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Emotional space

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1. Introduction

Since the beginning of human existence, we have been building our own homes, deviating from the physical environment and creating spaces that suit our lifestyles. These spaces contain different ways of lives, and they are a source of stimulus that affects our emotion and behavior. Therefore, a dwelling place that provides pleasant, efficient and aesthetically pleasing spaces always needed.

Our living spaces have been developing ever since we set foot on earth and it is still changing. Particularly, the emergence of new materials have formed new types of spaces, as it can be seen in the evolution of house types from caves to huts, thatched houses, wooden houses, and adobe houses. In modern days, we were able to go further the physical properties of these materials, leading to the emergence of spaces that have no restrictions in form, showing their unlimited potential.

This means that “changing” has a more positive influence than “stopping or staying still,” and in order to pursue change and move forward, originality is indispensable. Originality is the aspiration towards a world in which we were not yet able to possess.

Such continuous progresses in mankind’s tools as well as the advent of new types of multimedia, provocative social culture, and an overflow of information have lead to a serious identity crisis. As a result, modern people live under great stress, experiencing negative emotions daily, as we are consistently exposed to confusing information. These changes in our state of emotions aspire for a better quality of life, refusing our present condition. Architectural system of thought also influences change in paradigm and style. Therefore, an attempt to produce a new life by adding pleasure and creativity – elements that were absent in the monotonous, tedious and austere spaces from traditional modernism – is crucial. Modern people had been living confined in between walls, and we need a space that stimulates our lives, reduces our stress (negative emotions), and changes our living conditions, bringing a positive effect. This is how our lives can become peaceful and productive. It means that we need a interactive space that can support us in a psychological level, as well as an experience on a participatory, accommodative, and aesthetical dimension. In order to create this effect and form an impression, human physical movement and color is used to stimulate people’s emotions.

The sense of sight takes up 80% of the human sensory system. This visual effect will be mainly applied in order to stimulate the users and create the impression. The most influential color encourages different emotional responses according to the change of time. A mutual complementation is created, moreover, through an instantaneous and dynamic emotional (adaptation, compliance) stimulus.

The aesthetic characteristic of a color is that it intensifies human emotion. In order to use this characteristic efficiently in a space, it is important to create an environment that encourages behaviors and supports the user’s psychological state of mind. Color will be used

as the independent variable to create the space, and the user's movement will be used as the dependent variable to increase their preference by providing more freedom and awareness. These are elements of space that awakens the body, stimulates behavior, and influences the aesthetic emotion; the addition of color will create interaction between people and the space they are in.

In order to realize this interactive space, a certain unexpected dimension will be formed even with the most sophisticated analytical tool, due to each individual's complex phenomenological factors. Because of this reason, this thesis attempts to consider space as the expansion of aesthetic objects or functional forms to convey its natural beauty. Particularly, the inherent color of a space is not only shown through instant logic or characteristics that are relevant to the concept, but also through results connected with situations that haven't been experienced. Architectural color cannot be considered separately from our thinking process because thought generates forms, provides energy and creates unique spaces.

Spaces with color are cohesive representations that strengthen the meaning of space, generate a relationship between people and color and activate various thoughts through color schemes. Colors form closer relationships with the users than form, and enrich the meaning of the space not only with different colors but also even when a limited number of colors is used appropriately. The relational system of space interacts with the architectural concept, creating different values with all chromatic, achromatic, and mixtures of the two types of colors.

This project, in particular, aims to create an interaction between visual and behavioral stimulation by encouraging movement in users through changes in functionality and symbolic representations of colors. These particular changes originated by the users or the passage of time will generate favorable emotional effects to people.

2. Emotion

2.1. Why is Emotion Important?

Our lives have become abundant due to technological development, and we always strive to live an even better life. Although there are always some mysterious aspects in human biology, we are discovering new physical conditions every day in terms of anatomy. They consequently lead us toward the discovery of an environment that is most effective in improving the quality of our lives. These environments aim for physical comfort as well as a positive effect in people's emotional state. This is why human emotion is being researched, analyzed and applied in numerous fields.

Psychologists and psychiatrists, nowadays, are profoundly interested in modern people's emotional state because we frequently and generally suppress our feelings during social activities. **Emotional suppression, however, has its limit and can trigger unexpected behaviors** just like when a glass full of water suddenly overflows by one more single drop of water. This is called the **Emotional Boomerang Effect**. When information and strong images from TV or games continuously stimulate our brain, it is harder to control our emotion. **Our mind becomes insensitive to the stimulus that has been constantly exposed to, craving for a more intense stimulus afterwards**. A stronger stimulation may bring a temporary positive effect, but as soon as the mind becomes tolerant, it again requires a still more powerful excitement and the cycle continues. When our mind does not get the proper stimulus it needs, however, it provokes a counter effect creating a chasm within the emotional state. Various shocking social incidents such as suicide are stemmed from this emotional gap.

Steven Holl studied that **phenomenology** is the objectification of different sentiments felt inside a space, and emotion is a fundamental factor that enables us to realize **the essence of beauty**. In his architecture, Steven Holl attempted to express the **"enthralling knowledge"** that people directly experience inside time and space, in other words, the beauty that is understood at the moment when a person is emotionally impressed.¹

Moreover, **Luis Barragan** introduced his studio designed by himself as, "My house is my refuge, an emotional piece of architecture, not a cold piece of convenience." He also said, **"I believe in an 'emotional architecture.' It is very important for humankind that architecture should move by its beauty; if there are many equally valid technical solutions to a problem the one which offers the user a message of beauty and emotion, that one is architecture."**²

¹ Myong Ok Kim, A Study on the Methodology of Steven Holl's Emotional Design, Korean Interior Design Society Treatise n.22, p54

² Yutika Saito, Barragan, TOTO, 1992, P10

The essence of emotion is vague and as fragile as glass since it needs to be treated with great care. Emotions should neither be overly expressed nor overly suppressed. The cause of our behavior, either right or wrong, mainly depends on the mental and biological condition we are in at that specific moment. **Even in the same situation, therefore, different states of emotion bring different results. Thus, it is crucial to accept our own feelings and apply them effectively, in order to gain positive responses in life.** In this point, **Karim Rashid** said that the **feature of space** has a complex relationship of mannerisms, cognitive and spiritual, and physiological connectivity in the senses. Pleasure is more psychological than physical. Health is more physical than psychological. Beauty is epitomized through the combinatory arrangement of factors. It is highly important to our daily sense of well-being and to our ethical idea.³

This intense effect of emotion is applied in the field of design to achieve a greater **aesthetic expression** and to **influence the consumers**, as a marketing strategy. This application is called human sensibility **ergonomics**, which is the study of consumer satisfaction. In order to understand the effects of maximizing the function of a space through emotion, it is important to first study the meaning and characteristics of emotion, in terms of human sensibility ergonomics.

³ Relax, Interiors for Human wellness, Introduction by Karim Rashid, Birkuayser

2.2. Definition

The meaning of 'emotion' has been interpreted differently and ambiguously depending on its context. According to a dictionary definition, emotion is a **'high-level of psychological experience' that arises from the depths of the human mind, generated when external stimuli are sensed. Together with feelings such as happiness, joy, disgust, anger etc. emotion is the human ability of perceiving the world.**⁴ In other words, emotion is a subjective feeling, a combined result of different factors such as personal experience and preference. Since this chemical, psychological human reaction is still an unknown world, each field of study have their own interpretation on emotion.

Philosophy: Emotion is a concept in opposition to reason, and is considered to be similar with sensation

Aesthetics: Aesthetics is the study of emotional perception that is acquired through beauty.

Psychology: Emotion, in a narrow sense, is equal to the state of mind; in a wider sense, is equal to the state of the subconscious inner-self.

Ergonomics: Human emotion is measured, analyzed and evaluated both quantitatively and qualitatively. It is then applied into product or environmental design as a technology that renders human life more pleasant.

Architecture: Complex emotion is created through an intimate interaction between human and space. It is interpreted as a psychological experience enkindled by the power of sense and perception.

Emotions are out of place in a polite, sophisticated society. They are remnants of our animal origins, but we humans must learn to rise above them. At least, that is the perceived wisdom. Emotions are inseparable from and a necessary part of cognition. Everything we do, everything we think is tinged with emotion, much of it subconscious. In turn, our emotion change the way we think, and feel. They serve as constant guides to appropriate behavior.⁵

⁴ Space design 16 lessen , Younggil Kwon, Kook Jechulpan (Korean international publish), 2001, p23

⁵ Emotional design, Donald A. Norman

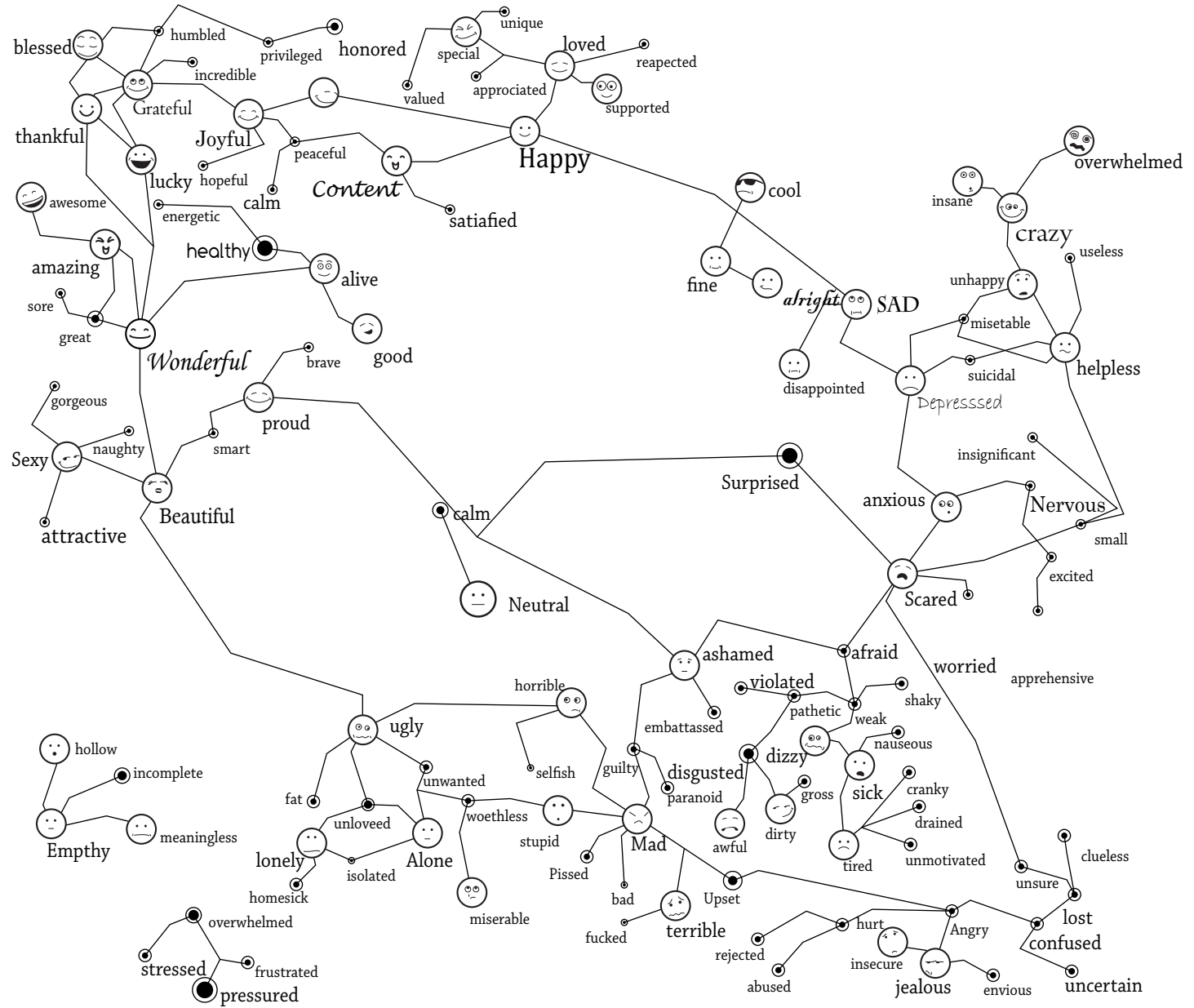


Diagram 2 Relationship between facial expression

2.3. Natural Emotion

To feel, to experience emotions is something very natural. Emotions appear when experience combines with subjective feelings, cognitive interpretations, psychological reactions and conducted expressions. It can be divided into two different types:

1. **Positive** – joy, happiness, content, calm, excitement etc.
2. **Negative** – sadness, fear, anger, frustration, depression, distress, guilt, embarrassment etc.
3. It is very important that the principal emotions, generally brief but intense, are naturally accepted and followed. They arise suddenly in response to environmental stimuli that affect us for whatever reason. **The sudden relationship of all organisms with physiological (the body), cognitive (the mentality) and the behavioral components (the actions).**⁶

When emotions appear within us, they provoke a series of reactions:

1. **Cognitive reactions - perception, thinking and memory** are involved in **emotional expression**; what happened.
2. **Affect** - all emotions are affective - involving a **positive or negative state**
3. **Physiological reaction** (Conative) - **hormones** attribute to our emotional state. These can **increase heart rate and blood pressure**. Other changes that can occur are metabolism change and change levels of neurotransmitters in brain.
4. **Behavioral Responses** - emotions motivate us to actively express our feelings; overt behaviors (position and motion). These may include crying, screaming, facial expressions, or body language.⁷

Emotions that appear instantly do not last for a long time, but show great intensity. If they are naturally expressed, instead of being restrained or denied, it will help improve the quality of our lives.

Natural emotions are part of our body's chemical process; when they are suppressed, our body produces toxins(stress) or activates the nerves more than necessary, making us extremely sensitive. Our personal abilities improve if these emotions are properly accepted and digested.

⁶ Perception design, Giulio Bertagna, Aldo Bottoli, Maggioli editore, 2009, p82

⁷ Natural of emotion, http://faculty.txwes.edu/mskerr/files/3304_ch2.htm

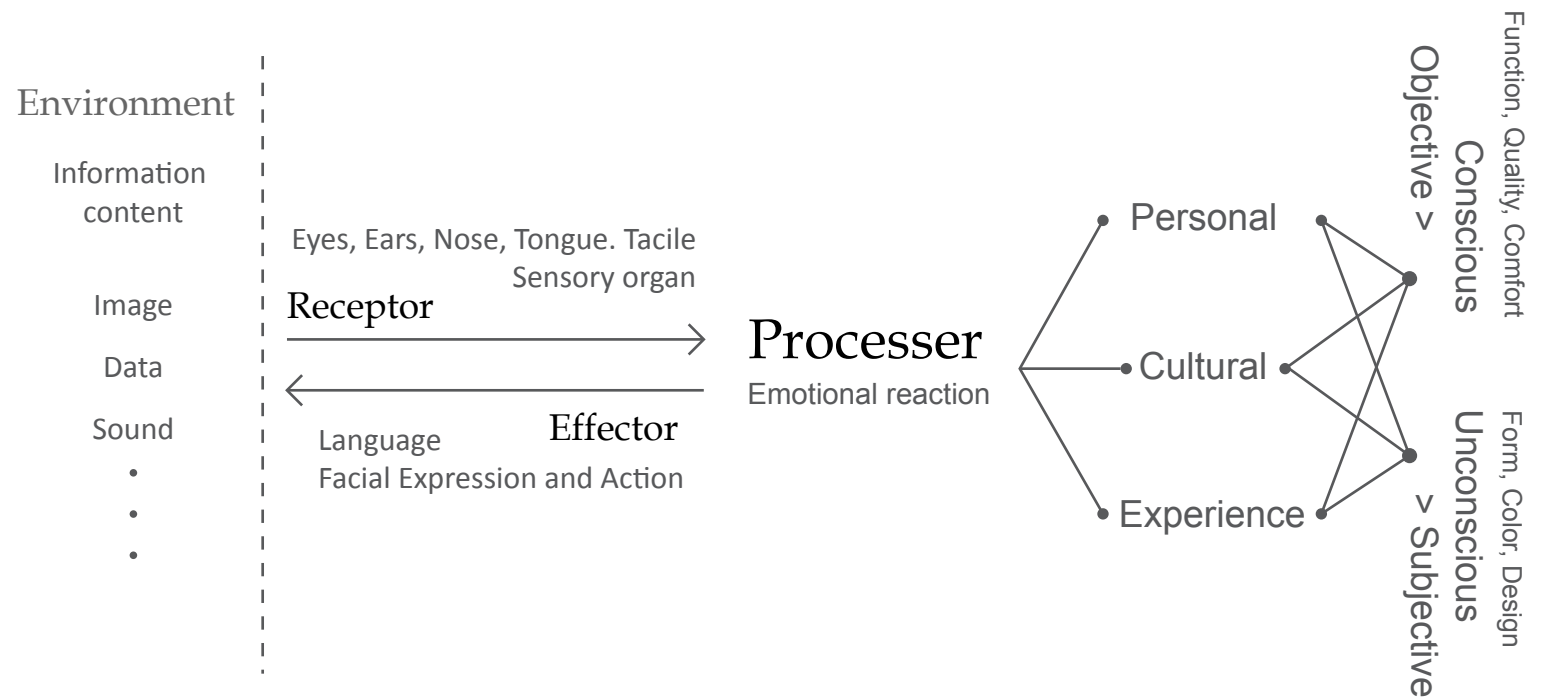


Diagram 3 Progress of Human emotion

2.4. The Process of Emotion

Emotions are generated by two progresses when directly sense '**primary sense**' comes from our five sense organ (sight, hearing, touch, taste, smell) and the '**secondary sense**' that comes from memory and experience or expectations. In other words, emotions arise as memories accumulated by everyday experiences and physical information are synthesized. This is why emotions differ even within the same individual, depending on the situation and environment. Emotions are the basic factors of humanness, and they are the responses related to the individual's needs and motives.⁸

There are **different types of stimuli that generate emotion**. In addition to the **physical stimulus** that is transmitted through the five senses, emotions are also known to be evoked by **non-physical stimulus** such as functionality and usability. The reason why emotions are applied in our lives is to make the user's life easier and also provide satisfaction. Based on this, emotions can be classified into two different types: **sensorial emotion** which is stimulated by shape, color and design; and **functional emotion** which is stimulated by quality and convenience.

