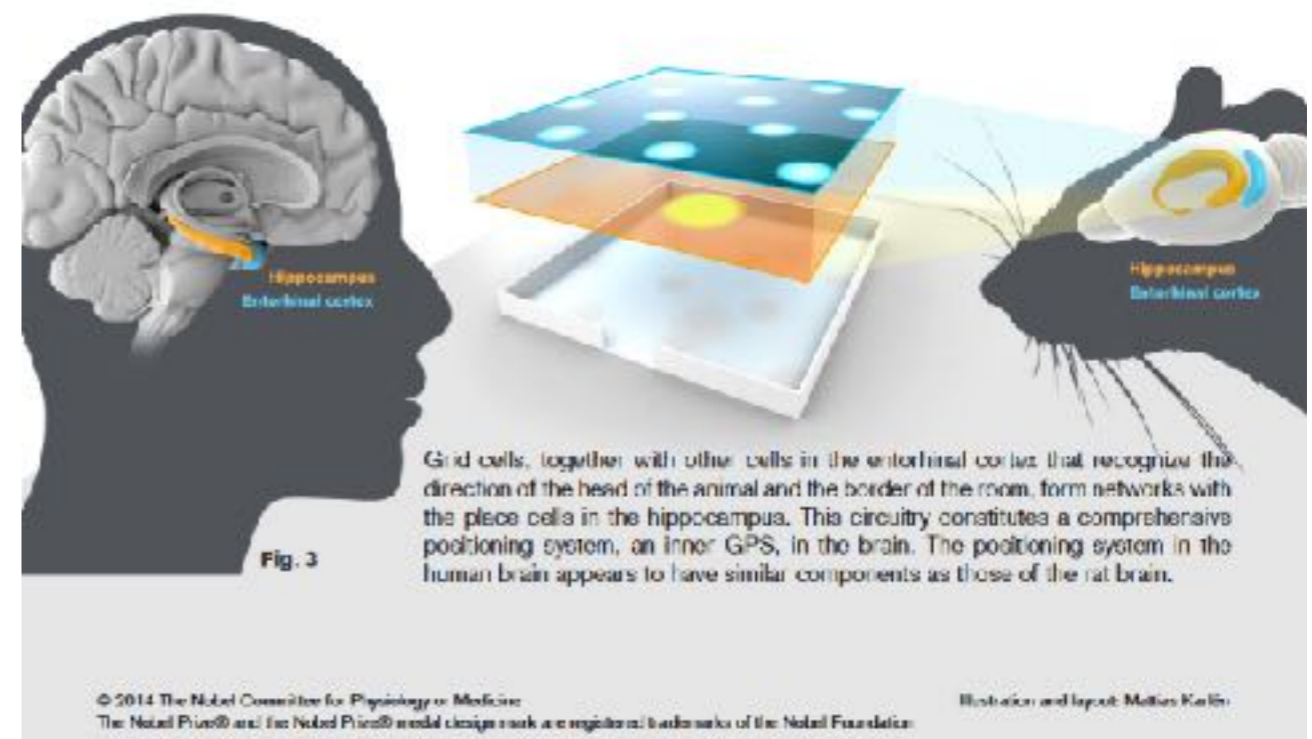


Fig. 3

Grid cells, together with other cells in the entorhinal cortex that recognize the direction of the head of the animal and the border of the room, form networks with the place cells in the hippocampus. This circuitry constitutes a comprehensive positioning system, an inner GPS, in the brain. The positioning system in the human brain appears to have similar components as those of the rat brain.



The 'where' component of our memories has been used to enhance memorisation for thousands of years. One example is the 'method of loci', a well-known remembering strategy that can be traced back to the ancient Romans and Greeks. It commonly involves visualising each item that is going to be remembered – for instance a word or a number – in different positions in a familiar building, a so-called 'memory palace'. On the cellular level, different rooms in the memory palace are represented by unique ensembles of place cells. Thus, the place cells 'carry' the memories and keep them separated.

Conclusion Chapter 1: What is space (to us) ?

Human activity (re)creates space not only in reality but also virtually. It all began with the concept of connecting and separating, the distinction between inside and outside that sparked an evolution of thought. We experience space through our movement and action but also through our thoughts, memories and dreams.

For the psychologist Alfred Lang, our surrounding space *as well as our memory* can be defined as an organized system that is filled with interpretation possibilities. The memory, which developed ontogenetically, acts as the carrier of inner, psychological dispositions. And the built environment, meaning all objects and buildings, serves as external and accessible cultural storage, or you could say as the concrete memory. ⁴⁵

Because our action in space and our creation of space, we always influence this concrete memory and at the same time influence ourselves again. Space is the result, the base and the structure for human activity, creation and memory. We represent space internally and space represents our internal being, too. We act in the space and the space is in us. The room belongs to humans like the body and with that too, we have this floating relationship of being having. This summarizes our relation with space as an ever changing, interdependent circle of expression

and influence. Or as the philosopher Gaston Bachelard writes: „ I am the space where I am.“. ⁴⁶

These findings show us the close relation we have with space and our environment. We use it as an individual identity as well as our group identity. It is activity and movement, creation and imagination. Our beings are so closely connected to space because we use it in creating reality *and* creating our dreams and memories. It is part of us as we are part of it, we influence each other in a continuous circle. The duality of space lies in its possibilities for us to separate and unify. Ideas such as a door that we use in space, helps us evolve intellectually because we can fully understand a concept of isolation and freedom of thought. Our bodies and the movement of our bodies is half of our perception of space. We feel space with our senses and through our movement store the information. Our perception of space connects our bodies and the spaces they're in. That is how the reachable space is the most 'real' to us (example of the 50cm distance), and the further the space is the more it is conceptual. We need to engage with space in order to really understand it. We are our spaces and in a lot of ways, our spaces are us.

The way we perceive space makes it possible for us to use it the way we do.

But how do we rate a space as pleasant or unpleasant? How does space evoke emotional reactions in us? And is this only subjective or can we make up general aesthetics of a pleasant/unpleasant space?

Chapter 2

How do we rate space aesthetically?

Something is called aesthetically beautiful if it evokes the feeling of inner approval and beauty. The word comes from the Greek word ‚Aisthesis’ meaning feeling, a perception through senses, a sensation. Aesthetics can be described as the doctrine of beauty, the science of clarifying the personal and general conditions/causes of liking and disliking. ⁴⁷

Today harmony is basically recognized as beauty. But what is harmony exactly?

If you look at the origin of the word, it describes only musical beauty. „The combination of simultaneously sounded musical notes to produce a pleasing effect.“ ⁴⁸

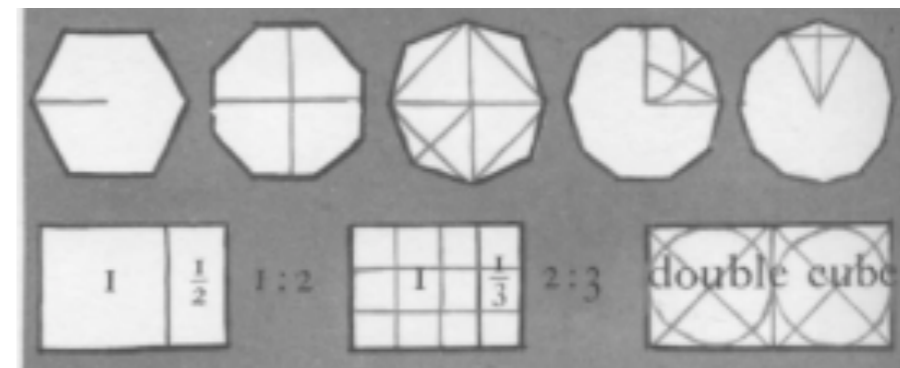
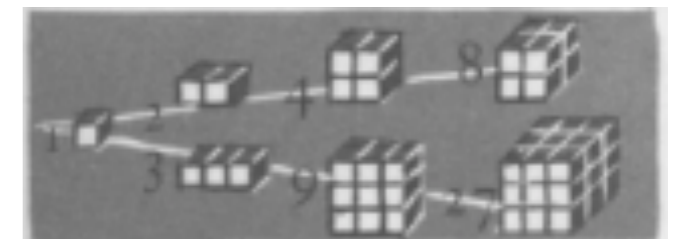
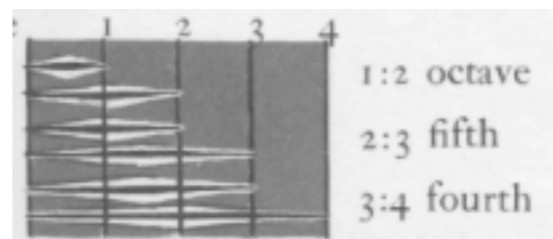
Pythagoras (582-510 B.C.) was a polymath, a great thinker of the hellenistic period in classical Greece.

Pythagoras discovered that the first and fourth strings of a lyre when sounded together produced the harmonic interval of the octave.

Pythagoras found out that tones can be measured by striking cords proportionate in length. Having once established music as an exact science, he applied his newly found law of harmonic intervals to all the phenomena of Nature, even going so far as to demonstrate the harmonic relationship of the planets, constellations, and elements to each other.

The great greek thinkers **Aristotle** (384- 322 B.C) and **Plato** (429-347 B.C.) built up on Pythagoras’ theories and Plato gives us the first harmonic scale as: 1:2, 2:3, and 3:4.

So for the first time, the harmony of music was translated (mathematically) into visual arts. ⁴⁹



Chapter 2: The influence of space

Individual aesthetics

Some things might immediately pleasure us aesthetically, other's allure might develop through our interaction with the space/object.

At the beginning of any aesthetic rating stands our perception and interaction with the space.

How our attention is driven towards different stimuli, and which elements actually will be taken in from reality and internally represented, depends a lot on individual experiences and memories.

Through the exploration of a space we build our cognitive maps. It is through movement and visual stimuli that we start the processing of space. But how we move and act in a space is also influenced by our needs, wishes and goals at that moment.

Kurt Lewin, one of the founders of the Gestaltpsychology explains in his theory, that in each of us there is a psychological field, which holds these needs, goals, dreams and insecurities. The psychological field of us humans is enveloped by a shell of facts. These facts are autonomous of psychological rules, but consist of physical, cultural and social criteria, by which the human gets influenced. ⁵¹

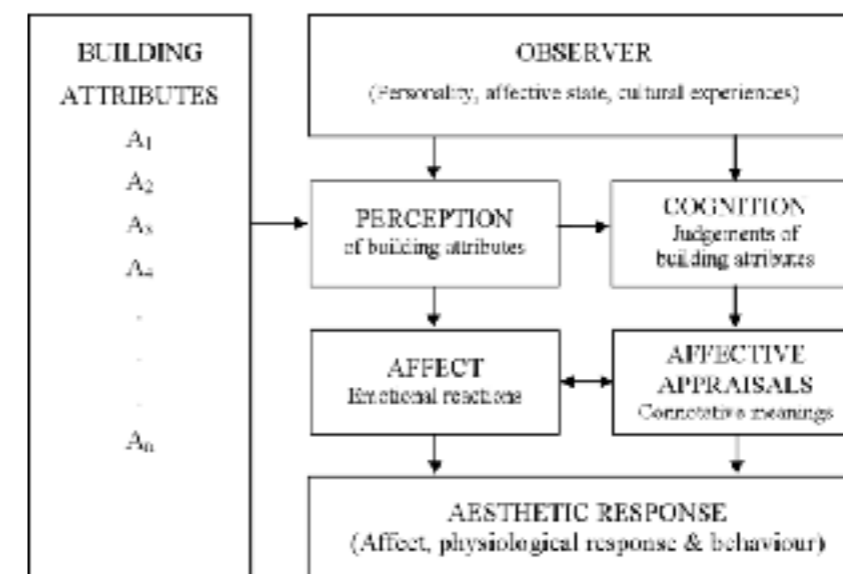
They can be age, gender, culture and personality. ⁵²

The elements of space give out different invitations to act (today we call them stimuli). When we see an apple in a kitchen, it can invite us to eat, we will feel stimulated to go to the apple and take a bite. There's usually a lot of stimulants in space and so it depends on the state of the psychological field, which stimulant will win in the moment. The stimuli of our environment will always have an effect on us, but it depends on the state of our psychological field and the shell of facts that surrounds it how we will act on the stimuli. Any space will influence our psychological field and can let us feel different needs more than others, which influences our behaviour and interpretation of that space. It will present

possibilities and hide others at the same time. The intensity of the invitation/ stimulant can be different, because it depends on the intensity of the need. ⁵³

The attributes of our surroundings evoke a psychological reaction, immediately when they are perceived. We are only partially aware of the effects, but we can't detract completely from them. We might feel them when we go into an impressive building or when we consciously feel relaxed in nature.