The renowned philosopher **Immanuel Kant (1724–1804)** commented that "Emotion is passive. It provides a subject matter to the ability of reasoning. Without emotion, perception loses its validity. Emotion is beneath reason in terms of ethics or practice, and although it provokes animal instincts it can be controlled by will. In terms of formality, emotion is a pure intuition like time and space." It can be understood from Kant that since the logical cause for emotion is difficult to find, it is not considered as an objective target of understanding. Whereas **emotion** is a sensorial experience that perceives objects through sense organs, **reason** grasps facts without this sensorial experience. Humans, therefore, define objects through both emotion and reason.

Since the emotional need of each user is unique and diverse, it is difficult to incorporate all of them when creating a space. Because of this, functionality has been the core motive when architects design a certain environment. As our society's demand of exclusiveness in space is being ever more valued due to the increase of individuality and diversity, our interest in fulfilling the user's desire is also expanding. Satisfying the sensorial emotion should therefore be an essential consideration when creating a space.

⁸ Brave, S and Nass, C, Emotion in Human computer Interaction, Sanghoon Jun, Gunpyo Lee, 2006, p346

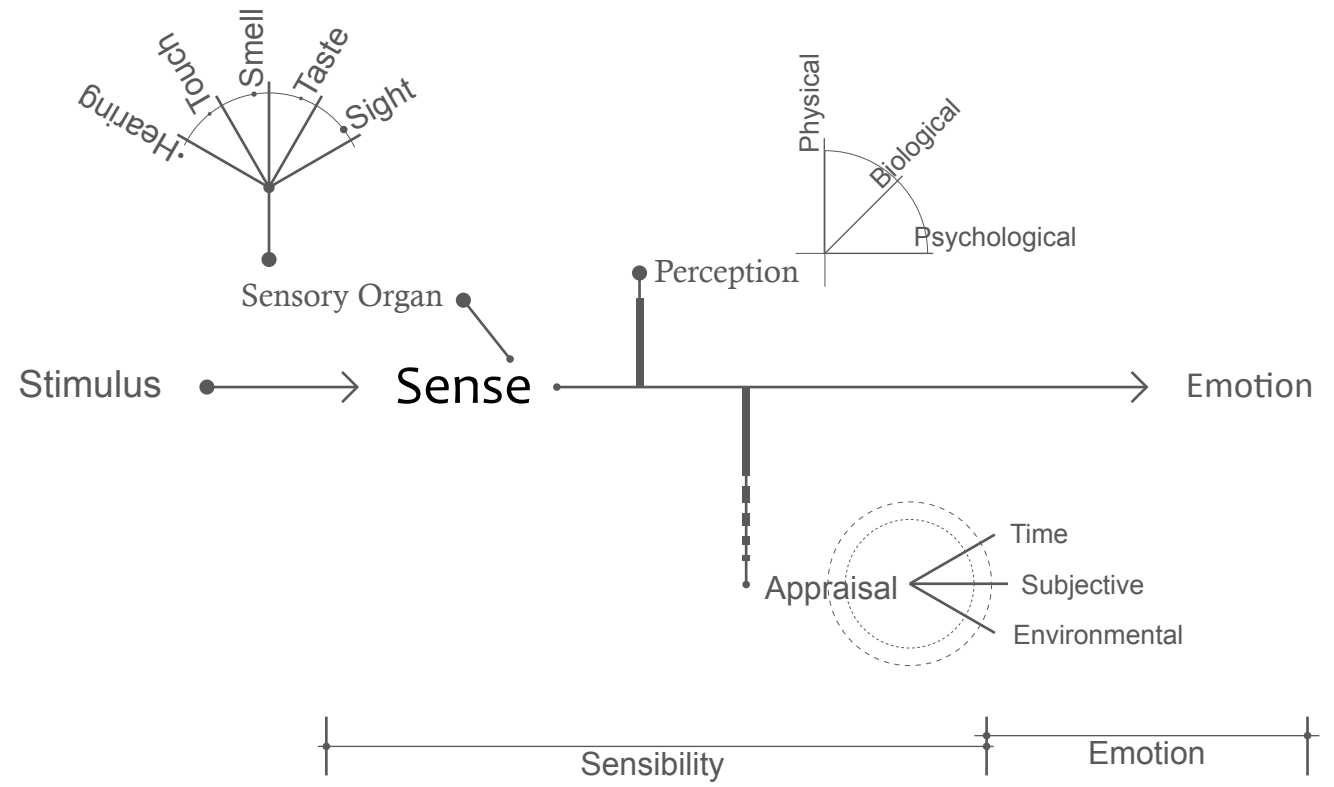


Diagram 4 Progress of How make the emotion

2.5. Physical Process

Human senses perceive physical stimuli through **sight, hearing, touch, smell and taste**; there are six senses in total, including the sense that exists inside the body. Although different in characteristic, these senses interact with each other. This process is called **synesthesia** and it generates complex, combined emotions. The sense of sight consists 80 percent of this process, which explains the reason why people are able to influence each other's emotions without using words. 80% of the physical information is perceived through the sense of sight. During the transmission of this **visual information**, the ones that make up the characteristics are firstly **perceived** and sent to the **Limbic System** where **hormones** are secreted. This is why people show emotional reactions prior to making an objective judgment, and it shows that emotions are more intuitive than rational, especially in color. Color generated emotional effects when our body perceives its visual characteristic. This process has been established through a long-time evolution such as heredity and also through social learning. When emotions are decided, they are transmitted through two different paths: neurotransmitters and hormones. Neurotransmitters transmit information in an instant whereas hormones pass them slowly but persistently through the vessels. **Thus, the body adapts to the environment, and hormones mediate emotions in order to create an appropriate state for the perceived environment.**

Emotions react to the information received from the environment, causing a more complex behavior within modern people whose lives are extremely complicated. Furthermore, emotions differ according to the sensory organs that perceive physical information. Due to this fact, emotions are never absolute towards the subject but will exist within a certain range, because they are accepted through sensorial experiences.

Experiences are composed of **sensations and reflections**; emotions are modified and completed through practical experiences and the judgments generated by these experiences. Practical experiences, therefore, are crucial in the application of emotions.

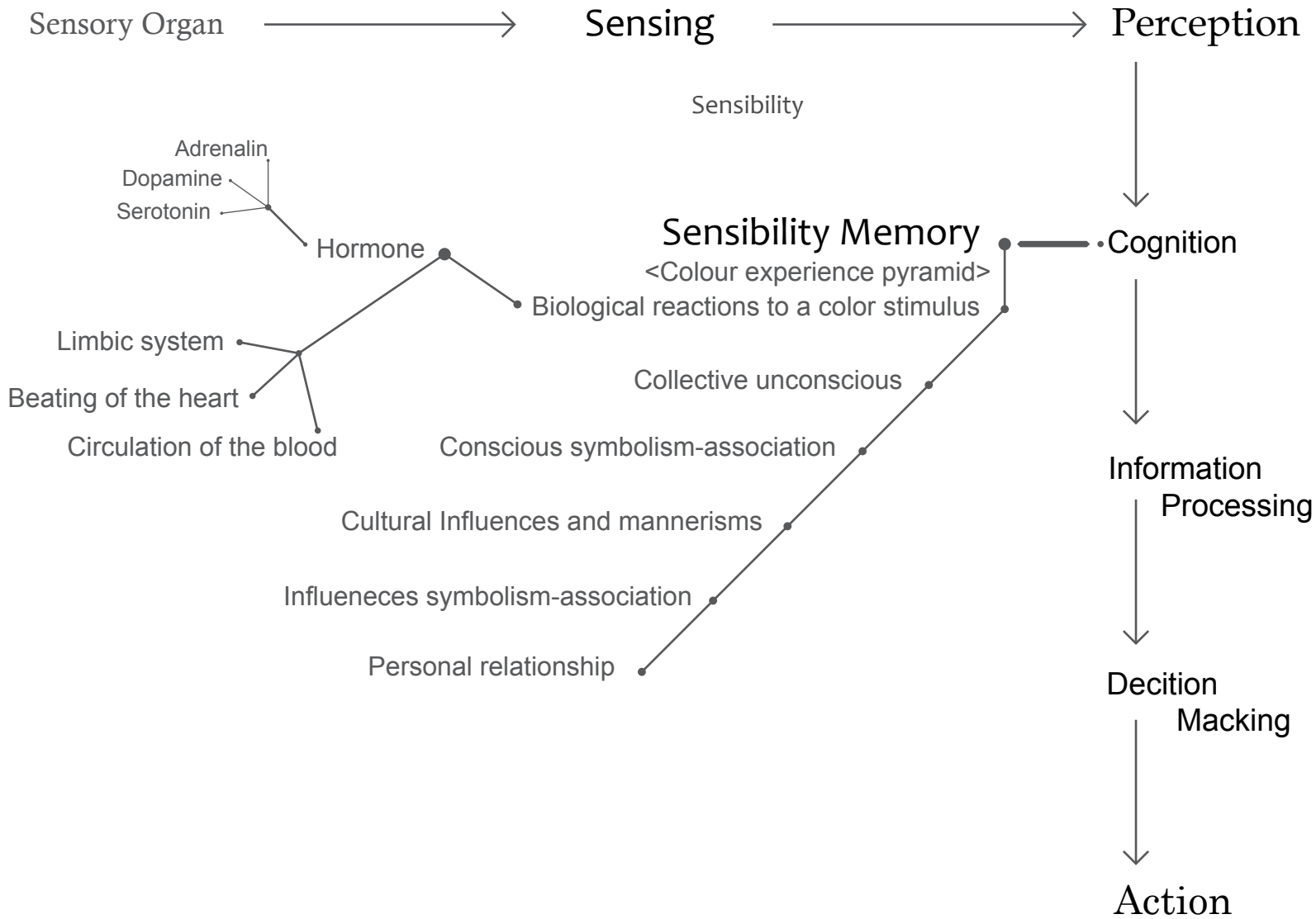
Human sense is the passage that directly connects the outside world and our perception. The result of this perception is an emotional reaction.⁹ **The 3 main factors that influence emotional reactions** are: **environment, time** and the **individual**. People who live in similar environments share similar emotions; emotions tend to get stronger or weaker as time passes; emotions are extremely personal and ambiguous for each and every individual. When emotions are influenced by these factors, it is difficult to estimate and evaluate because the biological, facial and behavioral changes are subtle. Furthermore, the reaction to physical stimulus happens unconsciously and intuitively that it is almost impossible to self-control.

⁹ A study in sensibility and method of creative idea technique in exhibition design, p10

In terms of space design, such undefined emotions “**contact with the surrounding environment through perception, which means that emotion itself contains the function of communication.**”¹⁰ If we extract all the variables that provoke emotions and study the user’s level of satisfaction, we will be able to detect the emotions generated within a certain space. For this, it is essential to understand the effects of our emotions and how they are formed.

¹⁰ Space design 16 lessen , Young-gil Kwon, Kook Jechulpan (Korean international publish), 2001, p25

The Process of Sensorial Recognition



2.6. Emotional Communication between Man and Space

Stimuli insertion	: Information	
Perception	: to see, sense	Physical
Cognitive	: to feel, imagine, remember or guess	Mental
Responsive	: to move, react	Action
Emmitt the result	: to feel the space, to use	

Our emotion form by our senses, it depend 80 percent of the sense of sight. This shows that **humans are visual-oriented beings**. It is rich and sensitive, and it greatly influences people in a psychological point of view. Our ability to visual perceive is extremely precise, and it captures even the vaguest meanings. People think that the clouds in the sky change their shape every minute; this proves the existence of our visual classification instinct. **Visual information is perceived as symbols, which are consisted of one meaning or different layers with broader ideas**. Therefore, it is important to know the **view field**, because each symbol can suggest different ideas and depending on the perspective, a symbol could be interpreted differently.

The **information** we receive from our environment, the space we live, are stored as **images**. Images are the simplified form of the countless number of information we perceive through our environment. In other words, it is the mind's effort of processing and summarizing the vast quantity of materials, and it is the human mental representation of its target. This is an important notion in the sense that people's behavior depend much greatly on images rather than on objective matters¹¹. As time passes, the information would become like animated papers. But these possess, express and manifest, not only visual functions that are not related merely to the visual and sensory, but can also play a moral, sensitive, and aesthetical role.

Based on how the information is processed, **environmental psychologists classified these images into three different types**: cognitive image, affective image and conative image. **Cognitive image** is the objective knowledge or conviction of the target's properties. **Affective image** is a person's feeling towards a certain target. Lastly, **conative image** is the behavior created by the image evaluation. These behavioral images are shown through selective and absolute behaviors, where emotions are affected by movement,

¹¹ Destination Positioning Analysis through a comparison of cognitive, affective, and conative perception, Steven Pik& Chris Ryan , Journal of travel Research, 42. 2004, pp.333

and behaviors are affected by these changes in emotion.¹² When these images get together, they form an **overall image**. It is difficult to define the overall images because it happens inside people's brains and the effect depends on each individual. So, in order to certify the things that are impossible to define in emotion, we can configure them with a symbolic language, made of suggestions, which are not only derived from rational observation. We can get closer to it through a type of contact that in philosophy is called 'image'.¹³ The 'image' corresponds to a real faculty of the soul, which is a subtle faculty and an intermediary between perceptions arising from the sensible world as well as the spiritual and intelligible world. Based on this, when visual and perceptive spaces stimulate the senses, it facilitates the flow of communication between the users and their environment, multiplying the emotional experience. Since all users demand a space in which they can contain their lifestyles, the space needs to provide functions that can satisfy its users. The more the demands are fulfilled, the greater the satisfaction will be.

There are two different stimuli in the process of emotional communication between space and its user: the active stimulus coming from objects such as furniture, and the passive stimulus coming from the empty space in between objects. The empty space, or the passive stimulus, gives autonomy to the user's behavior.

Kevin Lynch classified the structural order within a physical space as **Node, Path and District**. He stated that this system of orientation formulates an exceptional environmental image, providing emotional stability. And the human body is the mediator between the stimuli from space and emotion. Emotions conveyed from spaces are subjective; they are the products of physical reality and personal experience. Despite this observation, the emotional area of space design has been so far much focused on the intensity of the stimuli that the physical space conveys, which is a secondary factor.