This reaction consists of a cognitive and an emotional component, that determine the aesthetic evaluation of that surrounding and thus the person's behaviour in that environment. Aesthetic standards and reactions, that are influenced by our psychological field, develop and change throughout our life. Through experiences our cognitive fields evolve and build up certain aesthetic standards. A kitchen, for example, because of certain experiences in it, might stimulate a feeling of togetherness. ⁵⁴



Nasar's model of the aesthetic evaluation of space (1994)

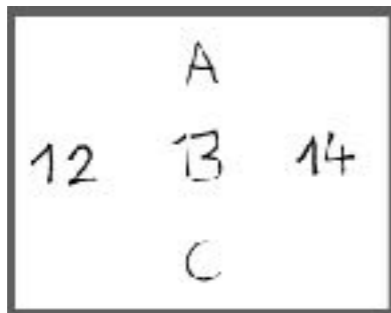
Chapter 2: The influence of space

There are different situations that are helpful/beneficial for our satisfaction of needs and therefore we are attentive to them. We never all feel the same intensity of needs or even the same needs, and that is mostly why our environment can't be interpreted exactly the same by everyone.

The last of the Gestaltgesetze, the rule of attitude, proves graphically how our psychological field leads to different interpretations of environments:

The rule of attitude

Our attitude towards certain things defines itself through the psychological field which over time, adopted tendencies to reach certain goals, believes and emotions. These tendencies will make us react positively or negatively. ⁵⁵ In the image some people will see a 13 and others a B, depending on the psychological field at the moment.



Personality is an important factor of our aesthetic judgement as well. The psychologist R. Gifford already found out that landscape paintings are judged differently by more extrovert people and more introvert people.

From the psychologist Jürgen Eysenck's results (1987) we see that introverts normally have a higher level of activation/excitement, meaning they have higher cortical arousal than extroverts. ⁵⁶ So introverts have a lower limit for stimuli and react to stimulation with stronger excitement. This means that they might need less activation than extroverts to feel the same thing. For example at a party, 100 people can all feel very communicative and active and another 100 can feel blocked and not communicative at all.

From these results the idea formed that people depending on their level of intro/extroversion aesthetically judge differently.

The philosopher Otto Bollnow additionally talks about our emotional state and how that influences our perception and interpretation of space.

He argues that on a sunny day, objects can seem a bit further, more free in the room whereas on a rainy day things can come close and feel more reachable. He continues that when we feel fear, spaces can become heavy on us, or just feel smaller. ⁵⁷

When we feel confident, the same space can open up for us.

In happiness we can embrace the distance, overview it and really experience it, when in sadness it can make us feel more stuck and heavy. He even argues, along with Binswanger, that when we are depressed we would hit our toes on hard obstacles more often. When we are happy the obstacles become soft and give us way. ⁵⁸

This change of feel and even perception of space caused by our emotions, also translates into how we feel with other people in a space. A lot of people around can make us feel jealousy and rivalry. We might feel like we stand in torturing narrowness to others, but once we accept a real collegiality, the tension can easily evaporate and the same space will feel friendly and maybe even spacious. Purely by changing our attitude, the space will feel equally shared, and not like others take away from our space. Bollnow gives us a quote from the poet Rilke for this idea.

„The *lovers* create mutually and continuously space, vastness and freedom.“ ⁵⁹

Chapter 2: The influence of space

Place attachment

A big factor in the development of our psychological field is our childhood. Field studies were able to show that aesthetic ranking of space is also connected to our childhood environments. People that had grown up in the countryside would rate images of nature aesthetically higher than people who hadn't grown up in the countryside. Especially the early childhood experiences (0-6) seem to be very influential to our aesthetic standards. ⁶⁰

The childhood home is our first and most influential experience of space. It is where we form our first memories, where we experience movement, interaction and stimulation for the first time. Most importantly, it is still today, our primitive refuge and body of protection.

In our childhood environment, we build up our first cognitive maps and our psychological field. All our movements and feelings are experienced for the first time and linked to these first sensations of life. We learn which shapes and forms help us in our development and which can become obstacles. We learn the rules of our culture and family and we even have our first own room where we can form our individual identity.

This close emotional connection to our childhood space is called place attachment.

With the use of memories of spaces in early life phases, diverse associations and therefore emotional reactions are evoked. ⁶¹ The childhood environment builds the base for our interpretation of all spaces to come. It is also a very intimate and private space that is deeply engraved in our memory.

~What would be the use, for instance, in giving the plan of the room that was really my room. (...) I alone in my memory of another time, can open the deep cupboard that still retains for me alone that unique odor, the odor of raisins drying on a wicker tray.' ⁶²

Experiencing space at different ages also has effect on our aesthetic sensation and judgement. Every new experience the place cells remap or make new cognitive maps. So the older we get, the more cognitive schemes determine what our reality is. We are more set on our thoughts and feelings about certain things. Also our bodies change with age which changes our ability to move and act in space.

Even if our childhood home forms the centre, the start from which all our cognitive schemes will develop, how we aesthetically rank something changes throughout our lives as our cognitive schemes change constantly as well.

This concludes my research on the elements that make our interpretation of space and objects subjectively different. Space is a personal thing as it is a big part of our memories and dreams as well as our reality. The way our psychological field is put together defines a lot about how we rate aesthetically. The psychological field holds our dreams and goals and so establishes a lot about our personality and emotional state which have an impact on our aesthetic evaluation, too. Furthermore is the childhood home an influential space for everybody, but in different ways and shapes so it becomes a more subjective part of our aesthetic evaluation of space.

Chapter 2: The influence of space

Aesthetic standards

In addition to our more conscious, learned aesthetic standards based on our childhood, aesthetic evaluation can occur unconsciously. These affective reactions come from mechanisms acquired throughout human evolution.

I've already talked about the parts of our brain that evolved a lot more than those of mammals. The brainstem however, still function in a similar way to that of other animals. Especially the areas that help us survive and pursue *pleasure*.

Food, mating and pursuit of refuge form the base for primitive survival. Today we have built a different world and survival has taken on a less objective meaning which varies depending on social class, geographical location, culture and more. However pleasure, mostly held the same standing for the past 200.000 years.

How we achieve happiness, satisfaction and enjoyment in today's world is subjective. Our interests and cultures have evolved, but the human brain is still imprinted with 'memories' associated with places and objects that made a chance of survival likely.

The architect Stefan Behling talks about snow monkeys enjoying a natural hot tub just as much as we do, to give you an image of that primitive pleasure that lies deeply rooted inside us. The hot tub stimulates our senses in a simple and effective way. ⁶³



The Savannahhypothesis

For the earliest humans pleasure involved nutrition, water, shelter and specifically, the layout of the savanna. Balling and Falk (1982) assume that humans have a preference for savannah-like environments that originates from our long evolutionary history on the savannas of East Africa. It provided food, water and shelter with its trees and lush countryside.

A field study shows how deep this engraving lies in us. Children were given a few images of natural and artificial spaces and all of the children under the age of 11 chose an image of the tropical savanna.

Their study included six age groups (8, 11, 15, 18, 35, and 70 or over). None of the participants had ever been to the savanna. All the age groups together the least liked environment was the desert. Balling and Falk's studies also suggest that because with age we learn new experiences of space, we learn which environment to subjectively prefer for our survival in today's times. They also found out that children after puberty prefer more complex layouts of the savanna (more trees and height differences). ⁶⁴

Even though, we don't live in this kind of environment anymore, the characteristics of the savannah still dictate our preference for space. ⁶⁵

What attracts us is what gives us better chances of survival. The savannah could be seen as the first place-attachement for humanity. Even in depictions of paradise or the garden of Eden, we can see similarities to the savanna of East Africa. In a way, what we would've seen in the savanna, is what people are attracted to with the idea of paradise. It really seems to be a very deeply rooted preference.



Painting 'The garden of Eden' by Peter Wenzel



Photo of East African Savanna

Chapter 2: The influence of space

Biophilia

In 1964 Erich Fromm coined the term Biophilia. In his book *Die Seele des Menschen: Ihre Fähigkeit zum Guten und zum Bösen*. He writes about *biophil* and *nekrophil* as productive and non-productive character directions. Biophilia here means the love for anything alive, growing and natural. Nekrophilia would be the decay or dead, whose influence happens in a non-productive way. ⁶⁶

Edward Wilson took this theory of Biophilia some steps further and defines it as 'the innate tendency to focus on life and lifelike processes'. ⁶⁷ Life attracts us.

The environmental psychologist Roger Ulrich (1991) analyzed the physiological effects of a stress inducing 10 minute black and white video displaying industrial accidents on two groups of subjects. Following the initial video, one subject group viewed a 10 minute colour video displaying everyday nature, while the second watched a 10 minute colour video of urban areas.

The participants exposed to the nature video experienced an increase in positive feelings and were found to have lower blood pressure, muscle tension, and skin conductance levels; the urban scenes failed to produce any of these positive physiologic effects. ⁶⁸

Basically Biophilia is our bond with nature. In hospitals, recovery rooms with a view of nature have had great success and shown how effective the theory of Biophilia is.

Studies also show that natural environments are categorized faster and need less cognitive processing to evoke positive judgements. This might be because our brains developed mostly in natural environments, which would suggest that recognizability plays a big part in the effects of Biophilia. ⁶⁹

Alliesthesia & stimulation

Scientists have found out that what we want is stimulation of our senses, and we want that stimulation to vary. Even if it is a perfect stimulation, it has to vary throughout the day to please us constantly. This is called 'Alliesthesia'.

Alliesthesia is a phenomenon, that describes the dependent relationship between the internal state of an organism and the perceived pleasure or displeasure of stimuli. ⁷⁰

Our environment has to change for us to be stimulated at all times as well. Nature, just like our organisms is constantly changing. A good example is the sun. It changes its position throughout the day (and night) and because of that, stimulates us all day long. The evening light, for example, makes us produce melatonin to prepare our body to go to sleep.



This need for us to have a variation of stimuli is called Alliesthesia.

The CIA carried out field studies about sensorial deprivation. They put a person in a completely artificial space which was a white room with no window, artificial light, air conditioning and one chair. They found that after only 24h inside this room, people started to hallucinate and after 48h they had completely broken down. ⁷¹



Not only Allisthesia is an important element in the stimulation of our senses through space, other factors were found to be playing important parts, too. The British psychologist Daniel Berlyne studied factors that condition our aesthetic behaviour. He discovered that aspects such as surprise, innovation, ambiguity, unsureness, and also complexity create a comparison reaction in us. If discrepancies are detected between the newly processed (reality) and the known (memory and cognitive scheme), it leads to a cognitive conflict or unstableness. Depending on the intensity of this reaction, a physiological excitement or reduction of excitement occurs.

The aesthetic judgement stands in connection to this excitement-curve. If something is perceived as not exciting or maybe even boring, it is aesthetically not pleasant. But if a comfortable level of excitement is felt, something might be judged aesthetically pleasing. ⁷² Because of human action and movement, space is an ever changing phenomenon. Stimuli cause us to move or not, they guide our activity or our capability to act/move in a space. Too extreme excitement or fatigue/boredom, are hurdles for a good capability. Depending on the level of difficulty and complexity of the action we set to do in a space, the ideal level of stimulation changes.

For example, studying for very complex things, a space that is not at all complex and very minimal might feel ideal. For easy concentration tasks, a space with more stimuli might just become the perfect spot for that more boring task.

A wide variety of unique buildings and shops stimulate our mind, while dull repetitive buildings bore us which has been clinically proven to induce stress. A too monotonous world is perceived as boring. ⁷³



Streets with different openings, shapes, colours etc leading to sense stimulation vs. street with monotonous wall leading to sense deprivation

Contradictions are exciting concepts to us, they stimulate our brain as it will find more and more discrepancies that make what we see ~'come alive'.

I've already talked about the border as an alive energy that creates tension and excitement the less 'in between' space there is. Comparing lets us separate and connect and lies at the base of our perception of space.

For example, Snow, because of its immediate simplifying effect on the outside world, makes the inside seem more complex and exciting. Simplicity in the outside evokes an inaction in us and on the other side, increases a feeling of intimacy of the inside spaces. ⁷⁴

We interpret space differently but generally we need a certain degree of stimulation and that degree of stimulation needs to vary after a while in order for us to judge a space as pleasant.