¹² A study on the evaluation model of color image in architectural space, Eunmi Yu, Hongik university press, 2009, p,17

¹³ Il colore, simboli e archetipi, L. Pedirota, Mediterranee, Roma 1996, p31

Standard of emotional application	Contents	Remarks	Application
Harmony between emotion and reason	Emotions co-exist with reason.		Emotional application based on rational need coexists with limiting factors.
Subjectivity of emotions	Emotions are applied subjectively, within an objective range.	Kant states that subjectivity originates from personal judgment.	Select subjective emotions within an objective range.
Motive of emotions	Emotions do not follow a purpose. Instead, they find meaning in the type of composition.	Kant states that reasonable motives originate from personal judgment.	Use a combinational representative method instead of a conceptional approach
Hierarchy of emotions	Emotions are not absolute; they have a hierarchy.	The quality of emotions	Classify and rank emotions through vocabulary
Experiencing emotions	Emotions can grow perfect through experience.	The importance of sensorial experience in emotions	change of emotional experience through movement and imagination
Conveying emotions	Human emotions are first conveyed through adjectives.	Emotional vocabularies are conveyed through adjectives.	Apply adjectives to classify emotions

2.7. The Effect of Emotions

Maybe you could find one who does the work as well as I, but I do not think it's easy to find one who can become as I am to do it. Bill Clinton

Positive emotions make people more motivated and creative. They also increase the capacity for collaboration, reflection and decision. In a situation like brainstorming, where we need to imagine solutions to a complex problem, the person who has positive emotions tend to produce more ideas, take into greater account the suggestion of others, and collaborate more easily and develop numerous, better solutions.¹⁴

There is a study on diseases caused by negative emotions show that excessive emotional fluctuations causes the blood, sweat, saliva and breath to carry out chemical reactions; our blood acidifies and our saliva produces harmful toxins. In addition, anger produces a considerable amount of toxins which are later breathed out. The fact that psychological conflicts and stress are the cause of all kinds of illnesses is being proven by numerous experiments.

Emotions have been defined as affective reaction, usually short but intense. As mentioned previously, emotions arise suddenly in response to environmental stimuli that affect us for whatever reason. The difference that distinguishes emotions from feelings is that the latter does not depend on external stimulus but on our personal interests and our values that are influenced by cultural context. Moreover, they persist over time, regardless of the presence beside us.¹⁵

For example, we can consider emotion as the attraction that provokes our life to be ideal and increases our personal capacities (e.g. Green and blue enhances our working ability). This attraction transforms itself into feeling when we begin to think about when it happens. We estimate that we could live in harmony because we share ideas, habits and the passing of time. After emotions are generated, we perceive the message immediately. Each of us has a very personal way of reacting to events, even in relation to personality and life experiences. It is more important, however, to be able to communicate our emotions; even negative emotions should be resolved in the right way, such as a body gesture.

¹⁴ La forza delle emozioni, Christophe André – Francois Lelord, TEA pratica, 2009

¹⁵ <http://www.ascoltopsicologico.it>

2.8. Emotion and its Function

According to David Norman, utility and emotions influence each other; negative emotions make easy tasks difficult, whereas positive emotions make difficult tasks easy.¹⁶ Although **emotions are not frequently generated by physical stimuli from our daily lives, when people are constantly exposed to small stimulations for a long period of time its effect can't be denied.** This is because visible stimuli tend to get weaker and apparently insignificant stimuli eventually tend to play a great role in the growth of our personalities. For instance, when an orange object is placed inside a green room, the level of stimulation will be at first relatively high, due to the effect made by the two complementary colors. However, as the user spends more time in this room and gets used to it, the image of the space adjusts itself in accordance to the room's function.

Our environment, which consists of factors that influence our emotions, influences the quality and condition of our lives as well. As a consequence, people's behavior and emotions change according to the change in their environment. **Two environmental psychologists, Albert Mehrabian and James A. Russell,** stated that the physical stimuli from our environment directly influence our emotions and trigger various behaviors (approach-avoidance, work efficiency, social interaction).¹⁷ This basically forms the **Stimulus-Organism-Response (S-O-R) model.**¹⁸ Emotional reactions caused by environmental changes can be calculated when this model is applied to the environmental variable and human emotional reaction. This means that physical and social stimuli directly influence human emotions, and these emotions influence the behavior of the people living within that environment.

When architects design a building, they plan so as to generate positive emotional reactions inside the user, although the level of reaction might be different depending on the individual. Moreover, since emotional images change as time passes, it is important to create positive reactions by encouraging certain behaviors and altering the mood of the space through colors. Affective images also change according to factors such as the individual's experience, desire, situation and the instability of the stimuli. Emotions rely on the

¹⁶ Emotion design – Why we love or hate everyday thing, Norman David

¹⁷ A study on the evaluation model of color image in Architectural space, Eunmi Yoo, Hong Ik University, 2009, p3

¹⁸ Woodworth's "Dynamic" psychology and the S-O-R formula, [http://www.igs.net/~pballan/section5\(210\).htm](http://www.igs.net/~pballan/section5(210).htm)

When we accept some stimulus, our body react something by organism and the organism makes the response when it is aroused by a stimulus. In order to predict the response, we must know not only the stimulus, but also the organism stimulated.

information perceived internally and externally, and they are direct and concrete “feelings” coming from our senses. However, they are also extremely personal and unstable because they can be perceived differently depending on the situation.¹⁹

People have the tendency to seek change. This pursuit is a constant process of periodic ups and downs of the mutual conflict and cooperation between the human duality, which is fused inside our intuition. In other words, we have the innate quality of repeatedly demanding a change in the stimulus, moving from relaxation to tension and vice versa.²⁰

¹⁹ Space and Human, Nakano Hagimu, Korean national publish, 1999, p83

²⁰ A Study on the Tendency of Interior Design's Periodic Changes based on Psychology, Jungdo Ham, Korean Institute of interior design, 1999. 12

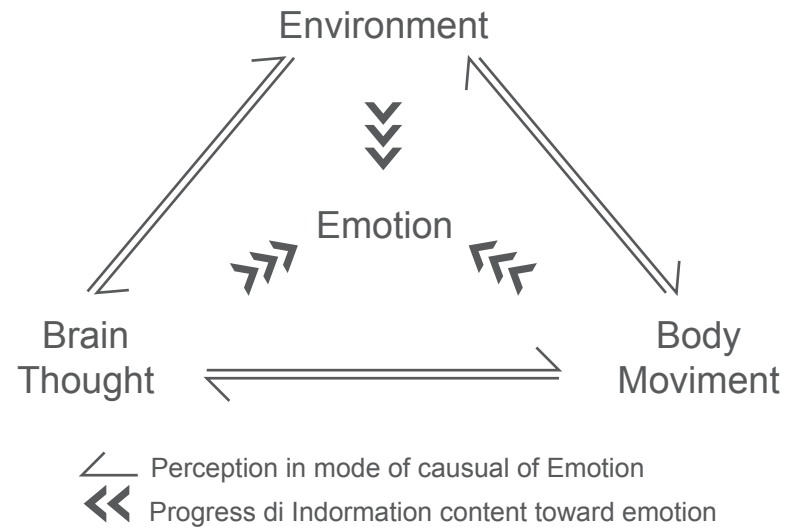
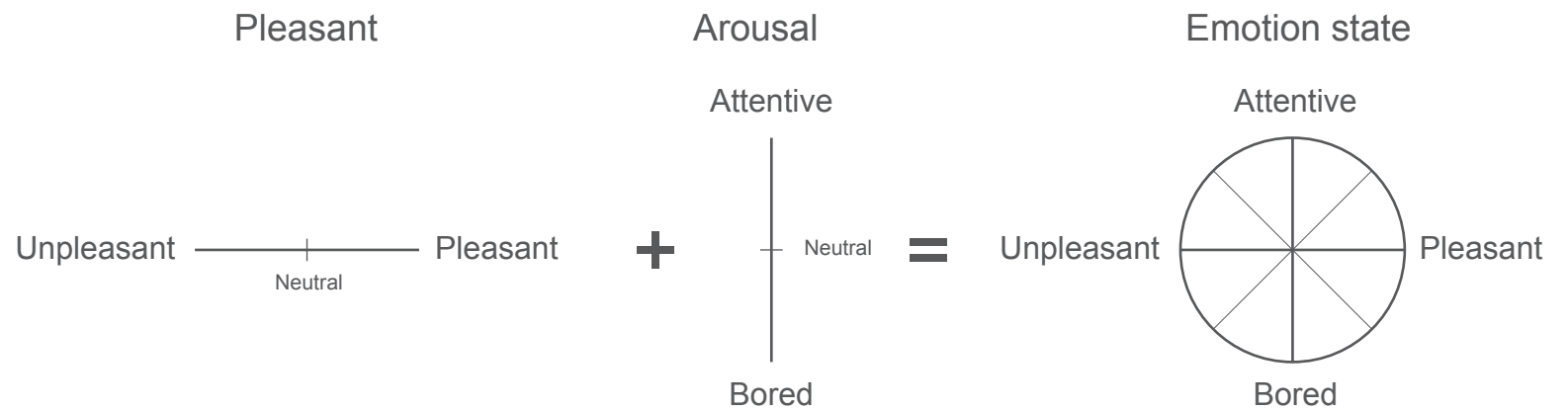


Diagram 5 Emotional statement according to PAD Method

2.9. Satisfying Emotional Space

"Everyone needs his own place as an area containing his body and also for the soul."

"It is true that unconscious desires always remain active. They represent practicable ways every time a quantum of excitement is needed. To remain indestructible is indeed a prominent feature of unconscious processes. Inside the unconsciousness this characteristic can be completed, and nothing is spent or forgotten.

Freud

Marc Olive(French architect), who is for some time also involved in psychoanalysis argues that "to build one's own space means to create a place of peace, calmness and security, [...] a place where you can withdraw from the world and hear one's heartbeat; it means to create a place where you do not risk to get attacked, a place where the soul is present."

Living with emotions is not simply a physiological function to be fulfilled, but it recalls the deepest spheres of our being where we can ask "**how do we want to spend our lives?**" We cannot deny the power of emotion, whether negative or positive. But we can transform from the negative to the positive and keep the positive emotions as long as possible under the assumption of "**We feel excited because our body moves.**" And "**We feel excited because we think.**" **Cognitivists**(**we feel excited because we think**) recognize that certain emotional reactions are triggered without a real thought. Those who support the theory of **physiology** (**we feel excited because our body gets excited**) readily acknowledge that, under certain situations, our emotions depend primarily on what we think.²¹

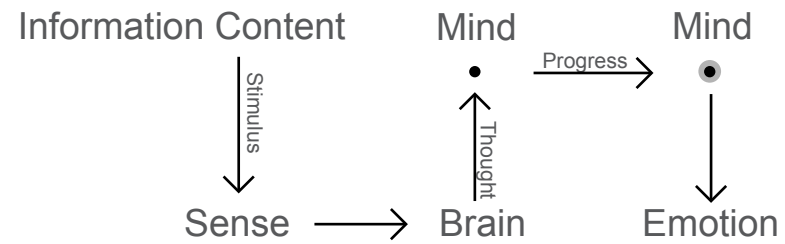
Therefore, we must search for the conditions which cause the positive within the subjects of the experiment, and then we have to create the behaviors that change the moment when the negative is present.

²¹ La forza delle emozioni, Christophe Andr'e - Francois Lelord, TEA pratica, 2009 p20

A. Neutral state



B. Emotion + Thought



C. Emotion + Thought + Movement

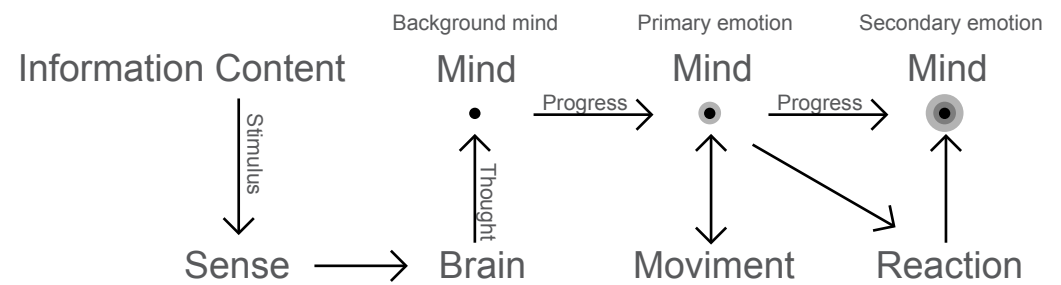


Diagram 7 Emotional occasion

2.10. Emotion Lexicon

There is not much difference in how a **meaning of a psychological emotion or symbolic language** is interpreted when they are commonly shared and understood by most people in a particular culture, and it has been possible to classify emotional languages into adjectives. It is important that these Emotion Lexicons are written down because emotions are generated simultaneously or right after perceiving the environmental stimuli. Environmental psychologists, therefore, classify these environmental properties as adjectives and mediate communication between people and space.

In this respect, **James A. Russell** announced **PAD**²², a method that can examine different emotional responses that occur in normal environments. He stated that every emotional expression has 3 different effects: **Pleasure, Arousal/Activity, and Dominance**. The nuances of these emotion lexicons vary depending on their combination, and in different cultures the process of their combination simultaneously reveals similarities and differences.

If **Russell's PAD** is the positive aspects of emotional state, then we also have the opposite which is the negative state. This is because people do not stay in one state but change continuously through endless stimulus and environmental properties. In oriental philosophy, matters are formed by Chi(energy), and the environment created by these matters induce a smooth flow of energy. Therefore, changes in the state of the environment are generated by the relationship of cause and effect between objects and its users, and in order to understand their properties many methodologies have been proposed.

Although the process of understanding human emotion depends on the experimental methods, it is mainly done through **SD**²³ and **MDS**.²⁴ Usually, the SD method uses a specific emotion adjective in order to integrate them as a higher level concept factor. Of course,

²² James A. Russell and Albert Mehrabian (1969) proposed the PAD model in order to analyze emotional factors under the assumption that real environments act as parameters that influence human behavior. It is a model that empirically examined the correlation between Pleasure, Arousal and Dominance. Evidence for a three factor theory of emotions, James A. Russell & Albert Mehrabian, Journal of research in Personality, 11, 1977, p. 273

²³ Linguistic analysis **Semantic Differential(SD)** method: The semantic differential (SD) is a technique developed during the 1940s and 1950s by **Charles E. Osgood to measure the meaning of language quantitatively**. Semantic differential questions measure **people's attitude toward stimulus words, objects, and concepts**. This question type consists of a series of **contrasting adjective pairs** (e.g., good-bad, beneficial-harmful) listed on opposite ends of a bipolar scale. Many studies have shown that semantic differential questions can work effectively with different age groups, cultures, and languages. These questions are popular because they are extremely easy to construct and administer, and provide reasonably valid and reliable quantitative data.

²⁴ **Multidimensional Scaling(MDS)**: from the data that shows the distance between objects, their dissimilarities are represented geometrically on a low-dimensional space with a multivariate graph technique

it cannot be said that the factor itself is a value concept that corresponds to the user's definition and value towards a space, but there are possibilities of integration in the meaning of the emotion adjective groups through an appropriate analysis process. In addition, the particular needs of the user on a space correspond to a scope that represents the value concept.

Positive category	Arousing quality Intense, arousing, active, alive, forceful	Negative category	Sleepy quality Inactive, drowsy, idle, lazy, slow
	Exciting quality Exhilarating, sensational, stimulating, exciting. Interesting		Gloomy quality Dreary, dull, uninspiring. Monotonous, boring
	Pleasant quality Pleasant, nice, pleasing, pretty, beautiful		Unpleasant quality Dissatisfying, displeasing, repulsive, unpleasant, uncomfortable
	Relaxing quality Tranquil, serene, peaceful, restful, calm		Distressing quality Frenzied. Tense, hectic, panicky, rushed

This is a utility value concept that can be derived by emotional image, where the user's extensive and practical needs and requirements on the space can be known. It is thus helpful for maintaining the user's satisfaction and positive effect when the atmosphere of a space is being newly created according to its utility, time or event.