When processing space, there is always a comparison of information to our cognitive maps while we explore or when we look at an image of a space. In order to achieve an aesthetic admiration, a heterogeneous result of comparison has to evoke excitement and irritation at the same time. ⁷⁵

The irritation shouldn't go beyond a certain limit though. Something is perceived as beautiful if the impression arises that the environment is complex and is highlighted in a healthy relation to it. ⁷⁶

The psychologists Rachel and Stephen Kaplan studied the effect of natural environments and give us variables that influence our aesthetic evaluation of the environment. The variables coherence, legibility, complexity, and mystery influence this aesthetic evaluation of space.

To define the categories, *coherence* is the degree to which the environment is organized as a whole (rule of shape: Nothing without the rest) ; *legibility* is the degree of distinctiveness through which the viewer is able to categorize the contents of the scene;

complexity is the variety and number of elements to a scene;

and lastly, *mystery* is the amount of hidden information a scene contains. ⁷⁷

With regard to the complexity, it is primarily determined through the amount of directions and/or corners in a space. But also asymmetry and variation of shapes and heights can increase complexity. ⁷⁸

The environmental psychologist Arthur Stamps found that detail is another variable of complexity. The concept of detail can be linked to size, similarity and proximity between smaller elements of a facade. An element is classified as a detail if it is just about seven times smaller than the size of the total area of a facade. (Smaller elements can also be judged as details)

Stamps defined three specific categories of facade detail. The first is ,trim' (door and window frames, railings), the second is decorative ornaments and the third is texture created by facings (stones or bricks). His study shows us that judgement of complexity is strongly related to the addition of details on a facade. ⁷⁹

The field study by Balling and Falk (savanna preference) suggested that the visual complexity of an environment is connected to scenic beauty. Increasing

spatial diversity is correlated with a feeling of stability. Probably because diversity would mean to our ancestors a higher probability to survive. ⁸⁰

As to the element of mystery, it is influenced mostly by light and darkness. A dark building is much more mysterious than a light one. ⁸¹ Mystery sparks our imagination which makes up a big part of the influence on our emotions. An indefiniteness of the spacial frame creates a blurry consciousness and so it has a tempting, exciting effect on the human psych. Imagination can grow, thinking without limits is reinforced. ⁸²

Excitement occurs faster with the image of the possibility of pleasure than with the direct image of pleasure. For example a bedroom made up with maybe a little flower on the bed (the possibilities) and a bedroom with someone sitting there smelling the rose. The former has more mystery, our imagination can plan and dream and our senses get more stimulated. Maybe this is because by imagining different situations, filling in the blanks with our network of memorized virtual maps, we connect the situation closer to already known experiences.

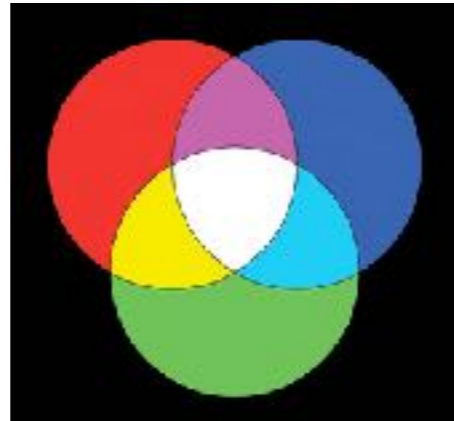
So generally speaking, natural environments will be preferred over artificial ones. Even shapes and forms coming from nature can help make a space feel more comfortable and pleasurable. Variations in space and arrangements enables sense stimulation which makes us happy in a space. Other elements like complexity, which can be expressed via different directions in a space but also a certain amount of detail, determine if a space is pleasurable or not. Legibility, coherence, mystery and recognisability play parts in that evaluation as well.

We interpret space mostly in the categories ,safe/unsafe' or ,comfortable/uncomfortable' and ,exciting/boring' (stimulating or not stimulating) and irritating/soothing. These feelings are linked to our sense of survival. In a sense, finding something beautiful or ugly used to help us survive. Today, these feelings seem less primitive, but it is their origin. And we can see, for example with Biophilia, how space still greatly affects our health.

Additionally it is obvious, how deeply rooted these preferences like the savanna preference are. Orientation and being able to predict events is essential in today's world as well as our past. Not only our intellect helps us survive, feelings and emotions are just as valuable and useful. And space influences us psychologically *and* emotionally.

Chapter 2: The influence of space

Colours & light



Visual stimuli make up a big part of the information we use to perceive and interpret space. To come to an interpretation, we use memories, experiences and even primal leftovers. It is a combination of subjective, learned elements and more general, primal elements. This also comes into play in our perception and interpretation of colour.

From a psychological point of view, the individual perception of colour doesn't depend only on light and the health of our eyes/our brain. Experiences and cultural influences play a big role in it as well. White, for example symbolizes purity and freedom in Western culture, whereas in Eastern cultures it represents grief. In the end, our perception of colour is a process between our engagement with ourselves and our environment. This is also why preferences of colours can change throughout a lifetime.

The meaning and place that colour can take in our lives depends on various factors. The associations, our personal experience and the effect on our senses all play a role in this.

For years, the symbolism of colour has evolved. A lot of these came from generalized feelings and intuitions. But a lot of different colours can evoke a lot of different emotions.

The different emotions we can feel, depend on the existing associations in our brain. The associations can be modified or even forgotten. ⁸³

Generally, the farther an object seems, the closer/more proximate we would interpret it to the horizon. Blue seems to us, a colour that recedes.

When we see various colours, it depends on the complexity and relation that they have with each other, which associations will be evoked. Furthermore, colours are associated to moods, tastes and forms. ⁸⁴

Colours can convey two types of information. They give our brain information about the world that we live in and at the same time they convey a certain energy that can even have an effect on our organism/health. ⁸⁵

For example, a red room will make our hearts beat faster, whereas a blue room will have the opposite effect. Hence the more cool feeling we might get in a blue room.

Colours intensify our perception of space. They can stimulate us and influence our moods. In an oppressive space, colours can give us security. A few studies even found that blind people can sense colour stimuli in a room.

Through colours, we can perceive a room as bigger or smaller, wider or narrower. ⁸⁶ We use colours to mark our territory a lot as well. Like space, colours give us another opportunity to form an identity. Colours can be used in a room, to divide parts of the room and give us orientation. They also have a certain stimulus and give out signals.

Yellow and Red are seen as alerting colours. Blue is used mostly for order and rules and Green seems to give us a feeling of security. Green, according to Nüchterein, motivates us to stay in a space more than other colours. ⁸⁷

Colours will always be influenced by culture and eras. Throughout the years, colours have been associated with a lot of different feelings. A recurring idea seems to be that red, orange and yellow evoke happiness and richness. ⁸⁸ The police force in the US found out that putting a person in a completely pink room for exactly 17 minutes would calm them down. ⁸⁹ Interesting is the very specific amount of time that the experience and influence of the pink is dependent of. This could be another proof for Alliesthesia.

Colours can make us stay or flee a space, they can guide us through a space and sometimes they influence a space so strongly that other elements fall in the background.

Light can make rooms feel bigger or smaller just like colours can. Light has two crucial characteristics. The first is the light intensity, which means the quantals per second. The other one is the density of the quantals, the amount of quantals per second that fall on each wave.

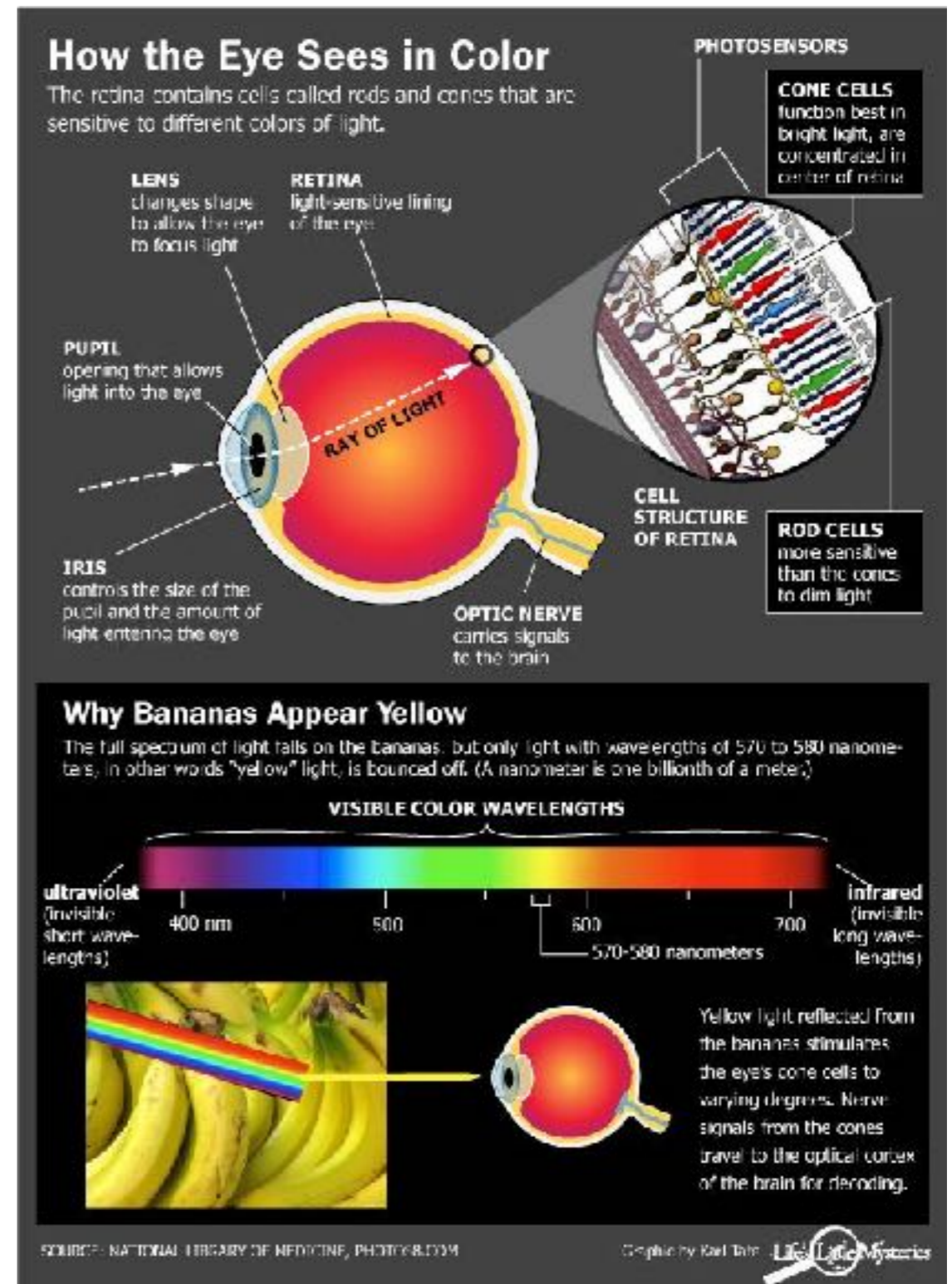
These quantals run on a straight line until they bump into an object. If this object is see through, most of the particles will go through it. But if not, some particles get thrown back to the rest, reflected. The degree of reflection plays a critical role in our perception of a surface. ⁹⁰

The right lighting creates a pleasant ambience and can support daily tasks. For work, for example, we all need adequate lighting to do the work best. We also use and need light for orientation. ⁹¹

It is the one light in the house that lets us see the darkness of night and the deep solitude of it that gives us immense individual space to dream. Bachelard sees the lamp in the window as the house's eye and, in the kingdom of imagination, it is enclosed light, that communicates to the outside. ⁹²

Sound also has an effect on how we perceive a space and what emotions are evoked. Complete silence can make a space seem endless. Furthermore, sounds can also influence our perception of colour. ⁹³

In this work, I cannot get further into the topic colour & light. But I would love to do more research and deal with the topic in a future work.



Chapter 2: The influence of space

Patterns

Because we memorize space in patterns (place-fields), we can recognize patterns like the savanna even in slightly different forms. Our brain associates specific patterns with good or bad survival attributes and thus with pleasure or fear. When the primitive human was able to identify a pattern and in that way predict what came next, the chances of survival were enhanced and that pattern got memorized. It makes intuitive sense that chaos or unpredictability, the opposite of pattern, can negatively impact us physiologically.