Diagram 8 Human state by PAD Method

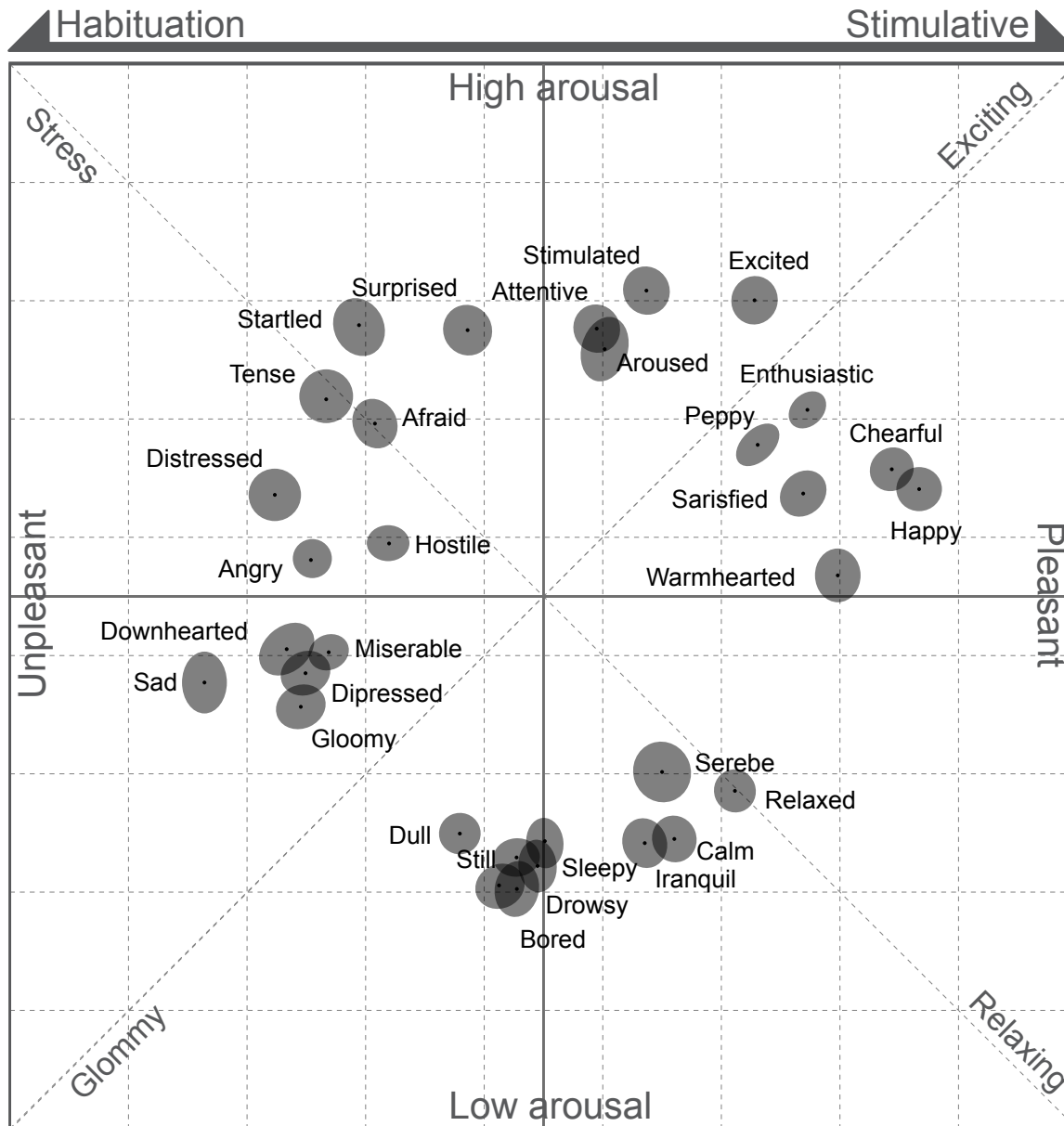


Diagram 9 PAD Method

2.11. Perception of Emotion within a Space

: Movement, Color, Space (architecture structure)

It is very important for our mental and physical health to live in places that appeal to us. Each space should be in harmony with the character of those who use it; the colors, in particular, should be chosen in tune with the user's deepest needs. According to **L. Cheskin**, people tend to be more logical when presented with shapes, whereas with color, our reactions are extremely emotional.

Color is a means to exert a direct influence on the soul. Color is a key, the eye, the hammer that strikes the soul, the instrument of a thousand strings. **Wassily Kandinsky** (painting, 1866–1944)

Colors have the power to rise from subjective sensations, which have great potential to express the idea, emotion and feeling. Humans perceive color through life and react. All of us, therefore, attribute a meaning to each color, connecting them to images, contents, and memories. The effect of these colors in areas that affect the architectural space can be classified as the psychological aspect, the sentimental aspect of the space and the principal visual aspect. The organic function of these areas enables them to interact with the space.

2.12. What Causes Emotion within a Space: Humanity

The factors that stimulate human emotions are perceived primarily through the sense of sight. Light, color, line, shape and texture of a space directly influence our perception where as composition, proportion and volume are perceived through a secondary path. Among these factors, color plays the biggest role in our perception, composition of a space and emotional reaction; when applied appropriately, it not only satisfies the user but also expresses the user's preference and personality most effectively.

The intensity and function of human emotions created inside a physical space change as time passes. In other words, as the experience within a certain space is repeated, functional effects gain more importance than sensorial effects because of the acquired knowledges and behaviors. These knowledges and behaviors give meaning to the sapce and connect the user to it. As new information become old, it no longer grabs our attention and becomes familiar. Within this time order, our perception stops depending solely on aesthetic beauty. In order to maximize the experience of a space, we tend to create different meanings to it, such as functional, substantial, perceptual, abstract meaning etc. The concept of '**humanization**' is in some ways connected to this notion because **emotion arises when a space possesses humanistic meanings, being greatly affected by them.**

The creative statement, symbolic effect, and impression made by an architectural space determine how people feel within it. It also affects how they appropriate it, behave toward and within it, and how they act individually and socially. An important aspect of "lived space" is the atmosphere and the quality of the impression that emanate from it, both of which affect the psychological relationship between people their surroundings.

Although people are influenced by space and the quality of moods emanating from them, it is important to realize that this is not about a simple transfer of moods according to Kukulhaus, people need the biological fields of tension, elements of contrast, and stimulation provided by variety.²⁵

In order to humanize the space, we need to consider the properties of change in emotions. These properties can be divided into individuality, experience and time:

Individuality – has the fact that emotion may differ depending on the user or situation been considered?

Experience – has the repetition of the user's experience been considered when detecting the change of emotion?

Time – has the relationship between the flow of time and emotion inside the space been considered?

²⁵ Color –communication in architectural space, Gerhard Meerwein, Bettina Rodeck, Frank Mahnke, Birhauser, Basel, p9

A key role in the relationship between people and architectural space is played by the following related components, which should also always be considered in the broadest sense, when developing color designs for architectural space. The impressions our environment makes are source of profound psychological forces; they exert a lasting influence on our physical and psychological well-being. The emotions generated in these architectural spaces are different according to the purpose of the space.

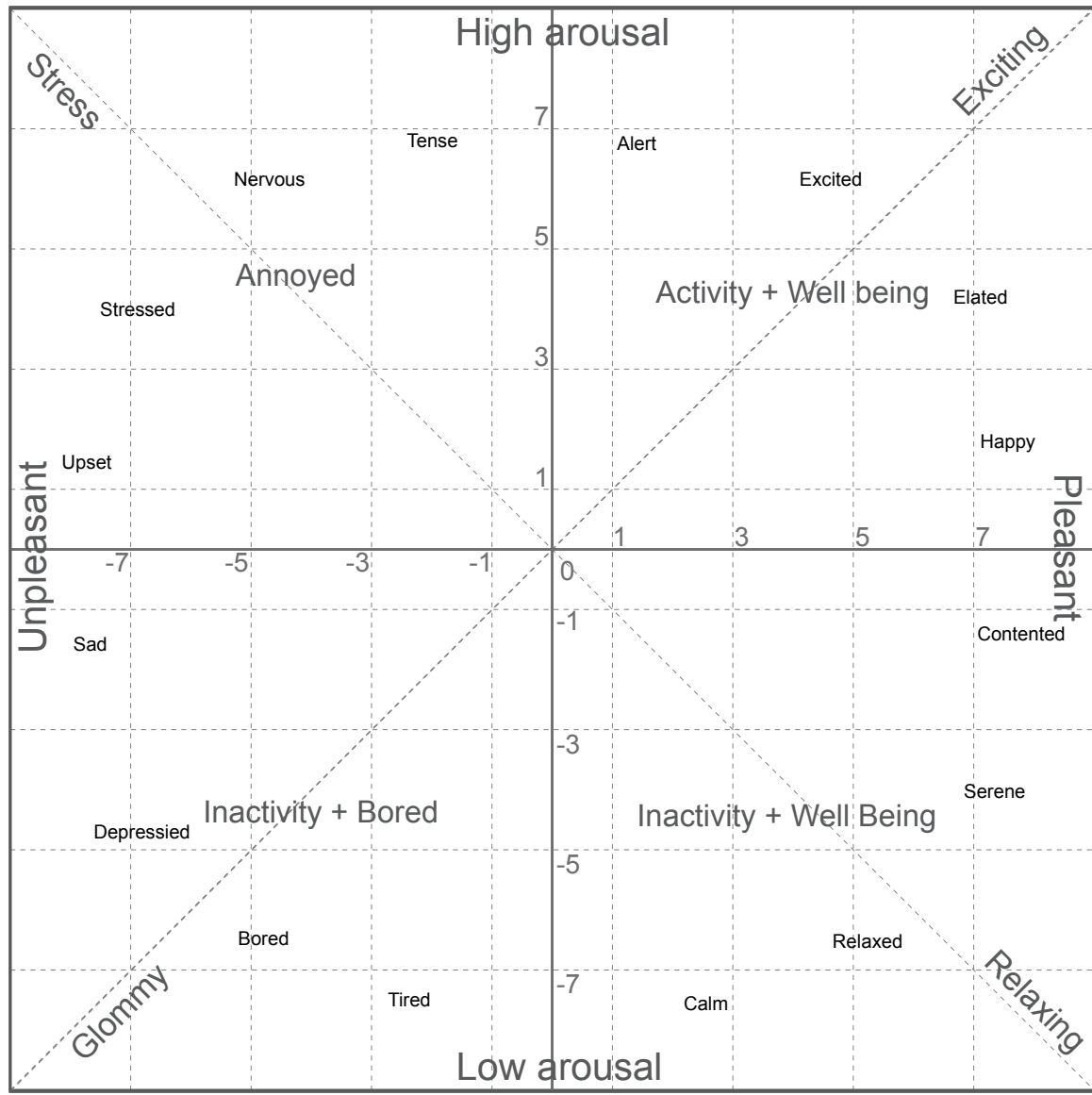


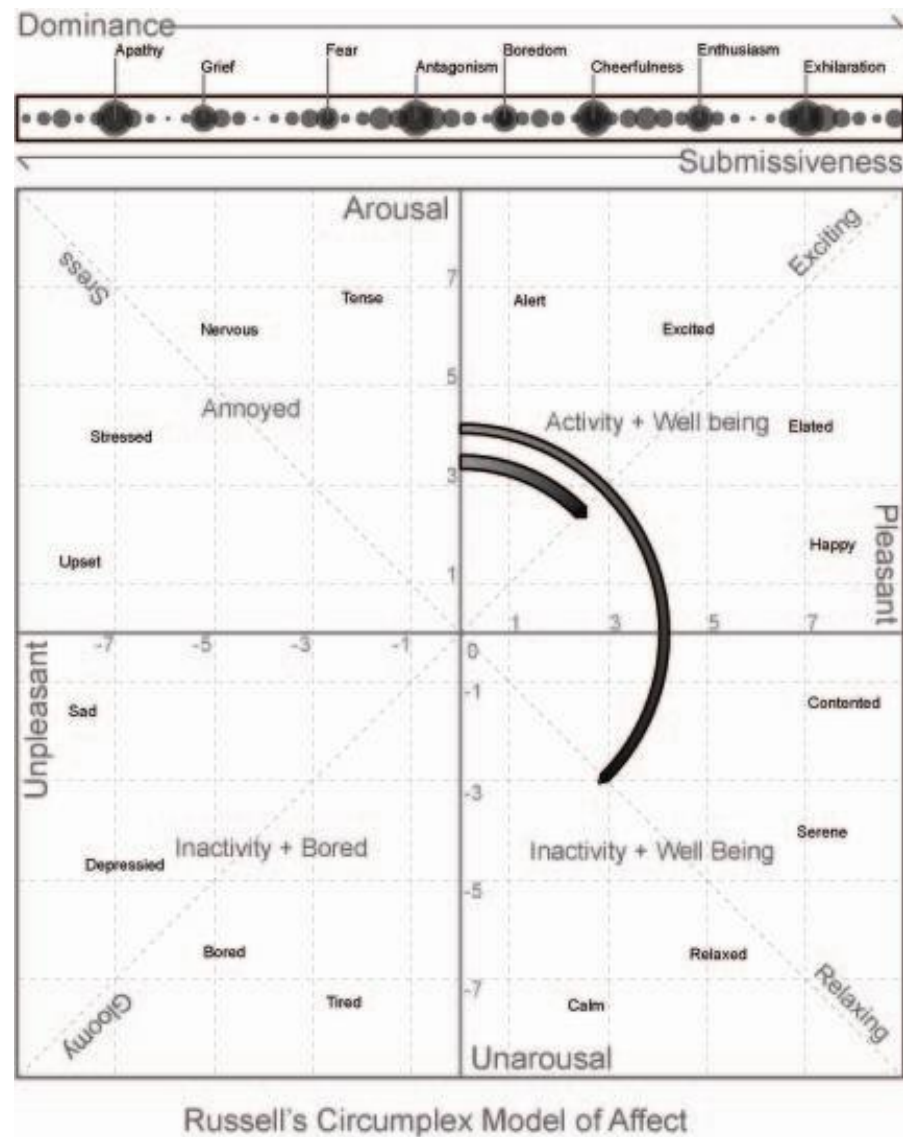
Diagram 10 Emotin measurement according to Circumplex method

2.13. Classification of Architectural Space According to the Emotional Responses

When we enter a room, we see something – in the fraction of a second – and get an impression or feeling about it. We perceive atmosphere through our emotional sensibility, a form of perception that works incredibly quickly.

People's psychological reactions change by the unapplied variables in an architectural space.

According to Russell's study on the characteristics of architectural spaces based on emotional reactions, they can be classified into Arousal (Activity space), Pleasure (Stability space), Dominance space.²⁶



²⁶ James A. Russell & Albert Mehrabian, Human emotion measuring method, 1969

High arousal – Low arousal(physical reaction), Pleasant – Unpleasant(paschal reaction), Dominance (by the human movement activity)

Activity space

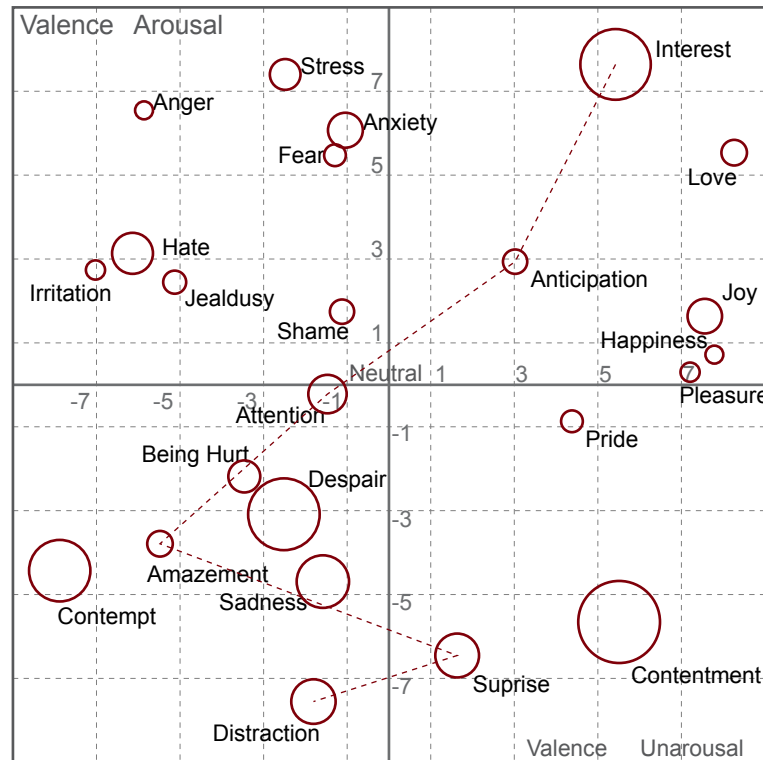
Arousal effect
Passive <-> Active

Dynamic space with depth. It proposes a sense of expansion and direction by giving high contrasts to the factors that form the space. It emphasizes the three-dimensional effect with diagonal or straight lines, instead of curved lines.