The architect Don Ruggles spent a lot of his young life traveling and observing everything around. During his travels, he discovered a similarity between all the architectural works that pleased him. Every building he considered beautiful showed variations of a particular pattern, the Nine square diagram. ⁹⁴

While the word 'beautiful' can be very subjective, the feeling connected with it is universal.

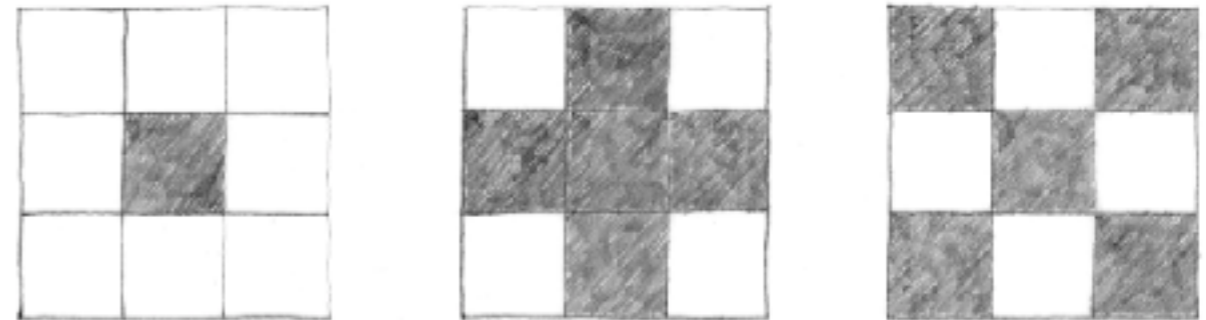
Buildings that give us a sense of pleasure and beauty are those that integrate the architectural features that our brain recognizes as having similar characteristics to those locations that helped our human ancestors to survive.

The Nine square and also the more known, golden ratio are natural patterns that promised our ancestors a good life. And still today, patterns in our *built* environment that the brain recognizes from nature as having been advantageous, evoke that same physiological reaction.

The Nine square diagram is maybe recently discovered, but it has been used for a very long time. In ancient Asia, they used it as they believed it had a cosmological meaning; in the Middle East, it is thought to have the perfect form and during the Renaissance it was used extensively. Even today, architects use the Nine square diagram.

The root pattern of the Nine square consists of a 3 x 3 grid, with a centralized

space (the middle square) surrounded by an exterior zone (the outer 8 squares). It may also be seen as five parts forming a Greek cross with four corner parts. Or five parts relate diagonally (the central part and the four corner parts) and create a quincunx. ⁹⁵



There are many more variations of the Nine Square that produce the same effect. This is because the Nine Square is less about the squares themselves and more about the *division of space* that creates the squares.

The four lines that define the Nine Square can either be pushed closer together (see Figure 5b), pulled farther apart (see Figure 5c), broken apart so they are not continuous, or even removed fully. ⁹⁶

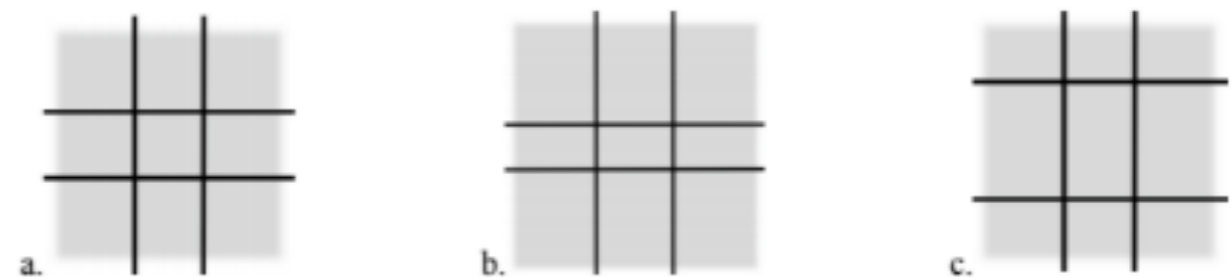
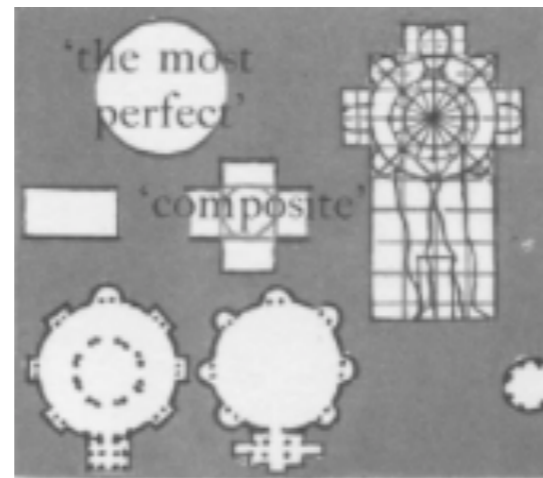
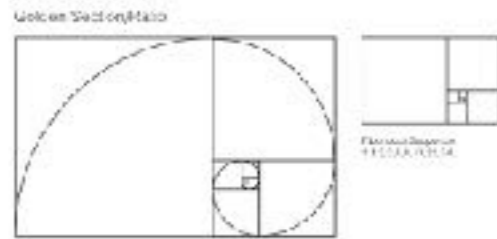


Figure 5. Various versions of the Nine Square Pattern.

Chapter 2: The influence of space

Also known as the Divine Proportion, the golden ratio is a mathematical concept taken from patterns of nature. The golden rectangle has been used for years and years by architects and artists as it is believed that we subconsciously find it to be aesthetically pleasing.

Vitruvius believed in utilizing proportions of nature as well. He is famous for his theory of the Vitruvian man, which uses the human body and its proportions for perfect measurement.

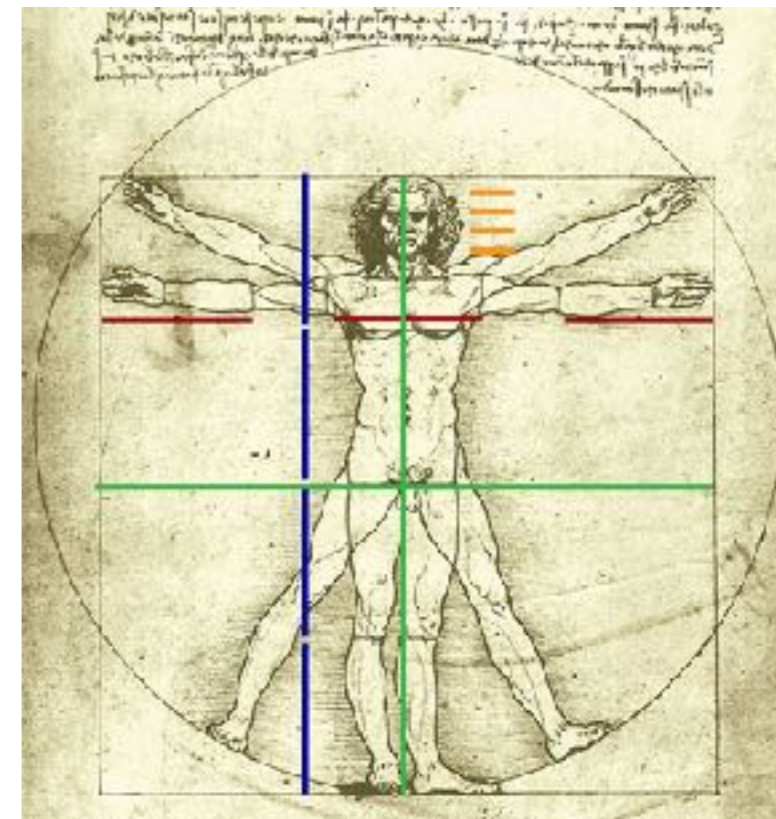


Vitruvius (80 - 15 BC) wrote the first series of books about architecture and its aesthetics, called *De architectura, libri decem*. The Romans later adopted his principles (also called the Vitruvian virtues) that a building should always have *Firmitas, Utilitas, and Venustas* (Strength, utility, beauty). His book also led to the drawing of the Vitruvian man by Leonardo Da Vinci.

Vitruvius saw the creation of buildings (architecture) as a human attempt to imitate nature. Just like birds, we build our nests.

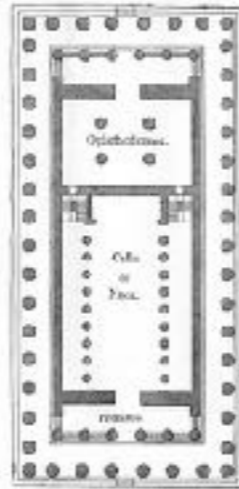
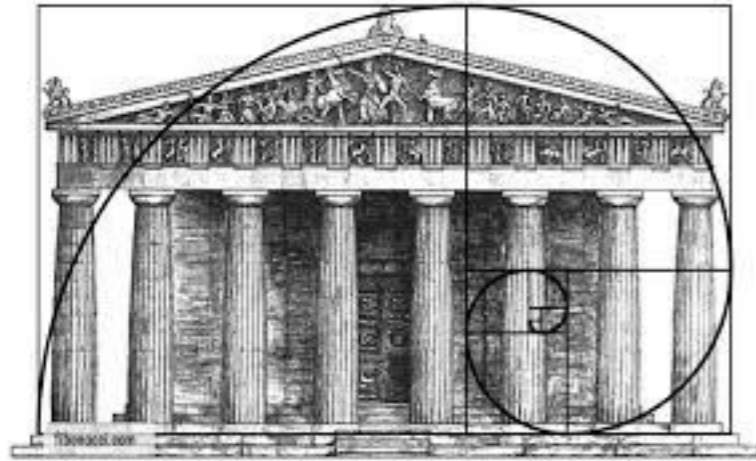
In his third book of the series he writes about the proportion of man and its connection to architecture: „Just so the parts of Temples should correspond with each other, and with the whole. The navel is naturally placed in the centre of the human body, and, if in a man lying with his face upward, and his hands and feet extended, from his navel as the centre, a circle be described, it will touch his fingers and toes. It is not alone by a circle, that the human body is thus circumscribed, as may be seen by placing it within a square. For measuring from the feet to the crown of the head, and then across the arms fully extended, we

find the latter measure equal to the former; so that lines at right angles to each other, enclosing the figure, will form a square“ . 50

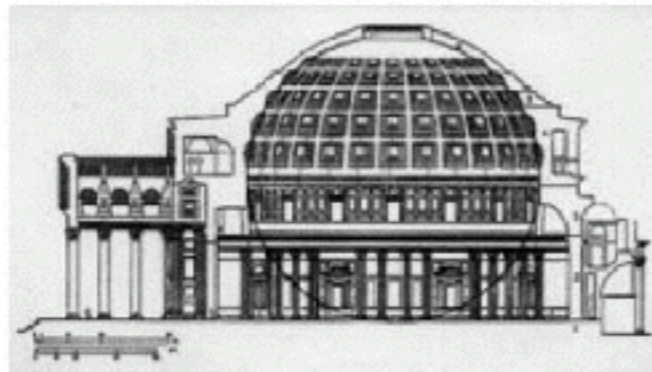
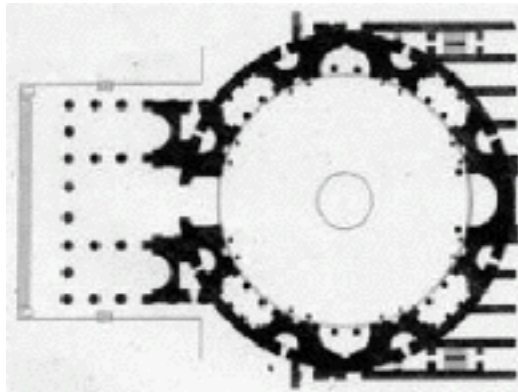


Patterns like the Nine square and the Divine proportion are often used in the same design as they are very similar and don't exclude one another. The following example show different variations of the Nine square diagram and the Divine proportion.