Light, Clean, delightful, Bright, Youthful, Dynamic, Cut, Shallow

: if it's overly complex or artificial, it will generate a restless and distractive feeling

Heavy, Dirty, Gloomy, Dark, Old-fashion, Quit, Cerebral, Deep



Emotion measurement

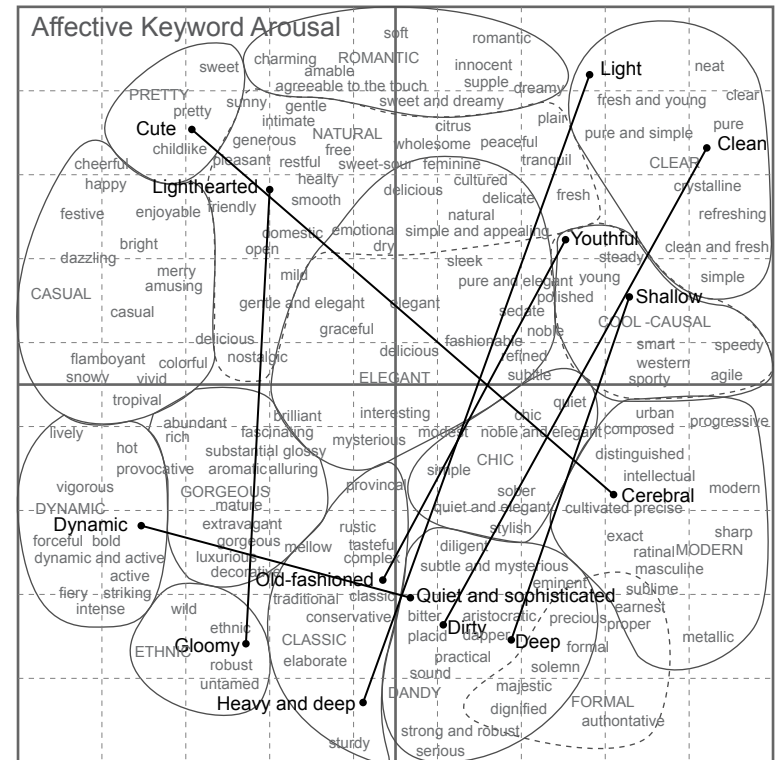


Image scale by adjective word, Kobayashi

Stability space

Pleasure effect
 Regularity <-> Consistency

A clean image helps create harmony through spaciousness and depth. An adequate use of material and texture creates a cozy environment. A modern and flexible space that gives a sense of simplicity and sophistication through the user's physical and visual movement,

Calm, Graceful, Comfortable, Pale, Simple, Soft

if it is too flat or calm, the sense of contrast between the space and its physical property is low

Vibrant, Garish, Uneasy, Strong, Complicate, Hard



Emotion measurement

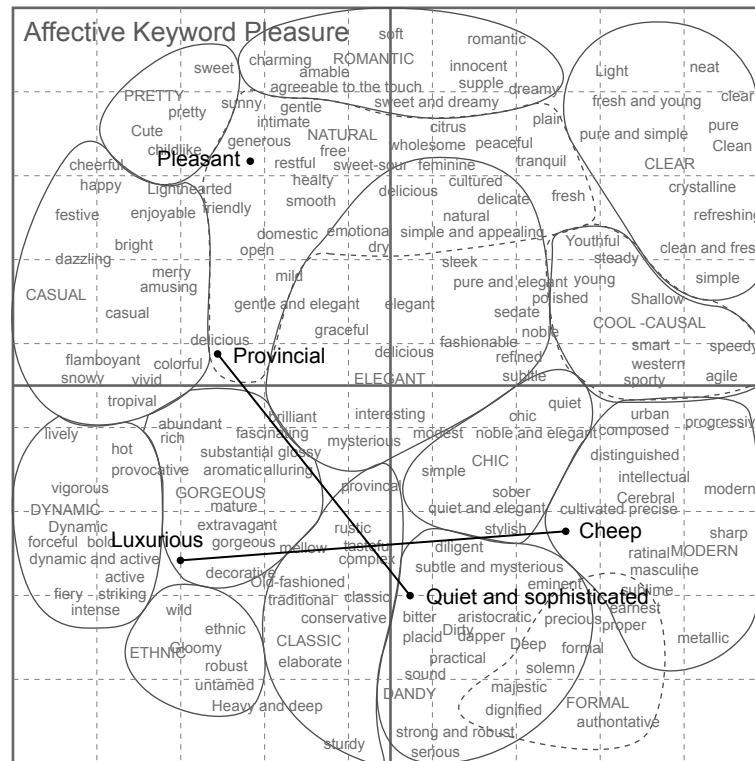


Image scale by adjective word, Kobayashi

Potency space

Dominance effect
Weak <-> Strong

dynamic, flexible yet neat space, or a rough and prominent space with strong sense of direction and roominess
Feminine, Warm, Restrained
too much factors induce confusion

Relax space

Negative <-> Positive

uses factors that create depth and richness. straight surface, high contrast of brightness, dark and solemn feeling - Luxurious, Sophisticated, Pleasant
may generate an artificial feeling - Cheap, Provincial, Unpleasant



Emotiv measurement

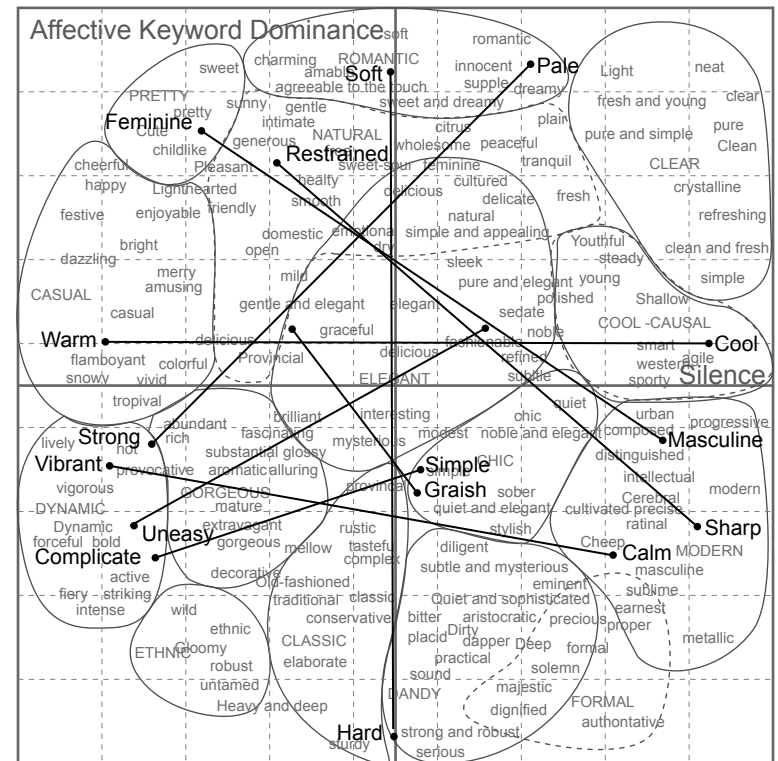


Image scale by adjective word, Kobayashi

3. Movement

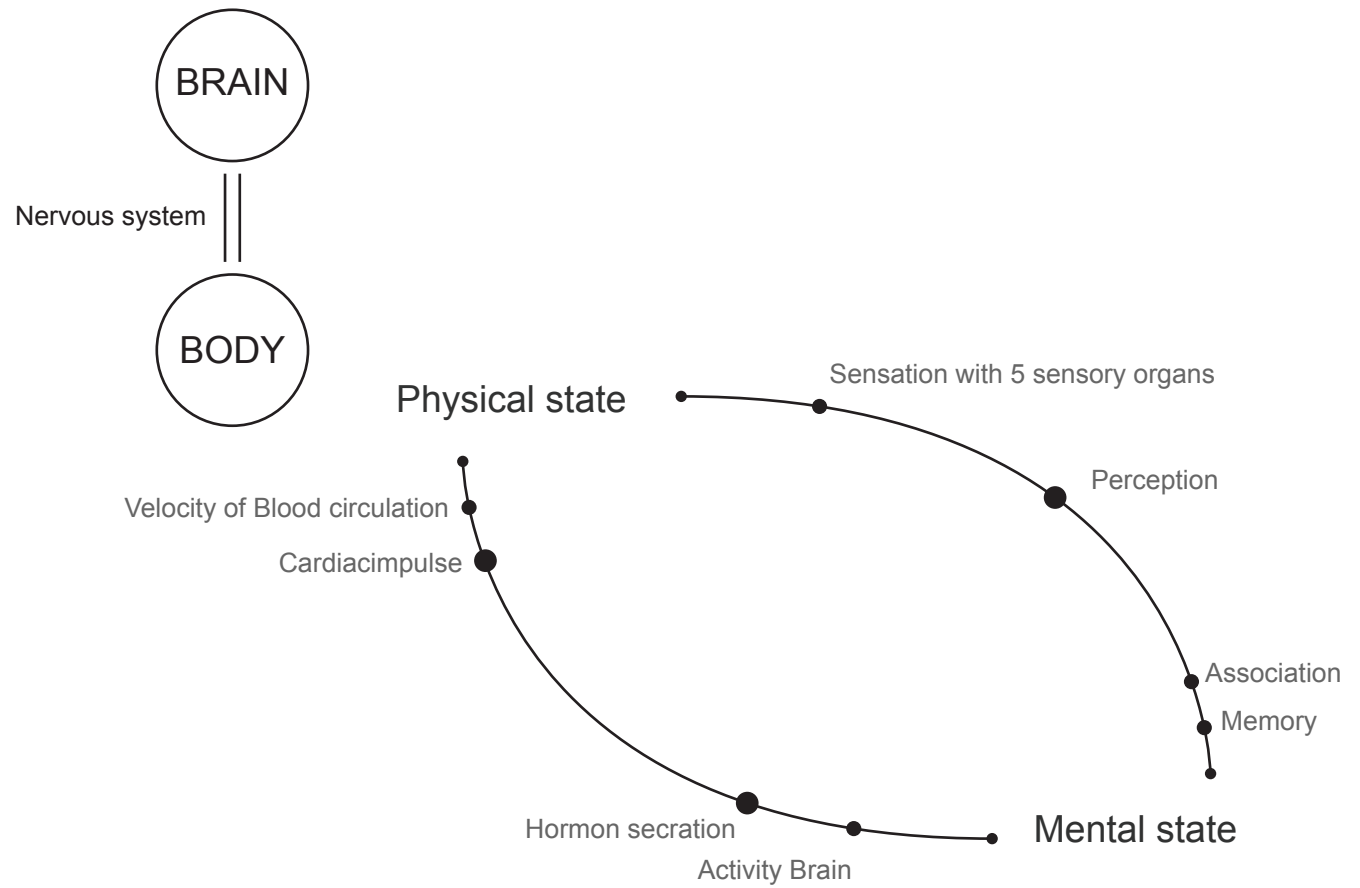


Diagram 1 Interaction between body and mind

3.1. Well-Being: the Importance of Movement.

To be truly healthy, one should not only be physically fit but must also be socially, mentally and spiritually well. Although it is difficult to define psychological health in a single phrase, **Kilander (1879-1962)** has clarified it as “**the human ability to gain satisfaction, success, efficiency and happiness by adjusting the environment and appropriately adapting into it.**” Our mind and body are closely related to each other; our physical state directly influences the mental state, and the changes in our mental state also have an immediate effect on our body. Thus, our physical state directly influences the mental state, and the changes in our mental state also have an immediate effect on our body. WHO (World Health Organization) has also defined health as a universal wellness of **body, mind, social** relationship and **spirit**, not just a disease-free or non-feeble physical state.

Ancient Greeks held various sport games, training the body and fostering the mind, based on their life-long value of ‘a sound mind in a sound body,’ which has been the origin of the modern Olympic Games.

Our state of mind is exposed through our body, and our body is the window where we can be viewed on the whole as a human being. How we are raised and what kind of feelings we have each moment is different for every individual, so analyzing a mind solely in terms of psychology has its limits. On the other hand, our **muscular activity** and **physical behaviors** show uniform patterns, creating continuous **interaction between the mind and the body**. What is experienced within the mind shows itself completely through the body, and what is experienced by the body influences our inner-self.

Our body and mind cannot be considered separately, so as the body gets healthy through exercise **it influences the mental health as well. Even the smallest change of movement can release stress and help control our emotions**, because when our heart is in high-motion, it increases the **velocity of blood circulation** and **hormone secretion**.

Different studies prove that regular exercise improves brain development is part of impact mental health. For instance, our brain is more active when we read a book as we move, than when we read in a still position. **An active brain consequently improves our ability to control our emotions**. This means that physical movement helps control our emotions, through a process of transforming a negative emotion into a positive one.

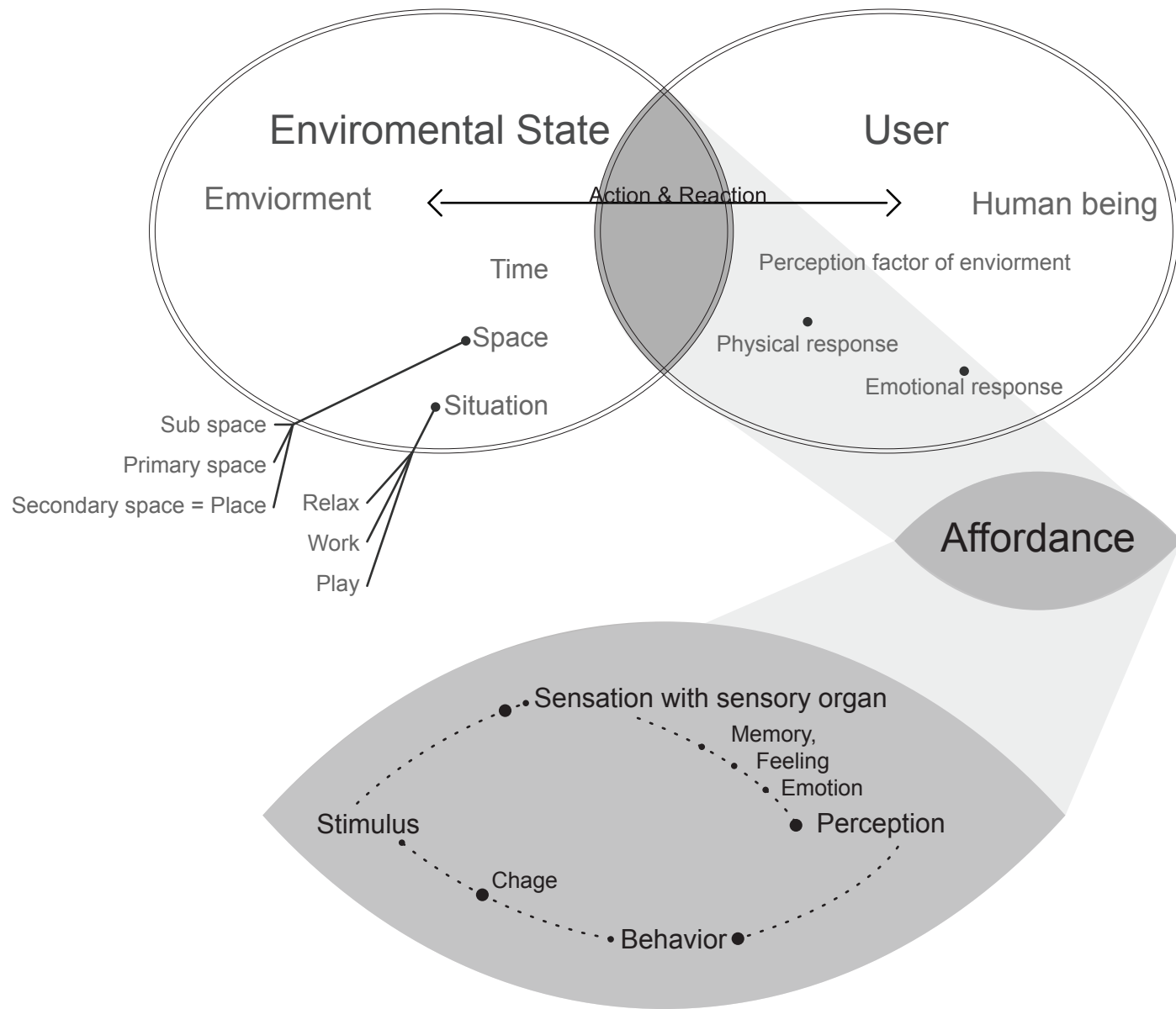


Diagram 2 Affordance between Enviroment and Human

3.2. Environmental Affordance

“Our senses should be perceived as an animated communication between the body and its environment.”

M.Merleau Ponty (French psychologist, 1906-1961)

As mentioned previously, human beings show unconventional behavior more often in an **emotional condition** than under a **rational state** of mind. In other words, we tend to show violent behavior under intense emotions whereas under a psychologically curious or interested state, all of our abilities are very much improved. Because of this, many spaces are intentionally designed to encourage certain behaviors that eventually generate positive emotions.