Examples of buildings that use the Nine square diagram (and also the Divine proportion) are the Greek Pantheon, the Roman Pantheon and the Taj Mahal. Through these examples we can see what Don Ruggles saw. The beauty and also stability of these buildings has been a great wonder to humanity for a long time. The Taj Mahal is even considered one of the 7 world wonders. ⁹⁷



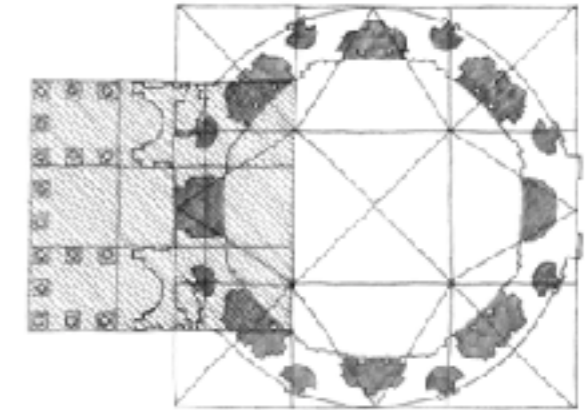
Believed to have been built between 447 and 432 B.C., the Parthenon resides in Athens, Greece. It incorporates the Golden ratio and the Nine square diagram in its floorplan. ⁹⁸



The Pantheon in Rome, Italy is believed to have been built around 120 A.D. and consists of both a height and diameter of 44 meters. Today, it remains the largest unsupported concrete dome in the world. ⁹⁹

Nine Square is used at the entrance of the building, as well as in the main plan which is viewable from an aerial perspective. The entrance is a simple Nine

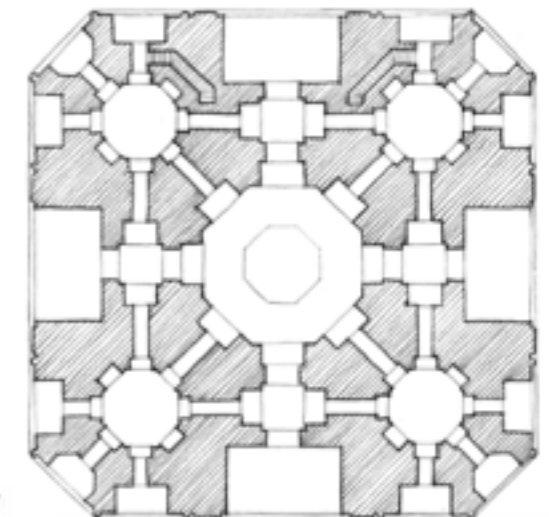
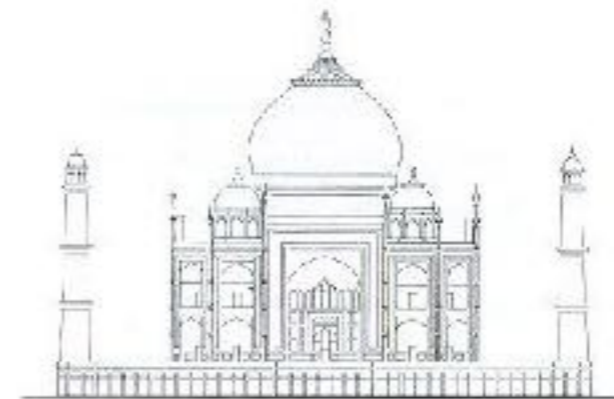
square that corresponds with the first row of the rotunda's distorted nine square. This distortion creates a larger center square, four smaller corner squares and four rectangles in the proportion 2:3. This geometric system is the basis for buildings designed in the Renaissance and Neo-classical period, for example for Michelangelo's Basilica of Saint Peter. ¹⁰⁰



Lastly, the Taj Mahal, considered by some to be one of the worlds 7 wonders, was built between 1628 and 1658. It also incorporates two Nine Square patterns: one in the 9 arches in the front of the building and another inside the center front arch. The plan follows the Persian model as a Nine square arrangement of vaulted and interconnected chambers.

The universally approved beauty shows how impactful the Nine Square pattern is to us.

The Nine square proved itself throughout 1000s of years as a beautiful and solid pattern and so we adopted it as that. ¹⁰¹



Another important characteristic of the Nine square is the similarity to the structure of the human face.

Facial recognition is one of the most important survival traits of us humans. It is so important that 65% of the brain's neuronal structure in a newborn child is devoted to facial recognition.

Facial recognition helps us to distinguish human faces from animals and even objects. Additionally it helps differentiate predators from parents at a very young age. ¹⁰²

Field studies have shown that babies prefer certain facial patterns to others that don't indicate faces.

In one study, babies were presented with patterns, made up of various squares that vaguely resemble facial structures (the shape of a T for example) (see Figure 6).



Figure 6. The shape of a T made up of various square to vaguely resemble facial structure. Inverting the T lessens its resemblance to facial structure.

The infants were shown these shapes in their upright form, as well as upside down, which obscured their resemblance to normal facial structure (see Figure 6b). It was found that the babies preferred the shapes when they were right side up and most resembled faces. ¹⁰³

The close resemblance of the Nine Square to the human face raises the distinct possibility that humans subconsciously see faces when observing certain forms of architecture and in the patterns of that architecture, providing another explanation for the physiological reactions and feeling pleasure that certain architecture can evoke. This also connects to the theory of Biophilia that we are drawn to all living organisms and look for them in our environment.

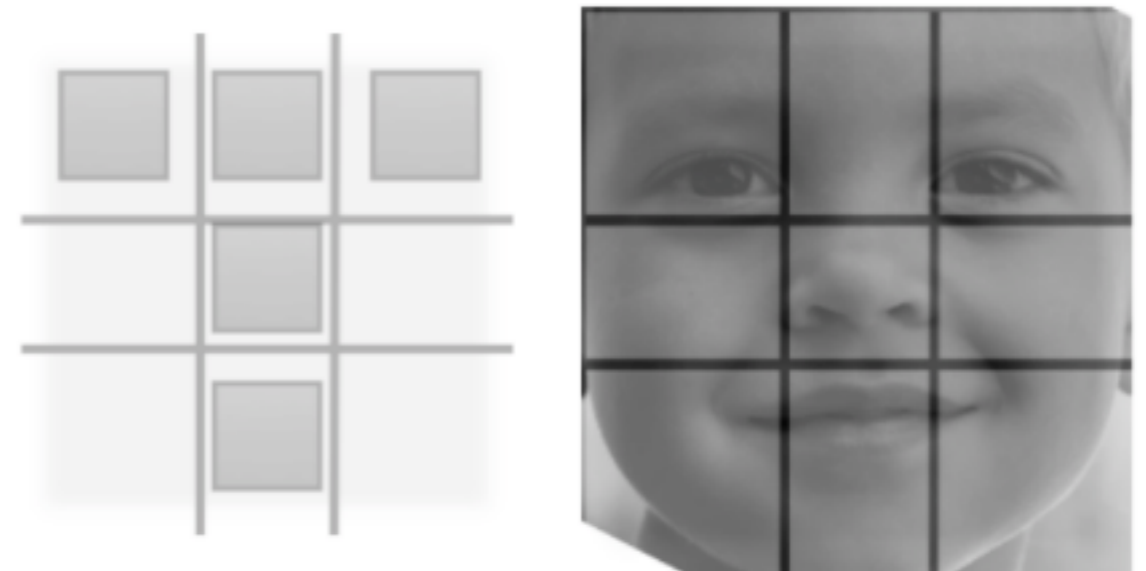


Figure 7 (left). The similarities between the basic facial structure and the Nine Square. Figure 8 (right). Example of the human facial structure and the Nine Square. Background Image from 2643525, by Tiluria, 2015, <https://pixabay.com/en/portrait-child-face-boy-human-2643525/>. Copyright 2015 by Tiluria. Note: Reference lines for the Nine Square in Figure 8 are not part of the original photograph. They were added to emphasize the similarity of the human face and the Nine Square pattern.

These patterns show the human need for order. We like spaces and objects we recognize, that we can systemize. Proportions taken from nature, like the divine proportion or the nine square, have the highest degree of pattern-recognizability.

The Nine Square has been used for so long that I'm sure we all have some place-fields with several versions of the Nine Square. Because our brain is looking for patterns, and making patterns to orientate and form memories, recognizable patterns make us feel comfortable and judge something more quickly as beautiful.

Chapter 2: The influence of space

Symmetry

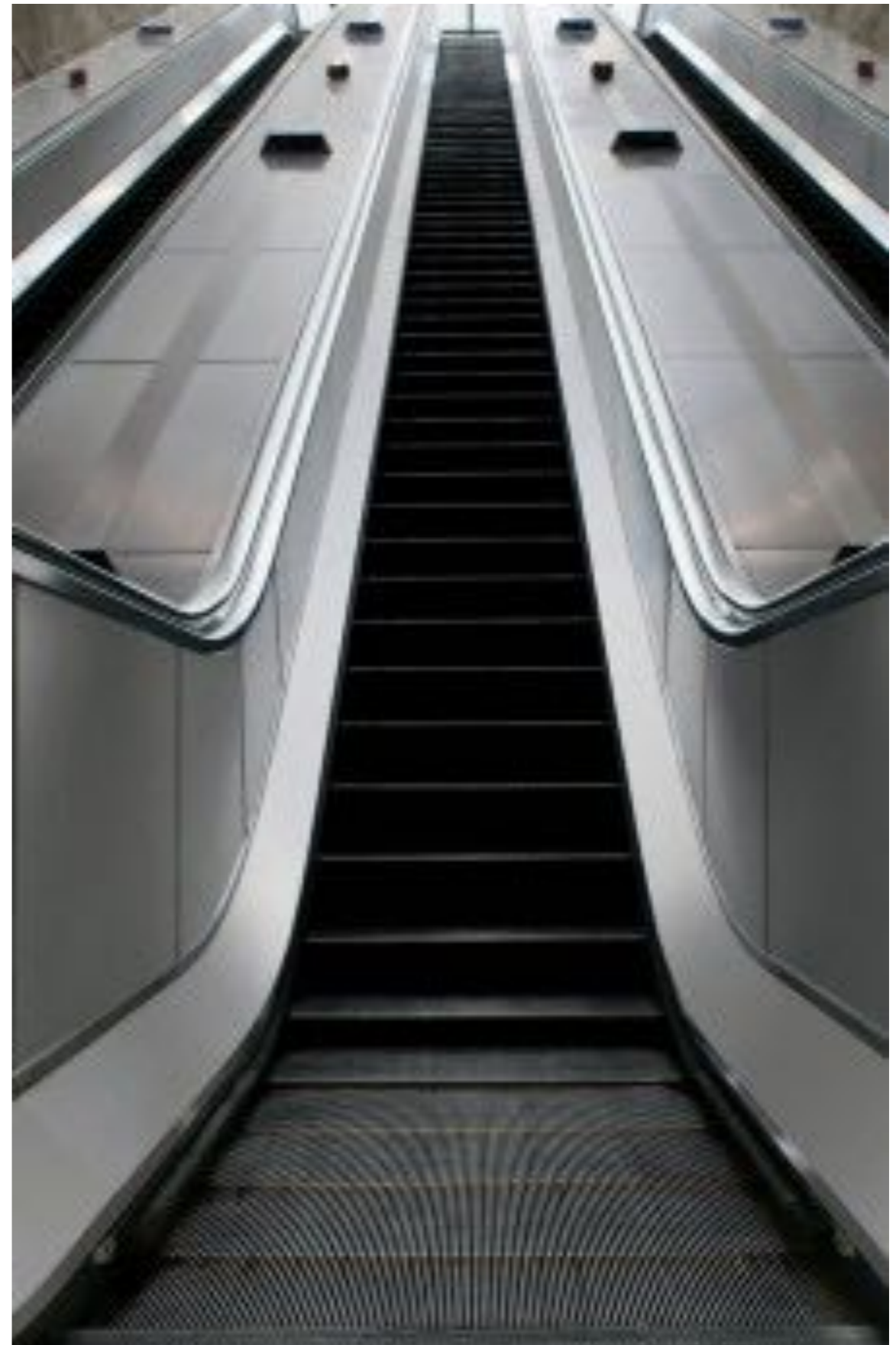
Symmetry, like patterns, makes the future calculable to our brain. The allure of symmetry lies in its balance and closeness, its harmonious and proportionate relation of the parts to one centre.

Symmetry lays everything open, it's the ultimate order that leaves nothing to the imagination.

If you look at a machine, every part is perfectly fitted to work with the part next to it, it's pure functionality. But it also has an aesthetic allure. The harmonious interlocking, grinding and resisting gives even the machine a beauty because it summarizes all parts perfectly into one functioning unity. This unity has a clear purpose and predictability. ¹⁰⁴ The function and form lies open and so we can quickly understand and feel comfortable.

Symmetry is also (just) a tool we use to make things a clear, easily digestible arrangement. We might say a hundred people when we see a big group, well knowing it's probably not exactly one hundred. It makes it directly clear that we are talking about a big group, the real number doesn't matter. For example, in Barcelona during the middle ages, the Senate was called the one-hundred, even though it never had exactly one hundred members. This was functional, but the symmetric one hundred also translated the order and power of the Senate. The aesthetic value of symmetry plays a big role in social forms because it is about order.

Justus Möser wrote in 1772: „The men of the department general want everything put into easy rules. With that, we detach from our true natural environment, which shows its richness through diversity. We are taking the way to despotism, that wants to force everything with a few rules.“¹⁰⁵



Symmetry is about ordering a chaos into a system, it's about understanding a coherence. And as we know, the coherence with the rest is an important factor in our perception and especially our interpretation of space. Once we are able to understand the pieces and objects of the symmetric image on their own, the aesthetic value of the symmetry fades away. In symmetry there is no room for individuality.

Symmetry speaks to our rational and logical brain but it doesn't stimulate it a lot because total symmetry is also total prediction. There is no mystery to it and so once we understand it, our brains are not stimulated anymore. Also as we know, in order to make our cognitive maps, we need diverse visual stimuli. If a building is built in a donut form and all corners that we turn are symmetrically designed, we will be lost. ¹⁰⁶ Our brains rely on our environment to make our cognitive maps and we need those maps to orientate and remember a space. Too symmetrical buildings have actually proven to be unhealthy for our brain because it is lost and confused in them. For example at the Nederlandse Filmacademie, because it is built as a symmetric square and every hallway looks similar, our body always moves the same way and our brain is constantly working on finding orientation. At first, symmetry seems like a relaxation for our brain, but eventually it leads to sensorial deprivation. ¹⁰⁷

A good example for overly done symmetry is the post war architecture of the 50s. Artificial materials, monochromatic colours, an absence of architectural detail, and repetitive, symmetric styles produced a distinctive form of sensory deprivation. Not only did this trend result in a lack of intellectual stimulation, it effectively removed every aspect of human touch, creating a cold, unwelcoming environment that lacked the ability to produce a positive physiological response or a sense of well-being.

This extreme systemizing of humans because of a lack of money, time and space led to an unhealthy architecture. This has also been proven in Russian ghettos where completely symmetric high-risers lead to unhealthy inhabitants.



British post war mass housing

When asymmetry demands again and again innovation, new efforts and understanding, symmetry does the opposite, it calms and doesn't encourage thinking.

But also an *extreme* of asymmetry and chaos would also lead to an unhealthy human. Studies have shown that battered houses and neighborhoods, and abandoned and run down buildings make us feel unsafe, thus evoking fear and anxiety. They activate our sympathetic nervous system which is detrimental to our health. ¹⁰⁷

Symmetry evokes a feeling of clarity and order. Symmetric forms and arrangements make us feel calm. Especially in situations where order is needed, symmetry can facilitate that. If it's not overdone, symmetry gives us pleasure and makes us interpret spaces as pleasurable.

To what degree symmetry soothes us is subjective and depends (among other factors) on our psychological field and cognitive schemes.

Chapter 2: The influence of space

Function & Form

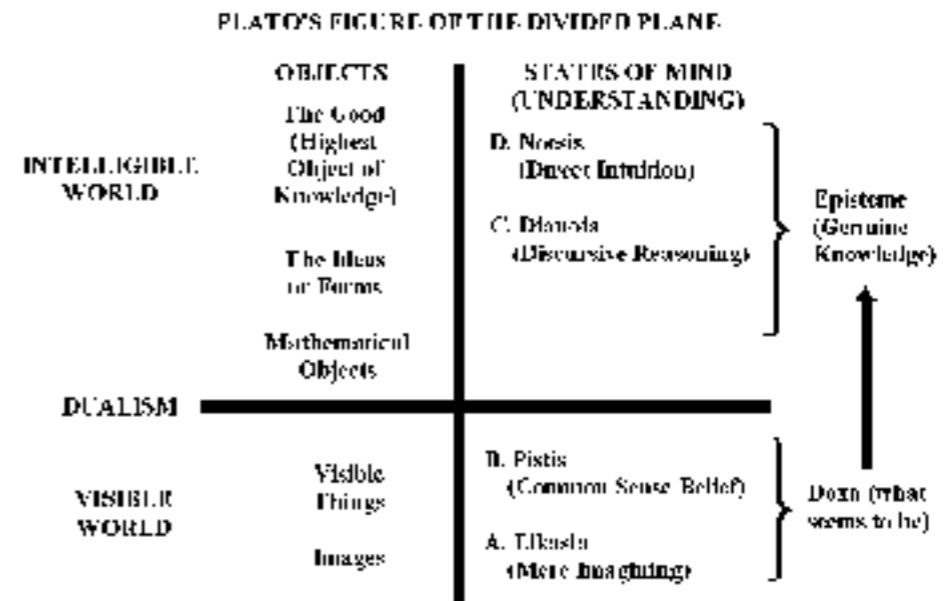
I've briefly talked about the function of a space influencing the emotion connected to it. Different architectural eras saw the coming together of function and form as the perfect architecture. Beauty is not only about a form or shape, but also about a concept and idea.

Georg Simmel, in his essay about Aesthetics, sees the material purpose of something as the root of its beauty. Firstly, something has to prove to be useful, then it has to be used and give us pleasure. Then it becomes a whole, mending function and beauty. If the purpose of something gave us pleasure at one point, even if today that object or space has no more purpose or we don't know its purpose today, we enjoy its form. The first purpose of the object is long gone, the material motives from which our aesthetic feeling stems, lie far in the past and that's why it gives the beautiful a pure form, a sort of irreality, a magical side. ¹⁰⁸

For the philosopher Immanuel Kant, beauty lies in a purposelessness of things. In 1790 he writes, something can only be classified beautiful when we don't look at it in its functionality. Beauty is only possible when our view of something isn't walled in by the general interpretation through its purpose in life. Once the functionality falls to the background, we feel an easy beauty about something. ¹⁰⁹

Plato even divides the world into 2; the visible world and the intelligible world. The visible is grasped with our senses. We can't really know anything about these sensible particulars. As we see, hear, smell, taste and touch them we can form only opinions.

The intelligible world goes beyond reality and what we can see. It is grasped through the intellect rather than the senses. It is the realm of truth and knowledge. Essentially what this means is that everything has a form, a body and an essence of being, a soul. For example, an apple can be red, green, rotten or ripe in the visible world, but in the intangible world it will stay an apple no matter the outer visible 'body'. For Plato, every being and object is merely a representation of a true, unchanging concept (virtue) that is why the apple can rot, but stays an apple. ¹¹⁰



Plato argues that because we can't be truly satisfied by only the visible world, we turn to the intelligible world, the world of concept and knowledge. This dualism of form and function, or body and soul as Gaston Bachelard would say, plays a big role in what makes something beautiful to us.

The purpose, or soul of an object or building forms itself through the human interaction with it. Human interaction with a space makes it complete.

Any creation starts out of a need, it always starts as a functional creation. When it is created, and we interact with it, use it, live in it, it's functionality goes over into a practicality and finally when we have made memories of the space of creation, it becomes meaningful to us. And then that meaning becomes the purpose/essence of the whole thing. Just like the primitive hut was a functional shelter that eventually became a home, a refuge, an image of protection.

Once we've made this connection with a space or object we can relate to it and are drawn to it.

Some images are engraved into our DNA because of the strong emotional link we've formed over years, that has its purpose in the likeliness to survive. Which in its essence also comes from our interaction with those environments.

It becomes beautiful because it has not only a practical function but an intimate legend of fixed happiness. ¹¹¹

A study from Marans & Spreckelmeyer in 1982 showed that people who didn't work in an office building found it more beautiful than the people who worked there every day. They came to the following conclusion: The people that work there see the purpose in the environment and thus find it not beautiful. This proves that once a purpose becomes too clear, we aesthetically judge it negatively. We need to build a relation to the functional space that isn't solely functional. ¹¹²

Something is truly beautiful, if it echoes a functionality but throughout the years has become more natural in its being. A purpose or function for the space/object has to be evident, but not take over its whole meaning so that we can judge it aesthetically pleasing. ¹¹³

These findings show, that our sense of beauty has a lot to do with what we know about a space, what it is for, and not only what it looks like.

I want to give an example where the form works to support the function and thus a generally accepted beauty is achieved.

The door of a church is an example for form supporting function. Gothic or roman, the church door leads us only *inside*. Its function is to lead inside the church. The openings of the wall seem to slowly become narrower until we reach the door. This form of door guides us with security and slight force on the right path.

Inside, the columns are all parallel to each other. But standing from the entrance, they seem to be getting closer and closer to each other. This also indicates there is only one way, one choice. If we would actually see the parallelism of the columns (like on a temple), the path would seem more possible to walk from two

directions. There wouldn't be so much an end and a beginning. The way would represent more of an exchange.

The church door combines the purpose of leading us towards one goal with the proportions and arrangements of shapes. It is form and function in one, and that is why it can have such a big impact on us. It doesn't force us with walls or fences to walk the one way but seems naturally guiding us inside the church. I should mention that temples were built not for the public to enter so in that way, the temple also succeeds in translating its purpose through its form. ¹¹⁴



Chapter 2: The influence of space

Symbolic & romantic beauty

A crystal, a flower and a shell are all natural forms that stand out as very beautiful. They are forms that are more mysterious to the mind, and more intelligible for the eye. The mind is searching for a purpose and because of the mystery to these objects, it can find it in its imagination. Because of their magical, beautiful forms, we want to give them magical functions.

The shell has a natural vortex that has been discussed throughout time endlessly. For the philosopher G. Bachelard, the shell is a symbol of life „for life is maybe less reaching upward, but more turning upon itself.“ ¹¹⁵

Also the shell holds in its form the ancient but still very accurate, need of protection. Around that function the shell twirls and finds its beautiful form. This togetherness of function and romanticism makes the shell one of the best examples of beauty.

Beauty is not only external, it is true beauty only if it connects to the function of the inside.

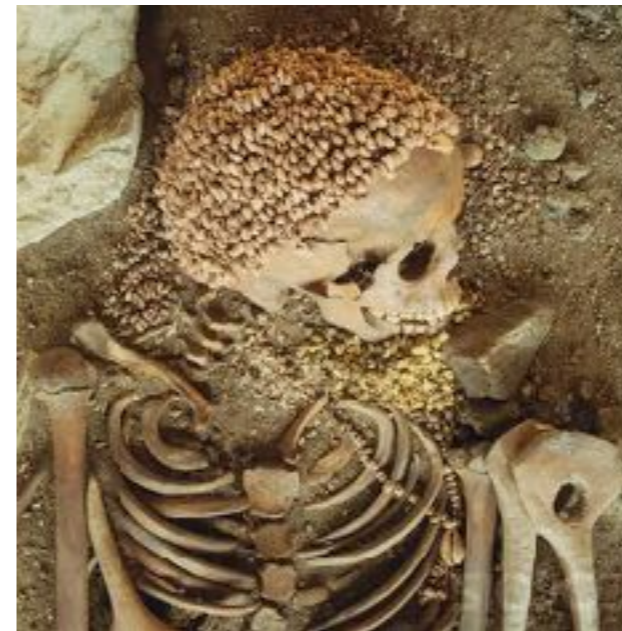
The inhabitant of a shell will amaze us, and our imagination will be able to imagine even crazier creatures. In the middle ages people would draw big animals coming out of small shells. It is clear that the shell bears a mysteriousness that enables our imagination to do very unrealistic things with it. It is interesting that the shell will always cover a part of the body, if the animal would come out fully, we wouldn't be able to imagine it going back into the small shell.

We don't see ,in' and ,out' the same way, which shows that our brain attaches feelings also to movements.

Since the animals do not come out entirely, the part that comes out contradicts the part that remains inside. Fear and curiosity are merged together in the image of a shell. This element of mystery has a lot to do with our sense of beauty. We want to see and yet we are afraid to see.

For the ancients, the shell was the symbol of the human body which encloses the soul in an outside envelope, while the soul quickens the entire being. The body becomes lifeless when the soul has left it, in the same way that the shell becomes incapable of moving once it's separated from the part that gives it life.