Among many scholars who have conducted numerous experiments on countless hypothesis related to environmental influence, **J.J. Gibson (American perceptual psychologist 1904~1979)** called the connection between environment and behavior as “**Environmental Affordance**”, adding that all emotions are generated due to the interaction between the perceiver and his environment.

Environmental Affordance is formed from the time of our birth. Through the recognition **system of action and reaction**, it relates with all the objects surrounding us within **time** and **space**, and the expansion of this system helps encourages creative activities as well. In the same way, the development of Art has re-created human emotions, intuitions on the meaning of life and values in a subjective language, whereas the development of technology has enriched our lives by controlling natural forces. Technology, however, has also changed our attitude and understanding of the world.

Architectural space can expand with the help of technology, and can be symbolized through artistic creativity. Our lives inside these spaces are representations of emotions and expressions of user that lead the user’s thought into physical behaviors. In other words, it is the union of physical object what forms the space and the user’s mind inside a space.

We can convey our own emotions to the outside world by experiencing spaces with our body (form and movement), soul (emotion and intuition) and mind (reason and logic) as a whole. **It is in the process of these experiences that we accept the meaning of our behaviors and express ourselves, in order to eventually find the meaning of our own lives by learning and applying the order inside spatial diversity.** Furthermore in the course of human judgment and action, the base of a creative ability lies within finding the boundaries between existence and non existence, meaning and nonsense since we form, destroy, alter and maintain relationships routinely and unconsciously.

The 5 factors that influence a person inside a space where we live on – **thought, emotion, body, movement (position and motion)** and **environment** – are areas that need to be viewed with an integrated approach. This is because these factors are in fact organically interconnected.

Various choices in the environment influence behavior.

Change in behavior influence the body.

Change in the body influence emotions.

Change in emotions influence thought.

Various choices in the environment influence thought, emotions, the body and behavior.

Changes in thought, emotions, the body and behavior influence the variety of the environment.

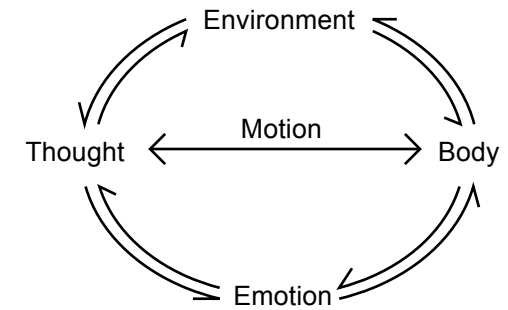


Diagram 3 Influential 5 factor of environment

A small change in one of these 5 factors influences each other and eventually changes the whole system. The interaction and endless connectivity among these factors enable continuous feedback.

Mutual relations inside a specific environment can be understood through Gibson's Environmental Affordance, which explains that the relationship between **perception theory** and **aesthetic experience** through **ecological approach** (body, mind and environment) should be more definite. As a result, the ecological approach that emphasizes the human – environment' reciprocity can clarify the characteristics of **ecological perception**¹.

The theory of **Ecological Perception** states that perception is not only an organism's innate characteristic, but also the process of 'stimulation – reaction' between subject and environment. The core of this theory is that an object's form should provide 'affordance' to its user, in other words, informative clues on how it should be used. Environmental Affordance, whether good or bad, one factor gives something to the other, so the other react something. We can call it an **organism system**. A dictionary tells you what words mean because it is derived not just from its etymology but from its usage. Likewise, the verb 'afford' is present in the dictionary where

¹The environmental perception & aesthrtic affordance based on the ecological paradigm, Kim joo-mi, 2000, november

as the noun 'affordance' is not. It is a term created by Gibson, he defined affordances as all "**action possibilities**"² latent in the environment, objectively measurable and independent of the individual's ability to recognize them, which implies the interaction between organism system and environment. For example, mass media, texture of materials, surfaces, and objects all **compositions of environment have the affordance for one factor of organism system, providing it benefits, pleasure, tense or relaxation by the who perceived where perceived**. This is the reason why an organism system needs perception. Moreover, Affordance is a property that is in reference to the user (human), and it is neither physical nor environmental.

The theory of formal composition with visual principles perceives form as a physiological or psycho-dynamic process where both perception and sense organizes the brain. Although this approach deals with both **experience** and **perception**, it stipulates the existence of a universal characteristic which induces human reaction, whereas physiological theory of perception sees that in visual stimulation, a combined ecological characteristic of personal, psychological, social and physical environment prevails.

We have previously developed the concept of the physical environment as a sequence of physical stimuli available at the **user-participant's** sensing envelope over a given interval of time and at a specific point or along a specific sequence of point in space. **Environment is a path-contingent sequence of these scenes and can be represented schematically by a number of adjacent and overlapping areas, each denoting a specific scene**. The scene, of course, may be various size and shapes, in three-dimensional array, with various degree and combinations of discrete and amorphous boundaries, and furnished and occupied in a variety of ways for a multitude of purposes.³ **The percept environment(scene) is that a consequence of the particular path followed through these scenes by the human body and interest**. Human perception is the mutual interaction between the object and its properties – a process of perceiving environmental factors through physiological senses. It is formed over a system of associative values, where the characteristics of an object's shape interact with personal experience. Ecological theory of perception talks about how an organism (the user) obtains information from an interaction with its environment, and how it uses the environment according to these cognitive functions. Movement plays an important role in perceiving the environment. This is why we need to closely examine the dynamic changes in perception that alters itself in accordance with movement. Furthermore, an environment where the user's emotions are drawn out through the mutual interaction between organism and its environment is needed. If we consider a given scene at the moment in the space, we can decompose the scene into three basic components: **primary space**

² <http://en.wikipedia.org/wiki/Affordance>

³ People, paths and purposes : notations for participatory environment, Philip Thiel, University of Washington press, 1997,p131

(architecture structure _ ceiling, wall, and floor), **place** (referring to the further perceptual qualification of space to object setting), and **occasion** (activity of the human occupants in the place).

Visual space, then, exists term of the perceived positional relationships of three light-modulated environmental surfaces that are circumambient to a given point. In general we may classify these space-establishing elements in three catagories: **object**, **screens** and **surface**. Objects may be thought of two- or three- dimensional forms existing as separate, discrete visual entities in a larger space than the one they help establish. Surfaces are perceived as two-dimensional forms limited in spatial effect to the space they help establish. Screens are perforated surfaces or closely spaced object, and are obciously an intermediate type.⁴

By investigating the complex visual structure coming between the user's moving behavior and the environment, we can also understand the problems of ecological validity, it arise from the research of ecological psychology. The main factors that a user perceives from an environment – **time**, **light**, **space**, **movement** and **color** – are done so through continuous interaction among themselves.

⁴ People, paths and proposes : notations for participatory envirotecture, Philip Thiel, 1997, p136

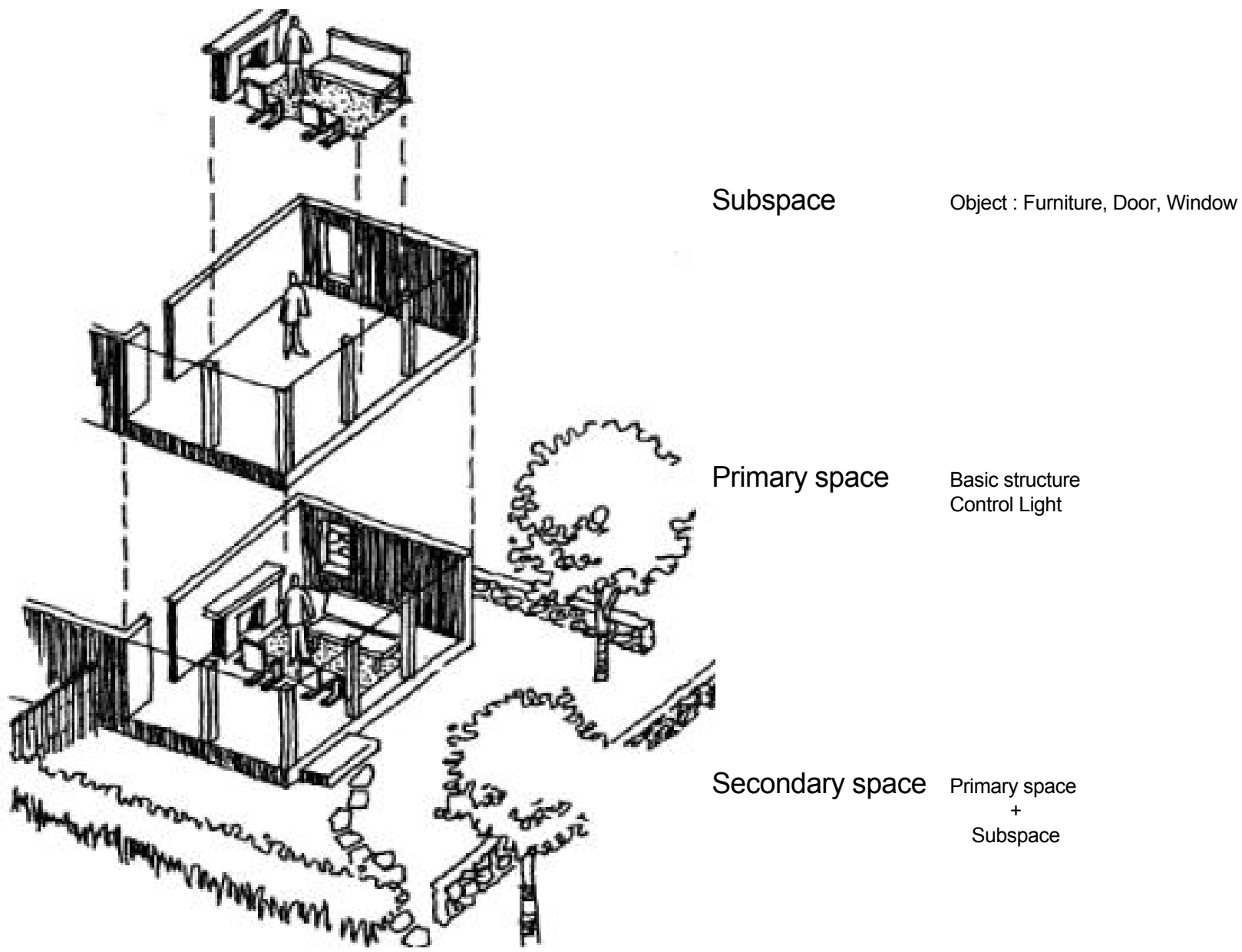


Diagram 4 Simultaneous In-Space by Philip Thiel, People paths and proposes

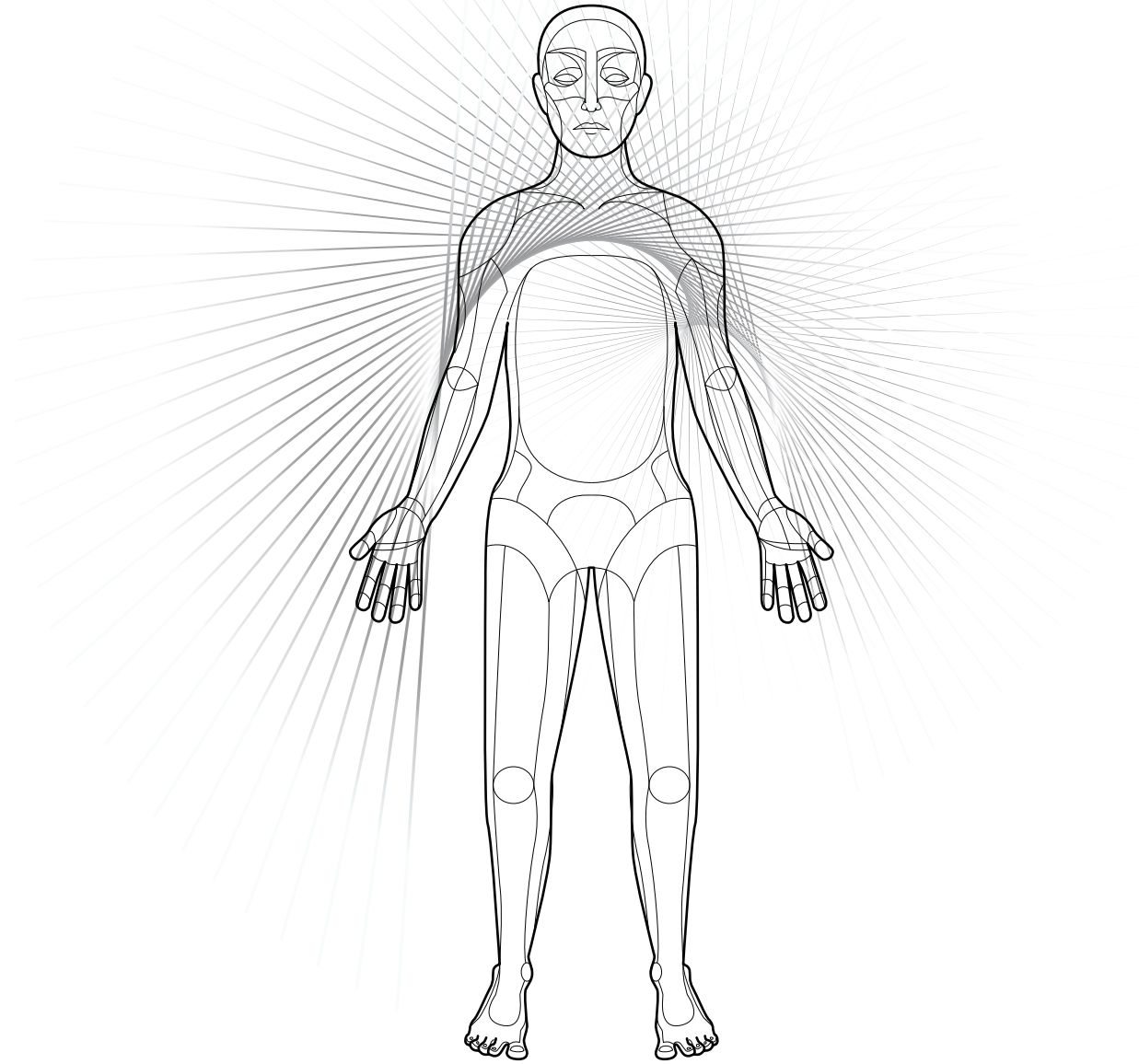


Diagram 5 '氣 (Chi) = Energy' of each person

3.3. Energy influences Body and Emotion

Oriental philosophy views the body and mind as one. It is based on the idea that **'the vitality flowing through the entire universe originates from the '氣 (Chi) = Energy' of each person.'** Energy is the force that creates all forms of life, and flows into all living things. Spaces are full of energy, and everything expresses itself through a mass of this energy. The energy of a space is therefore, the harmony with its surroundings. A special wave is created when the characteristic of a space is formed within the relationship between the user and the **surrounding objects**. The flow and balance of 'Energy' determines all of human beings (growth, health, potential etc.). It means is that the energy's flow influences not only our physical state, such as the way we sleep and eat, but also our emotional conditions. In a physical point of view, 'Energy' could be considered as the circulation of blood.

"Our body is dominated by the law of heredity, our soul follows a self-created lot (or karma) and our immortal mind endlessly repeats its life on earth."
Rudof Striner (psychologist, 1861-1925)⁵

The psychologist **Rudof Striner(1861-1925)** stated that a human being can be understood as an integrated being whose body, mind and soul are closely interconnected.

When we live our life, we perceive everything through our body. In other words, we perceive countless things from the outside world through our body. On the other hand, our emotions are always there although we cannot see them. We can only feel their presence (good, bad, joy, pain ect.) when they are generated within our inner-selves, in a place where nobody else can see. This deep place called '**mind**' also helps us to perceive the outside world in a more sophisticated dimension.

Things can exist without being visible, and these non visible things, such as our emotions, can have great influence in our lives. An instant emotional state controls our decisions every minuts, and those decisions eventually change our lives.