Today it's a bit crazy to believe a little, very inferior insect like a snail would carry such a heavy symbolism. But this is where we see how the meaning, the ,soul' of something is very connected to our sense of beauty. The imagine of the shell has been used so much that it seems to be imprinted into our DNA as a meaningful form, even if today most people don't know about all those ancient stories. ¹¹⁶



Side note: Archeologists discovered a grave in the Inde et Loire area: A coffin that contained nearly three hundred snail shells placed on the skeleton from feet to waistline. This real, physical contact with symbols shows us the great need for them. ¹¹⁷

The more we can connect the function of something with our own beings, the more it gets a deeper sense for us. The element of mystery has so much influence because it lets us make up our own ideas. Once we perceive something, the brain immediately starts making cognitive maps, comparing information and is directly trying to find a sense in the form so that we can attach a function to what we see. Mystery works our imagination which works our deepest memories and dreams.

The spaces that we experience these moments of imagination and dreaming in, become part of these thoughts. And mostly this happens in wide and open nature spaces and in the protection of our home. These spaces give freedom to our thoughts and freedom seems to be another element important to our aesthetic behaviour.

For Georg Simmel, beauty lies in the solitude of the individual. ¹¹⁸

Especially because it evokes that thought that the one is not only part of the whole, but more importantly a whole in itself, too. It's belonging and being free at the same time. The romantic beauty lies in an isolation from the rest, in a resistance towards the common. Through solitude we experience in intimate space. We can freely dream and think. When we are alone, we go to the places of inner immensity. As much as space is fixed, it is endless too. This *idea* of endlessness to space gives us endless opportunities to dream, gives us freedom. O. Bollnow talks about the mountains on the horizon as magical, romantic spaces that speak to us from afar. Even though, it is an unknown space, it doesn't seem dangerous but attractive. The far away mountains become a space/image to fix this feeling of freedom onto. Immensity and distance are the basis for romanticism. It represents the feeling of the dream, of a magical future. It gives the endlessness of our thoughts and dreams, and at the same time the whole of the 'far away space' an image to fix this onto. ¹¹⁹



Caspar David Friedrich, Der Wanderer über dem Nebelmeer (1817)

The house represents the other very intimate space of thought. It has been the space of isolation since the beginning of architecture. It is individual freedom and implementation of our own identity. The lonely house seems to almost hypnotize mankind. Here, we fix so many deep and personal emotions onto the space that it becomes part of us. Inhabiting and isolating takes over in what the house means to us. The *concept* of the house overpowers the form.

For example, in stories and poems the lamp is *waiting* in the window. Through it, the house is waiting too. The lamp in the window is the symbol of prolonged waiting. Through the light alone, the house becomes human, it sees with its one eye open into the night. Bachelard sees the lamp in the window as the house's eye and, in the kingdom of imagination, it is enclosed light, which can only communicate to from the inside to the outside. It is the one light in the house that lets us see the darkness of night and the deep solitude of it that gives us immense individual space to dream. ¹²⁰

Chapter 2: The influence of space



Wayne Daniels, First light (2013)

The emotional link we have to the house is so strong that the form becomes the embodiment of the emotion. A distant light or the image of a simple light hanging by a window is always an image of hope and refuge. We accept it as that immediately even if in today's world we rarely will be in a situation without light, it is still an image that touches us emotionally. But of course also here, there are a lot of different architectural styles that achieve a beautiful mending of function and form. What I am trying to show here is that the function of something and how we use it seems to have an even greater influence into our aesthetics than the form. The house might have patterns or similarities to faces which can contribute to the humanization of it, but it mostly comes from our emotional connection and experiences in the space of the house. ¹²¹

For example, the primitive hut becomes centralized solitude. When we imagine a hut we rarely put other adjoining huts in the image. Although we might see photographs or even visit real old villages with huts, our legendary past

transcends everything that has been seen, even everything that we have experienced personally. It is an image of solitude and refuge. The feeling overpowers the reality. Its truth derives from the intensity of its essence, which comes from the verb 'to inhabit'. ¹²²

These images always have a history and a prehistory. They are a blend of memory and legend. Sometimes we go to these primal images because they invite us to imagine again. They touch us emotionally because we understand them mostly emotionally. Symbols and images like this will be better understood once we have made our own memories and have experienced a variety of emotions in life. It is the feeling of hope and protection that we seek to find in those images. These images are back areas of our being. The human's certainty of being is concentrated as well as a sense of new beginning. Their simplicity and directness in what they make us *feel*, focuses us on the emotion rather than us trying to rationalize the experienced. We inherently understand these primal images, they are in us. Subconsciously, we already know them even if we've never seen them before, and so they have naturalness about them that lets us accept the feeling we get when experiencing them. One could compare this to our overall sense of beauty for natural, living organisms (Biophilia) or the savanna hypothesis, but also the Nine square that just immediately evokes a feeling of pleasure in us.

Conclusion Chapter 2: How does space influence us?

There are spaces and objects we find beautiful because once compared to our cognitive maps, psychological field and other factors (gender, age, attitude etc) they evoke an excitement and a little irritation. These things can change throughout our lives with every new experience we go through. But then there are deeper rooted images or patterns that don't change with our own life experience. The strongest emotions humans, or probably any animal, feel, is fear and pleasure. These emotions have helped us survive and made it possible for us to evolve. I think that patterns of fear and pleasure are similar in all of us. There are a lot of patterns of fear engraved in our DNA that still influence our behaviour a lot (for example: any snake like movement evokes to some degree, fear in us).

Chapter 2: The influence of space

Feeling safe and comfortable is the first step in *not* having fear. That is why a sense of overview and coherence is important in making an environment pleasurable. Symmetry can help us understand spaces more easily and also portrays a sense of order. Because in our environment there are always a lot of different stimuli, symmetry can help make a space feel calm and predictable. Stability can be communicated with the use of symmetry. The thing that symmetry is not helping is our freedom of thought. Symmetry is definition and I think that is where it can be detrimental to our imagination. Total symmetry is maybe for a short time pleasurable but generally, we need some degree of variation. We need our senses to be stimulated in order to feel content in a space. Natural forms and shapes can help with that. In general, we like shapes and forms to vary and have a complex coherence with each other. Different heights and shapes can contribute to a higher complexity. We additionally need some sense of recognisability to feel comfortable in a space. Here, natural forms can help again. Too artificial and simple forms are often too alien for us to create connections with. The element of mystery plays an important part because it lets us connect. We can use our own experiences and dreams to imagine and with that, have already pictured us or something from us in that space. The fear and excitement of mystery can make a space interesting and exciting. Mystery can also evoke a feeling of exploration which stimulates activity and movement in us. This helps our brain to make our cognitive maps better and we can store that space in our memory-palace of experienced space. With our own activity in a space, our individual feelings can be linked to it and we might form a personal connection.

The images on the right here show La Sagrada Famillia in Barcelona where the architect used tree like columns to give the columns of a church a more natural and inviting feel. It is a good example where a lot of the mentioned elements of beauty work together and form this overwhelmingly beautiful building.

To conclude the elements that always play a role in our sense of beauty:

Forms & shapes, function & purpose, stability & symmetry (goes hand in hand with a sense of overview) , mystery & imagination, coherence with a rest & individual freedom and a certain degree of complexity & recognizability.



La Sagrada Familia (Antonio Gaudi) Tree columns

Conclusion

Space is the foundation, structure and outcome for and of our lives. It is the containment of all our reality, memories and dreams. To us humans, space is an opportunity for change and creation as well as order and structure. Our being is closely connected to space and our surroundings. As I have demonstrated in this work, space, and our creation of it, becomes a part of us. We perceive space mostly through our senses, but also through exploration. We use space not only in reality but also virtually in memories and dreams. Space doesn't only surround us, it is in us.

In the German language 'being' translates into 'Dasein' which means 'being there'. Without the there, we wouldn't be.

We use space to find our identity, to order our lives, to be together and to isolate, to move and to think, to grow and to limit ourselves. Between our environment and us stands a concentrated interdependence, starting with our childhood home as the base for all future interpretations of space. Our memories and dreams recreate space virtually and links them to our emotional sensations. We build our world and through it, our being is reproduced. ¹²³ Space is not only our reality but it also is a fixation for our memories and dreams. Without the frame of time and space, all our thoughts and memories would be lost in the chaos of life. ¹²⁴

As Gaston Bachelard writes: „We think we know ourselves in time, when all we know is a sequence of fixations in the spaces of the being's stability - a being who does not want to melt away. (...) In its countless nooks and niches space contains compressed time. That is what space is for.“ ¹²⁵

Because we recreate all experienced spaces in our memories, we fix very personal emotions onto the shapes and forms of different spaces. The process of remapping lets us form this very strong link between emotion and space. In reality

space brings us together and gives us opportunities to be alone. It has a lot of practical and societal value. In our thoughts and memories, space *shows* us ideas, dreams, personal memories and lots more. Through the brain's spatial representation system, more theoretical and emotional value is connected with space. It is in our thoughts that space gets a sentimental and emotional value. The Austrian poet R. M. Rilke summarizes our (very personal) relationship with space in one sentence: „The world is large, but in us it is deep as the sea“ ¹²⁶

Human activity leaves marks on our memory and external marks on our environment which can influence the human activity again. New interpretation possibilities are constantly formed and reformed. Architecture is a visible product of this interaction between human and space. It is the material storage place for all human identity. Our created space becomes the external destiny for our internal being. Every change in the inhabitant can be seen as a change in their space as well. Our living spaces become a mirror of ourselves. Through architecture, we feel and get influenced by a human creation we were never part of. It is our connection to ancestors, our possibility for storing ideas longer than lives.

Our perception and interpretation of space is a process of exploration, visual stimulation and comparing of information. Through memories we experience space as a personal, emotional entity in our lives. There is always this duality of virtuality and reality with space. In a way, space is fixed but at the same time it is never fixed. Space is constantly formed and shaped with our thoughts, creations and movements and at the same time forms and shapes us and our thoughts and creations through that, too.

Space can emotionally and psychologically influence us in a lot of ways. The stimuli in our environment always influence us with different intensities, certain patterns will evoke certain reactions and our psychological fields filled with our experiences and wishes, permit a subjective interpretation of space.

Aside from the subjective elements always playing into our final aesthetic interpretation, there are aspects of that process that are generally the same or similar with all of us. We are born with mechanisms of our evolution that determine a lot of our aesthetic behaviour. The feeling of pleasure is closely connected to our need of survival. Whatever has helped us survive in the past, still influences us positively today.

Already Vitruvius knew that a building or space is always perceived as all parts playing a proportionate role to each other. Because of this perception of space, coherence and complexity of our environment is so important to stimulate our brain and rate something as aesthetically pleasing.

We like environments that are easily overviewed and not deceptive. In order to quickly understand different spaces and what they mean for us, the brain makes patterns (place-fields) of all experienced spaces. Recognising these patterns in nature or architecture, always generates a feeling of familiarity and comfort.

Recognisability in a space makes us feel safe. In order to feel good in a space, we need trusted elements and we need to be able to identify with it, too.

Patterns that we recognize like faces, the Divine proportion or the Nine square, are generally classified as beautiful. Psychologists know that the process of rating something aesthetically beautiful or not happens a lot of times unconsciously. (compare to the savannah hypothesis) Nature and natural shapes generally make us happy and can even help in curing physical and mental diseases. Natural materials like wood that can help us connect the artificial with the natural in a space.

We like environments that are not too simple and not too complex. The older we get, the more complex environments we enjoy. Variation means stimulation and stimulation means a happy brain. Colours and lightning can help stimulate us in spaces, but complexity and mystery are the most influential elements in stimulating our brains. In fact, any uniformity leads to a stress reaction. So not only uniformity in artificial environments, but also in nature, have a negative effect.

Total harmony or symmetry only work temporarily as images of pleasure because we always need variation in our experience of space. Stimuli call for action or

inaction, movement or resting, thought or daydream. In a way, stimuli are the language that our environment uses to communicate with us.

Space influences us on an emotional level and on an intellectual/rational level. That is why it is so important, in order for a building or space to achieve a positive reaction, to succeed in merging the form and the function into one. If a concept can be communicated through forms and images, it pleases our brain and being. This pleasure always stands in context with safety. It is only natural for intellectual beings like us humans, to feel safe only when both our body and mind have understood a space. The function or purpose of something has to go hand in hand with its appearance. By using a space, we look for a function and at the same time give a function to that space by using it. This interaction with space also gives us ways to define ourselves again. I think that is why we like natural elements or nature itself so much. It is a space we've explored already for thousands of years, we have given it many purposes and used it in many ways to create and identify ourselves. The natural space is part of us like our childhood home only with the difference that the former is part of us through engraved patterns in our DNA. Natural elements can communicate home and safety still today. It is almost more of an echo of a function that we immediately, but subconsciously understand and so it evokes more of an emotion than a rational interpretation.

Even the patterns we recognise as beauty, originate from patterns in nature. These patterns would help us understand the functionalities of a space and today still evoke that feeling of happiness in us. Subconsciously, we know the purpose but consciously we feel the beauty in these patterns like the Nine square or the savanna layout.

Different images have been engraved into our DNA and evoke different feelings in us. Other images that we associate with pleasure or danger evolve throughout our lives. A common one is the kitchen as a space of togetherness and family time, because that is what we usually experience there.

The architect Ludwig Mies van der Rohe saw architecture as a language: „If you speak it well, you can create prose, but if you speak it very well, you can create poetry“.

Just like a poem can succeed in touching us intellectually and emotionally, good architecture can achieve the same. We are able to think both in words and images, concept and feeling. When a building translates its purpose into its form, it feels like a whole, like one coherent arrangement where all parts belong to one but are individual unities as well.

Stimuli, the communicators of space, work in the same way. An apple stimulates us to eat because of its form *and* its purpose to us. If we didn't know the apple will satisfy our hunger, it couldn't stimulate us to eat.

Over the thousands of years that humanity is leaving its marks on space, symbols and different meanings to objects have evolved. Symbols are the utilizing of objects or images that have already been used a lot, to make them a metaphor of abstract an idea. Here, the function comes first (the concept) and a form that is already close to us is used to translate the function into. For example, the pyramid became the symbol of political structure. It portrays a completely structured system of society, whose elements become smaller rapidly the higher we go, but at the same time become bigger in power. Until we get to the top, that rules the whole.

Form and function become one and that's how symbols work so well. We need to be stimulated in both ways, intellectually and emotionally, to find something pleasurable.

Aesthetics of space are always is about a duality of recognisability and mystery, rationality and dream, reality and virtuality, symmetry and chaos, coherence and individuality, function and form.

True beauty lies in this duality. It all goes back to our deep perception of space and to use it to order and liberate, to connect and separate.

Epiloge

In movies we perceive space through mostly our eyes and interpret it by comparing images we see with our cognitive schemes. The element of exploration is missing with the perception of space in movies. Here, we identify with the humans we see in the spaces and judge the spaces by the actor's movement and feelings in the space.

Story telling is like architecture a tradition of creation that led to dramatization and eventually film. Film uses different techniques to guide us in a space and story.

Movies and photographs use the frame of the camera, the mise-en-scene and the ordering/arrangement of space to invoke a story.

Films can offer a more emotionally receptive way to understand and feel a space. In the real world spaces send out contradicting stimuli, but films can capture more clearly a feeling in a space. All the different stimuli that influence us subjectively in the real world are selected only for the emotion of the character in film.

The Production design is a mirror of the inner situation of the character or the story line. Filmmakers such as Terry Gilliam acknowledge that architecture is as much a set of characters as those that speak and wear costumes.

Resulting my research about space and architecture, I have collected a few points that can be used as tools to evoke emotions with the work of Production design.

The **Path** is about movement, not a goal. Walking a path is associated with a journey about finding one self and reflecting. The path is a connection but its not about a togetherness.

Stairs are a symbol of a two direction movement. It is always about going down or up, it's about a clear direction. Using stairs, we know where we are going, we are not searching. Going up the stairs can evoke a feeling of excitement, success and freedom. Going down the stairs can lead to dangerous spaces, is associated with uncertainty, poverty, sadness but can also be seen as a big entrance.

Stairs have been a big part of psychoanalysis and seem to be a frequent space of our dreams. They let us physically experience the possibility of up and down, or down and up. Just like the path, stairs manifest a connection and with that the detail of high and low, but also steps in between.

Through stairs we were able to experience space in its verticality, separate not only on one level but into 4 directions, our thought and imagination evolved with that. Space stimulates our cognitive and emotional possibilities

The **attic** is the space of the house that is under the roof. Usually, we use older stairs to get up there which already fixes a sense of nostalgia onto the attic. It is clear in its structure and shows the beautiful geometrical beams openly. The roof has a very clear purpose which is to protect us and the house from all weathers. In the attic the purpose of the house as a refuge shows itself again. Dangers in the attic, in contrary to the basement, are usually easily rationalized during the day when the space is lit, so the attic has a safe and nostalgic feel to it. Explain more

The **basement** on the other hand, is the dark entity of the house. Even during daytime, the cellar is a dark place that evokes feelings of uncertainty in us. It is unclear, irrational, never concrete. The basement is a very mysterious space. Fear only gets exaggerated by the possible dangers that the human mind can dream of here. Also stories and images of cellars being used as prisons contribute to this exaggerated fear about it. It also is a space that we always *descend* stairs to. Which shows again the emotional influence of stairs..

Darkness is the peak of limitless imagination. It makes spaces completely undefinable and so the imaginable possibilities grow rapidly. The meaning of narrowness and wideness come together in the darkness. The dark space hides all limits while at the same time it surrounds us with a feeling of limit because we can't see. It is a space of vagueness and fantasy. Because of the unknown of the dark space, humans tend to stay close together and a bigger feeling of dependency forms. On the other hand side, the fear and excitement of meeting someone in the dark shows this combination of closing and expanding forces in the darkness.

Domes are very special roofs. The roundness of a dome invites caress. Bachelard writes that „images of full roundness help us collect ourselves, permit us to confirm our being intimately.“. Because of their roundness domes have a greater similarity to natural shapes. A dome roof lets us dream freely and can even let us forget all our psychological determinations at once.

A big inside space or **big room** gives us the feeling of freedom to move. We feel we can reach something unknown. Big rooms often hold a lot of people which only reinforces the effect of imaginable possibilities. The individual growth can heighten in a collective sentiment. We can be swept away with the dreams of together, going much further than our personal directives and responsibilities. The big room filled with people can merge individuality with the unity of the group.

High **ceilings** reinforce creativity. Verticality usually symbolizes development, intellect and success. It illustrates the verticality of the human being. With the tower being the biggest possibility of dreams. Going higher is always associated with positive ideas. Also high ceilings are often seen with high windows so a lot of light falls into the space. Sunlight falling in can also add to a sense of softness and free thought.

Low ceilings, however, focus our mind into one direction. They push us towards the ground and fix us onto the ground of reality rather than giving us possibilities to dream.

Windows give a frame to the outside. A window frame makes the outside world into a digestible but still mysterious image. Usually high up it shows its purpose

from inside to outside and not the other way around. The window is an image of staying and romanticizing. The experience is mostly visual.

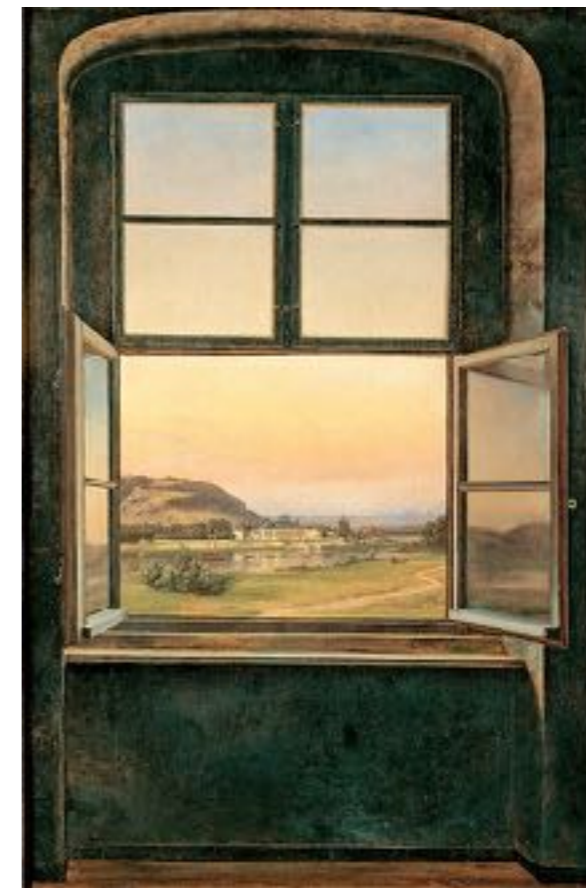
So the window invites us to become motionless and to let the wind in, get influenced. At the same time as it lets some of the outside in, it also separates us from it.

The window and the space by the window is a space of daydream and fantasizing. It also is a space of solitude more so than togetherness.

The functionality of the window is still clear to everyone, but at the same time images (for example paintings) of windows can evoke this feeling of dreaminess, new ideas and softness to us. In the 15th century paintings of landscapes, the window is used as an actual frame to help contextualize what is portrayed.

Through our emotional experiences we almost give a second purpose to the image of the window. We can see it for more than what it is.

In some cases the feeling attached to an image can even overrule real memories of them.



The **corner** carries a sharpness and stability. It is a clear choice. The outward corner is not flexible and pushes us to take a direction. The inward corner is also very definitive in its way of evoking a feeling of staying and punishment.

The curve or curved corner has attributes of grace and warmth. In opposition to straight lines that translate inflexibility, the curve welcomes us, invites us to remain. For Bachelard, the curve has nest like powers. It is 'inhabited geometry'. The sharp angle, rejects us. He asks himself: Why is it 'that the angle is masculine and the curve is feminine?'.¹²⁶

The **circle** is a symbol of life. We don't exactly know why, but circles are shapes that seem to make us happy. Maybe because next to a square, it is a more organic form. The moon is a circle, which always played a big role in the world of symbols, as well as the earth. It could also have something to do with the similarity to a human head.

Symmetry represents order and power. It is rationalism in an image. It can be soothing but also confusing for our orientation. Symmetry doesn't challenge or stimulate us a lot, but it can help understand (especially political) ideas and plans.

The **house** and especially the childhood home represent our human life and become our partners in life. A house can be a character as it is the body of our inner thoughts and memories. A home says a lot about a character and can portray deep inner feelings.

A garden is usually the space of regaining energy, togetherness and free spirit. Plants and insects make us feel part of nature again and we can understand our own being as part of the world. The garden is a door to nature.

Wardrobes give us an image of intimacy.

With their shelves, desks with drawers and false bottoms they become organs of the (secret) psychological life. An old wardrobe can give the feeling of protection and depth inside but also of delicate intimacy and privacy. In the wardrobe exists a center of organization. Order doesn't always mean geometrical, it can also mean clarity.

Wardrobes can spark our imagination and beyond, when at the same time it is clear to all of us what objects we store inside the wardrobe. Even though the wardrobe, just like the house, has a very definitive function, it allows dreams to come to life too. (Think of for example Narnia)

Doors can be symbols for a lot, but it always has to do with a connection or the denying of a connection. A mere door can tell stories of hesitation, temptation, desire, security, welcome and a lot more. Doors are a big part of our experience of space. Bachelard even says that if „one were to give an account of all the doors one has closed and opened, one would tell the story of one's entire life.“¹²⁷

The **door knob**, for example expresses the concept of opening. Even if in reality it is used to open and close doors, it is seen as the 'opener' of the door.

A key and the key hole are also used to open and close, but the emotion of closing is stronger here. We seem to lock the door with more importance than when we unlock it. Through this use of the key hole, it became almost a symbol of something locked away. (For example, the image of the keyhole is used a lot as a symbol of secrets in Hitchcock films)

The **bridge** unifies the randomness of nature. Because the bridge is a human creation embedded into nature and accepted, in an image of a bridge, we can understand nature better. The evident connection through existence the bridge and it's isolation in itself embodies a deeper understanding of life.

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- 34 Gaudi <https://i.pinimg.com/originals/83/63/71/8363712d0be408beaff0493f39c40c67.jpg> & https://www.researchgate.net/profile/Winifred_Newman2/publication/305638677/figure/fig2/AS:387936865538050@1469502764314/Tree---columns-at-La-Sagrada-Familia-by-Antonio-Gaudi-Barcelona-Spain-1883-to-the.png
- 35 Caspar David Friedrich <https://www.metmuseum.org/-/media/images/exhibitions/imported/rooms-with-a-view-the-open-window-in-the-19th-century/a7a22ac9053040c9b8d4b4ea40f7dd1004.jpg.jpg?mw=893&mh=520>

The rest of the graphics are self made.