⁵ Essens of color, Rudof Striner, Yang Yeokgwan, 2000, p12

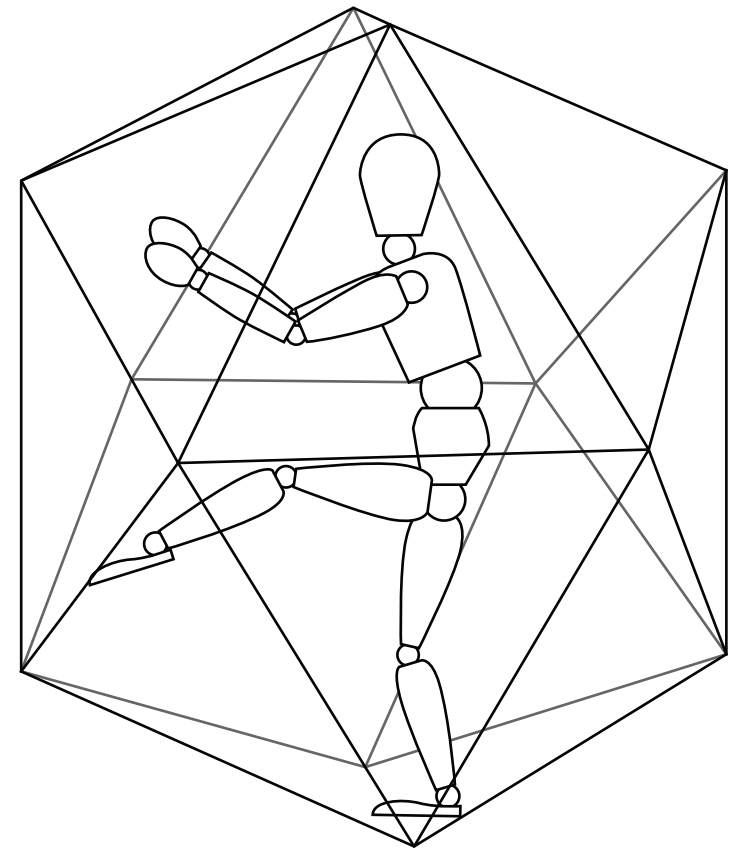
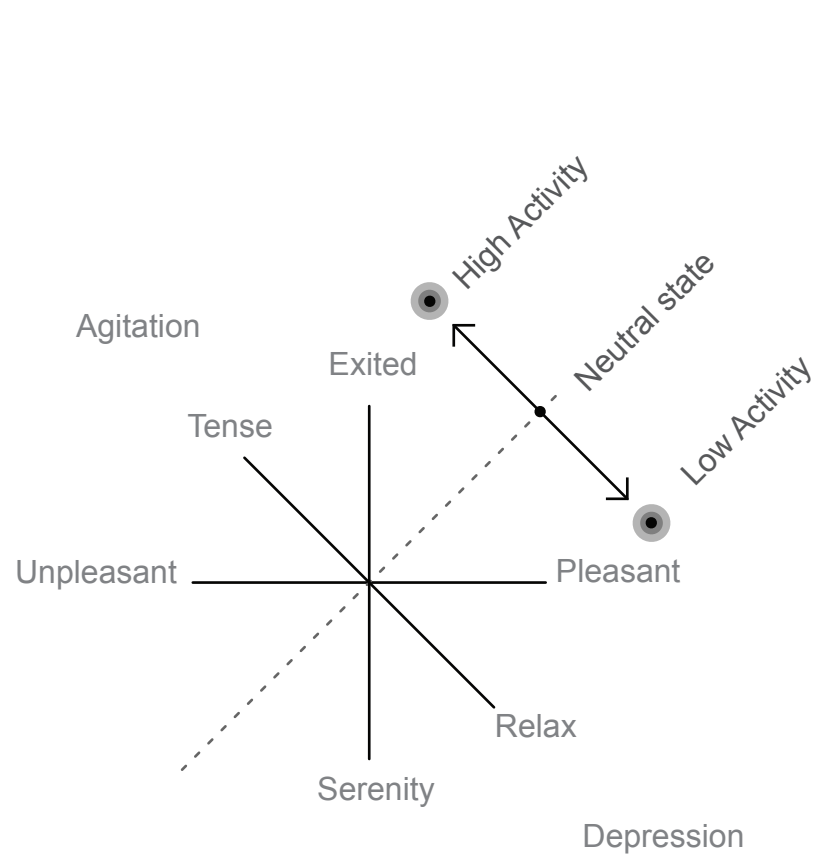


Diagram 6 Tridimensional theory of feeling and Laban Effort theory

3.4. Our Body Creates Emotional Energies

Our body is the fuel that ignites our emotional skills and talents. In order to gain maximum performance, we first need to generate positive and pleasant emotions such as joy, challenge, adventure and opportunity. As stagnant water becomes fetid, negative emotions also become irrevocable if they are remained neglected. Through a simple change factor such as a slight body movement, however, a depressive state of emotion can be transformed into a positive one.

According to the '**Tridimensional theory of feeling**' by German psychologist **Willhelm Wundt(1832~1920)**, our emotions consists of 3 directions that are in opposition to each other: pleasure-displeasure, excitement-serenity (high arousal-low arousal), tension-relaxation. It also states that all of these emotions can be placed onto one spot within a three-dimensional space. At the same time, numerous psychologists disagreed with this theory claiming that except for pleasure-displeasure, all the other emotions are the results of myesthesia, vasomotive perception and visceral sensation, thus adhering to the one-dimensional theory. Since **our emotions are a part of physical reactions occurring inside our bodies, one would have to undertake some muscular or circulatory movement that physical stimulation can change psycal emotion**. This concept is used in psychotherapy, alongside medication, to cure depression.

Humans are the aggregate of complication and contradiction. We need to create a situation that enables us to switch the unbalanced emotional state (boring, stress ect.) into a balanced energy. It could be said that our intentional motivation makes to become free from our own contradicting emotions.

Psychoanalyst **Carl Gustav Jung (1875-1961)** said that whether introverted or extroverted, people always outperform in one category among perception, emotion, intuition and reflection. Choreographer **Udolf von Laban (1879-1958)** incorporated Jung's categories into his Effort theory, relating perception with weight, emotion with flow, intuition with time and reflection with space
In addition, **David Best (1995)**, who described dance as the movement mediated by the body, proposed the following rules as reasonable conditions for emotional and physical movement:

1. A direct perception of what is indirectly inferred should be logically possible.
2. If the inference is upon reasonable grounds, a valid proof that it was equally experienced in the past or by other people should be given.

The user's movement in a space enables the user to perceive himself/herself, as being "present" and "existing." Perception through movement emphasizes the change of sentiment that is created when we perceive ourselves in a certain space.

Especially, the recent development in geometry and the advent of digitalism is scientifically and technologically enabling us to express human emotions through our bodies; the movement of our body is being studied in the artistic and scientific field as the "living", "soul" and "emotion". A sentiment generated inside a space can be primarily seen as the restoration of humanity. The user needs to transform a static space (normal place to live) into a dynamic one or otherwise, activating different senses and perceptions, in order to enrich the sentiments produced in that place. **'Movement' refreshes and restores the sentiment of the space that has been halved due to passiveness or lack of awareness by stimulating the emotional factors.**

We need to comprehend the entire ecological process in action. That is, we need to see perception as an active or dynamic process occurring between the user and environment. Architecture environments have shown that there is a consistent correspondence between the configurations of space and patterns of users found within it. In particular it has been shown that the topological relationships within a spatial system correlate to observed aggregate pedestrian movement⁶. **Dagobert Frey's (1883-1962) Spatial Perception Methodology** discusses that a user perceives the structure of an interior space through the two perspectives of **'Node'** and **'Path'**, which generates **'move'** and **'stay'** through **'spaces made for movement'** and **'spaces made for staying'**⁷.

According to this theory, the user will create a visual base when perceiving a space, and from that base will set a 'Path' inside the space for further movements. These will represent the "forward isovist", or everything that can be seen in the forward nominal visual field from a given point at a given moment. Our criterion for space occupancy is a perceptual one. The user's participant in space is said to occupy a space at a given moment when and only when the elements that establish that space are visible across the entire nominal visual field⁸. The user's visual field forms a visual circulation that follows the user's movements. A visual circulation is a spatial perception created through the forward visual field, which includes the whole process and result of obtaining information from the images (scene) that come from the interior space. Although we perceive space through all senses and not just through sight, they

⁶ Analysing the visual dynamic of spatial morphology, Alasdair Turner, Environment and planning 2003, p658

⁷ The 'Movement Space' induces vertical movements (ascending, descending) and horizontal movements (progress, retreat), whereas the 'Position Space' generates certain still poses (sitting, lying).

⁸ People, path and purpose: notation for participatory environment, Philip Thiel, University of Washington press, 1997, p222

work as complementary; information processed through other senses is in the end confirmed by sight, especially in spatial perception. Sense of sight is therefore the most essential sensorial factor in this area, and it greatly influences the user's movement inside a space. An important concept for this is a **“forward isovist” from given point of user's location**, which acknowledges that the surrounding environment's visual information is not only perceived through the place's composition but through a complex environments usually exoeruebcd in day life and for the time-based description of their sequential experience. To arrange something means to have control, what need to see make to see and defined as these where, at a given moment. A surrounding area is the expanded environment viewed from the user's place of interest. Let us now consider view's several attributes. View size is defined as the view's substended angular extent in the user's participant nominal visual field, and position of view, such as 'upper left', 'front' or 'downward'⁹. It is the structured pattern reached to the visual field of the user from his surroundings what they will see. **The importance of this theory lies not only in what viewpoint it is determined, in the fact that the viewpoint continously changes depending on the user's movements.** The invariant structure of the visual field provides detailed information on our surroundings, and supports the user's mutual movement with the environment. Perceiving a shape has its base on the unique interaction between human and environment. Likewise, the ecological theory of perception defines 'perception' as the direct relationship between human and environment, in order to adapt and respond. It is the process of acquiring information from the environment, an active function determined not only from a physical outer stimulus also effect from the person's inner motivation and experiences. Affordance is the attempt of finding the compatibility between acquiring eachother's information through the union of invariant properties that show actual characteristics within visual field and the 'stimuli – response' that the movement and environment of the user possesses.

When the visual field base is established, it not only changes the position of one self based on that point (theoretical spatial perception), but also provides a sense of psychological change to the user that actually uses the space. Moreover, it has a good effect in reducing the level of stress coming from closed spaces. Thus, the user moves around the standardized modern space, setting a variety of visual points according to his movements. The perspective that is formed as the user moves around the space changes according to the spatial structure and visual direction. The course is established when the circulation of movement that is influenced by visual information is chosen. The sense of direction of a space can change depending on whether it can be moved to another space containing how many different viewpoints, the change in volume as the viewpoint changes, how the space looks as the visual openness varies and on what point one is viewing the structure of the space. The sense of direction of a space is related with the

⁹ People, path and purpose: notation for participatory envirotecture, Philip Thiel, University of Woshinton press, 1997, p222

user's movement, and this is established through the structure of time and space flow. A space that possesses this sense of direction will provide the user with a different emotional change.

An in-space is "establish" by the perceived relationships of environmental element, as I mentioned earlier, it may classify them **three type: object, surface and screen**. These three elements then are the generic agents which perceptually delimit a portion of the space and which occur, as the figure, as built forms. For convenience in reference we shall refer to these space-establishing elements. The instantaneous position of a space-establishing element with reference to the user's position can be described in terms of over, under and side location. And the direction of environmental element may classify four types: horizontal, vertical, diagonal and curved plane, which is either perpendicular or parallel to the body axis. Also depend of user's position can see different scene, so need to understanding how combinet solidity of space.

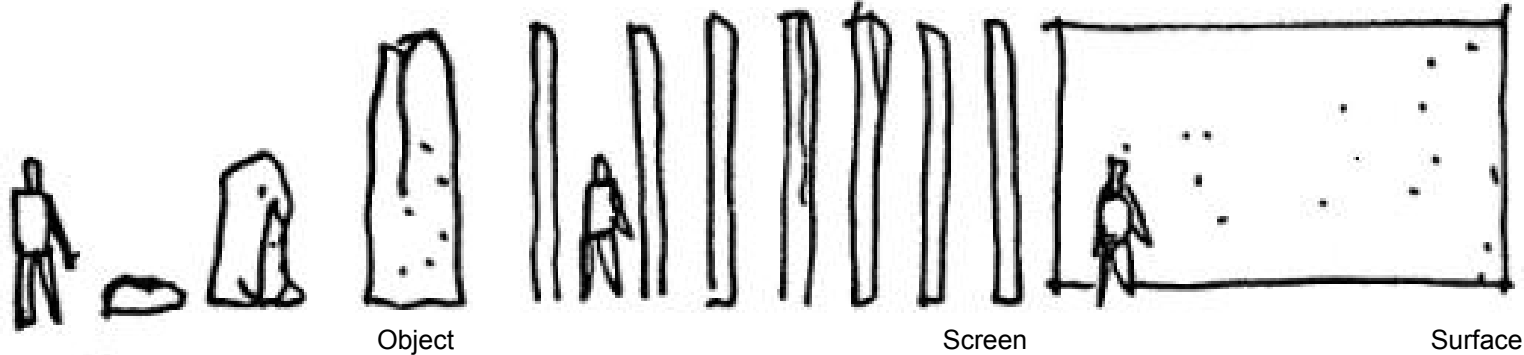


Diagram 7 Definition of object, screen, surface by Philip Thiel, People, paths and proposes

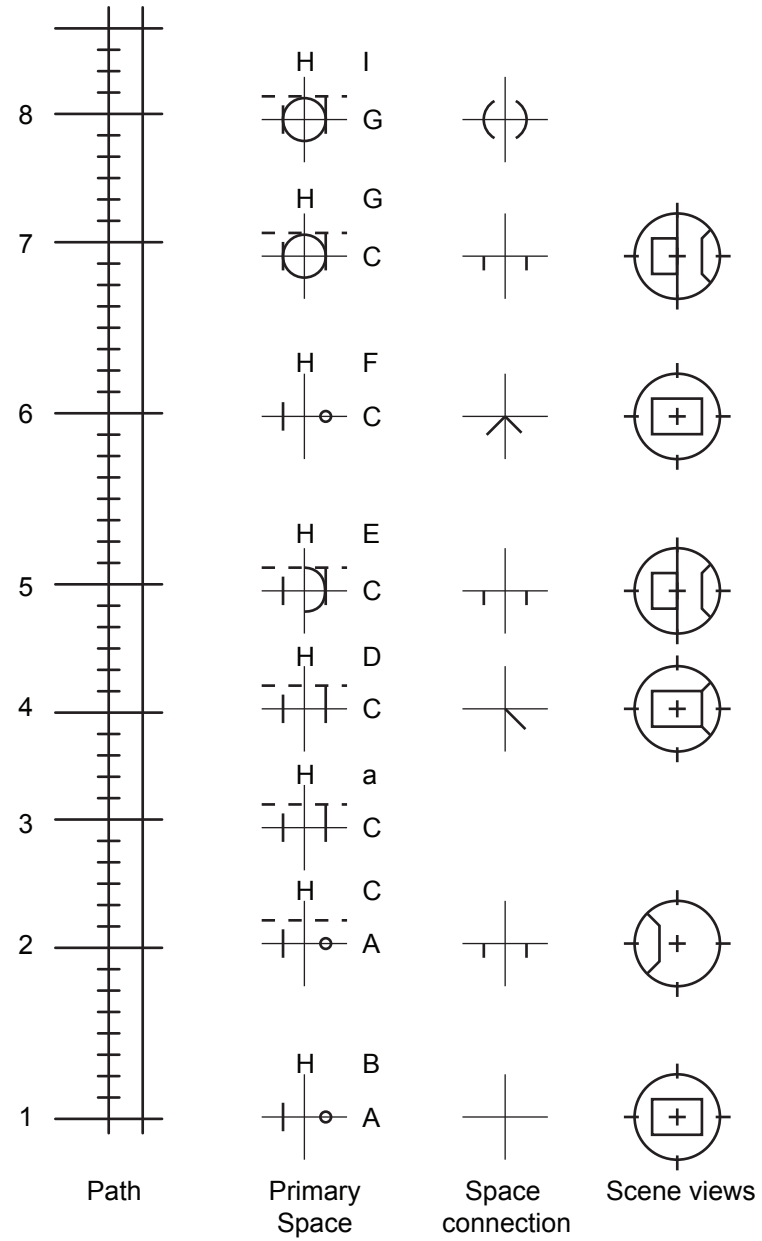
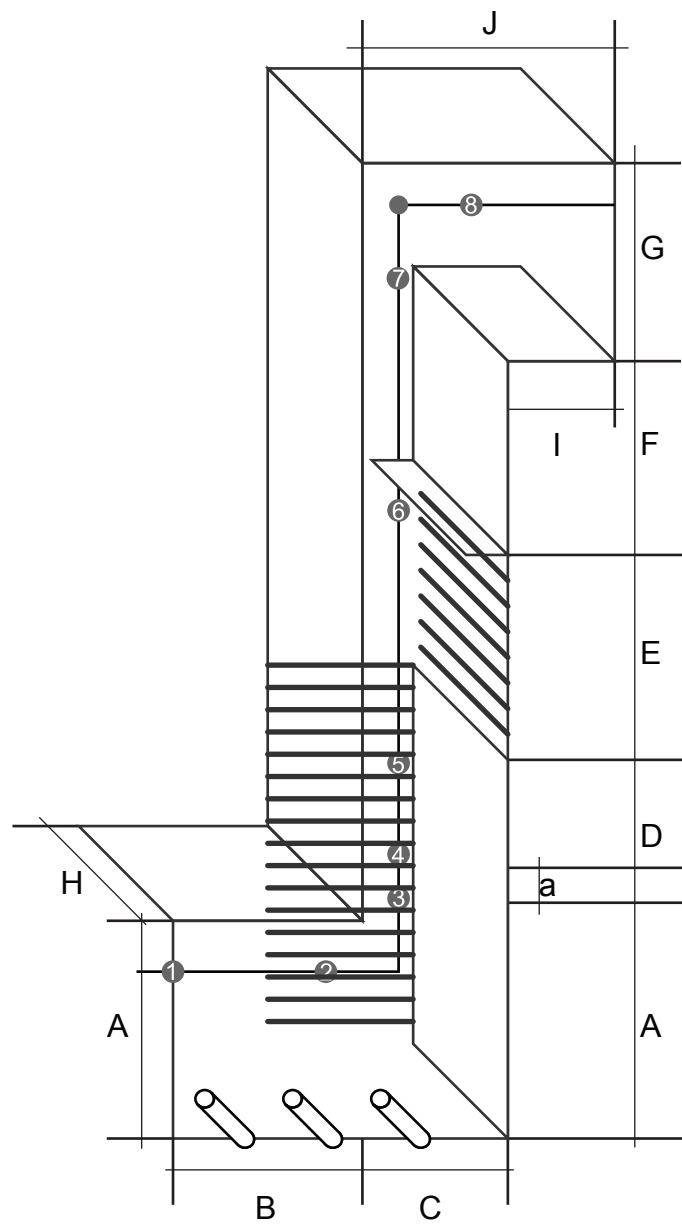


Diagram 8 Notation of Philip Thiel

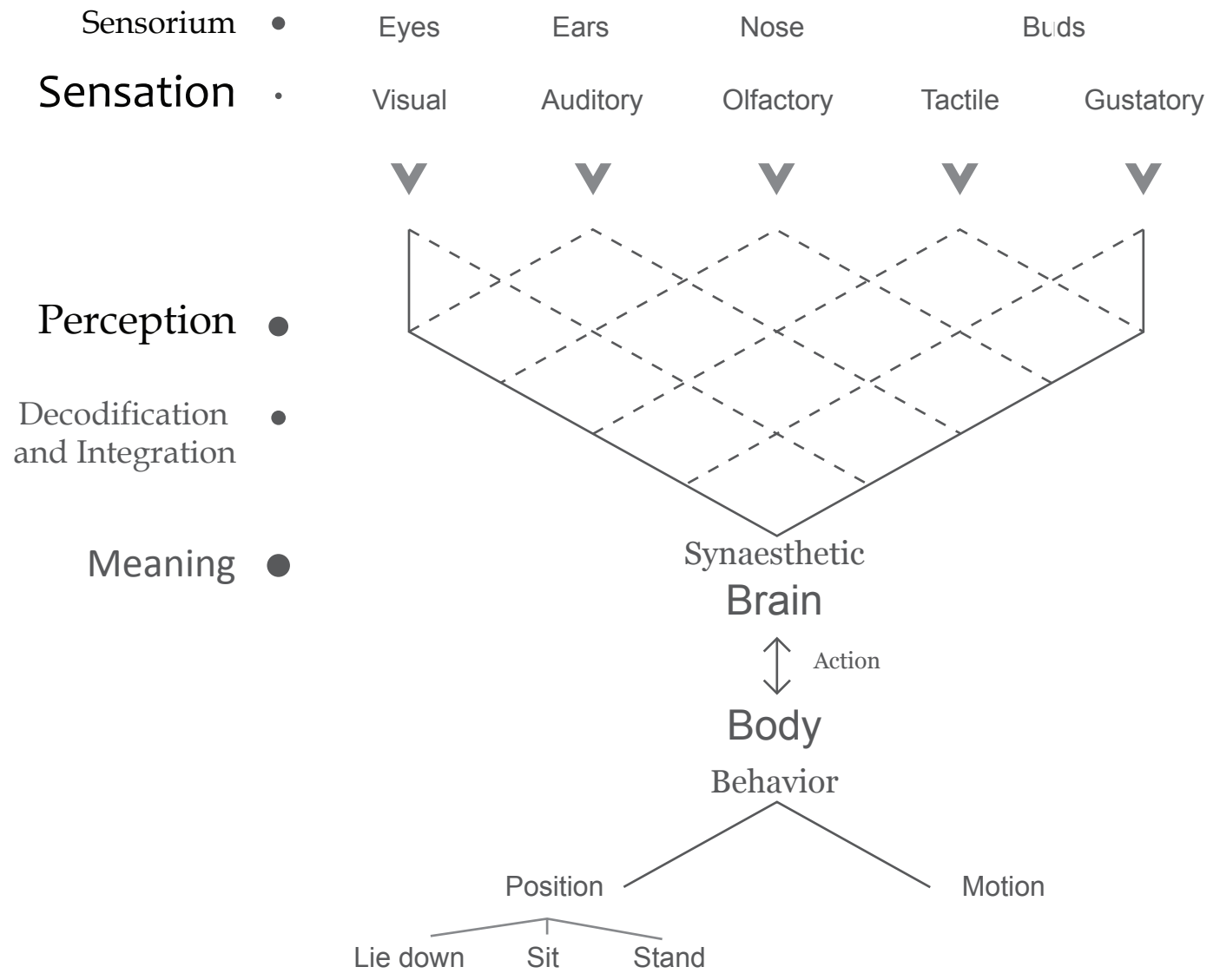


Diagram 9 Process of triggering behaviors

3.5. Producer of Emotions: triggering behaviors

Our body and emotion are not two separate entities; we have one body in which we use in an intellectual or psychological manner. Furthermore, we are able to generate one single movement with different emotional expressions. Thus, our body and emotion are a single structure.

When an emotion is triggered, our body experiences physiological reactions. **Cingulate Gyrus** influences impulses and emotions; **Basal Ganglia** controls our thoughts, visual movement and general movement; **Medial brainstem** controls our automatic nervous system. All of these systems are stimulated concurrently.

Bodily thought combines the objective and subjective process of “knowing”. When what we are dealing with is no longer “others” but an extension of “oneself”, it follows our own will and desire. Only when we feel the space surrounding us, we truly perceive and mutually communicate with it.¹⁰ In summary, perceiving a space is to think with the body, and in this case, movement provokes the emotion. The concept of emotion, viewed in a spatial perspective, is the feeling that is generated when the space and its user interact with each other through the senses. This rapport is produced as the user gets in touch with the space, and this means that emotion itself contains the function of communication.¹¹

Our environment works as the instrument that communicates outside information through sensorial stimulus. It also has the power to trigger behaviors, and we show an instinctive attitude towards our environment. These series of stimuli and responses are called Environmental Phenomenon. They are general behaviors that people show toward continuous situations of stimulus-reaction. Behavior, therefore, is different from action or activity; it emphasizes the tendency and pattern of a behavior, and shares the implicit meaning of comprehensive perception. It can also be interpreted as ‘human behavior’, or be reduced into ‘spatial behavior’, a concept that emphasizes behavioral patterns inside a certain space (work space, relax space, play and study space).

Human behavior is a complex theme. It has been the focus of various scientific fields as well as psychology, sociology, anthropology, semiotics etc.

¹⁰ Sparks of Genius, Robert Root-Bernstein(Physiology ,1953-), 2007, p234

¹¹ 16 Issues in space design, Younggeol Kwon, 2001, p283

3.6. Movement

Body movement is formed by a single part or a combination of different parts of the body: **position** and **motion**. **Positions (stand, sit, lie ect.)** are single movements that use the whole body. They are shown through conscious or unconscious behavioral habits and can be learned by imitating other people's poses. Once memorized in the body, they appear whenever some kind of desire and will need to be expressed. On the contrary, **motions** are movements that use different parts of the body. They repeatedly and instantly convey human's psychological state such as joy, sadness, anxiety etc. Our body creates integrated and simultaneous movement according to space or environment, reaction of stimulus and psychological state. This is why a movement in a certain situation is the memory of a previously experienced behavior, and each situation is an emotional expression in a story telling format. Simply put, movement is the ability to artfully control one's body and surrounding objects.

We can stipulate that movement is a single activity with both physical and emotional aspects; a physical movement contains emotional expressions and it represents "living" and "mind". It uses one body in an intellectual or psychological way, so it should not be considered as two separate concepts such as physical action and emotion.¹²

How movement collides with objects; how process creates formality inside a space; how the sequence of time reveals itself clearly through simultaneous space arrangement; how space and time depend on each other in real or imaginary actions; all of these contribute to the formation of a concrete scene.

Spatial perception is based on the rotational movement of the body and the stretching or bending of the limbs. As long as we live, our body will adapt within a space, and the space will continue to change by the influence of the body.¹³ Our body and space will need to have a structure that "is composed of scenes where various mollusk-like movements are created." By inducing joint movement, circulation of emotions and conversion of perspectives, the atmosphere of a space will constantly change.

In the book *Phenomenology of Perception*, **M. Merleau Ponty** stated that our senses should be perceived as an animated communication between the body and its environment. From this point of view, body movement is the subject of experience, and it

¹² Expression in movement & the Arts, Malbok Kim, Hyeon Daemihaksa, 1995

¹³ A Study in emotional expression and space characteristics in body movement, Young-Keun Oh, 2008, P173

enables the most fundamental changes. **Steven Holl** incorporated the concept of 'movement' into in his book, *Parallax*, from the base of *Intertwining*. For Holl, body movement is the basis of phenomenology of perception and the medium that creates the opportunity for people to recognize themselves and the world by perceiving a space. The spaces that Holl designs have a body-centered viewpoint, meaning that people can perceive sentiments and reality through changes of movement. Body movement is an essential factor in experiencing the changes in everyday life and feelings.

From the point of view of ontological phenomenon, people form their own world based on what they perceive from a space through body movement. All perceptive processes happen in our body. Steven Holl explains that a space-oriented body is a sensory and mental system.¹⁴ Furthermore, he saw that the body's tendency to create motions is an important means of communication when perceiving a space. Each user, however, has a different body. Their body and sentiments are neither passive nor predictable, but actively create the space that suit themselves.

The story of a space, created by the architect, changes according to the user's emotions and each situation, so, it is important to have the possibility of 'change' in which takes into consideration all unpredictable circumstances. In this regard, it is important to focus on body movement and the expressive values that change through these movements. Space activity will increase as movements change, and along with this, expressive visual factors will intensify the emotional level.

¹⁴ Steven Holl, *Parallax*, 2000, p.12

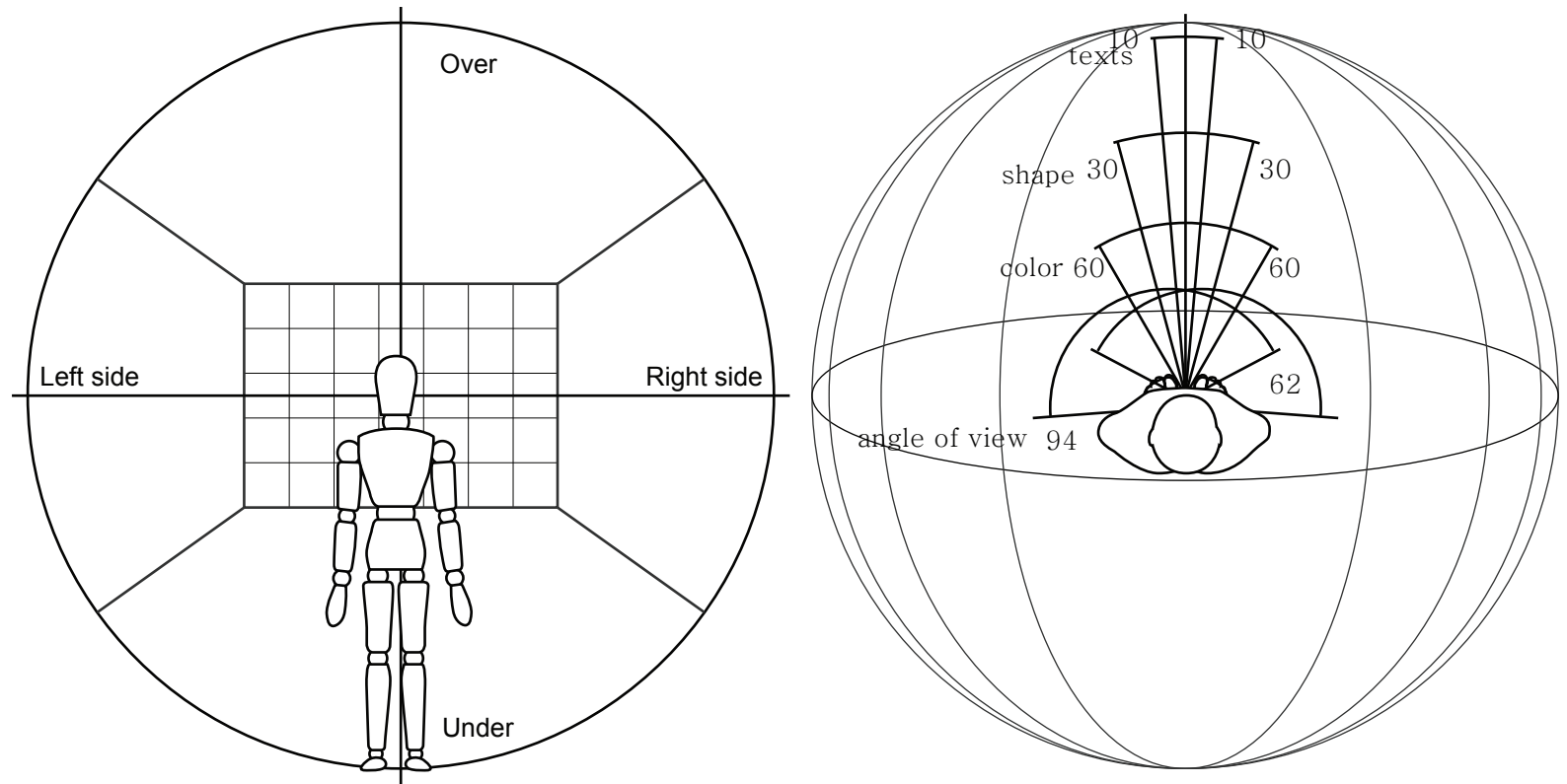


Diagram10 Hemispherical Projection

3.7. Experiencing Sensibility Space

Sense of Space > Visual or Actual Movement

The sensibility of a space is what the user feels toward a certain space. We use all of our five senses when using and perceiving a space. Do the spaces that we are currently using have positive or negative effects on us? The spaces we use these days are designed to provide convenience according to its own usage. These conveniences, however, do not always give us a positive effect. The fact that people living in underdeveloped countries feel much happier about their lives than those living in the richest cities proves that even with a low level of convenience in living, people can attain a high level of positive sensibility.

When we look into our lives, asking if we feel happy and satisfied, most people would answer negatively. With the advent of automation and industrialization we have been living a comfortable and highly functional life. On the dark side, however, it has also created uniform spaces that ignore individuality, humanity, and the sensibility of people. To restore this sensibility felt on a space, we need to focus on the harmony with its surrounding environment, respect to the sense of place, appropriate use of materials and the relationship with body movements that can be generated due to the form and characteristics of the space. A memorable space can help find the humanity we have lost.

The study of movement and continuity, conducted by **K.Lynch.D.Applryard**, **P.Thied** at the beginning of the 60's, established the notion of spatial structure analysis, although research regarding the emotional meaning in a deconstruction era did not last for long. However, through **Udolf von Laban's (1879-1958)** 'body theory' and **Ponty's 'physical phenomenology'** we can understand that 'body' shares the same meaning with 'subjectivity'.

All possible human movements within a certain space can be simplified into two main categories: vertical (e.g. sitting, standing, and going up or down) movements and horizontal shifting. A horizontal shift in the user's position changes the perspective in situation and environment, creating a different spatial image. In those spaces, movements and perspectives work as a turning point for a more dynamic way of thinking. Furthermore, the change inside a space perceived from the beginning until the end of every movement can be infinite.

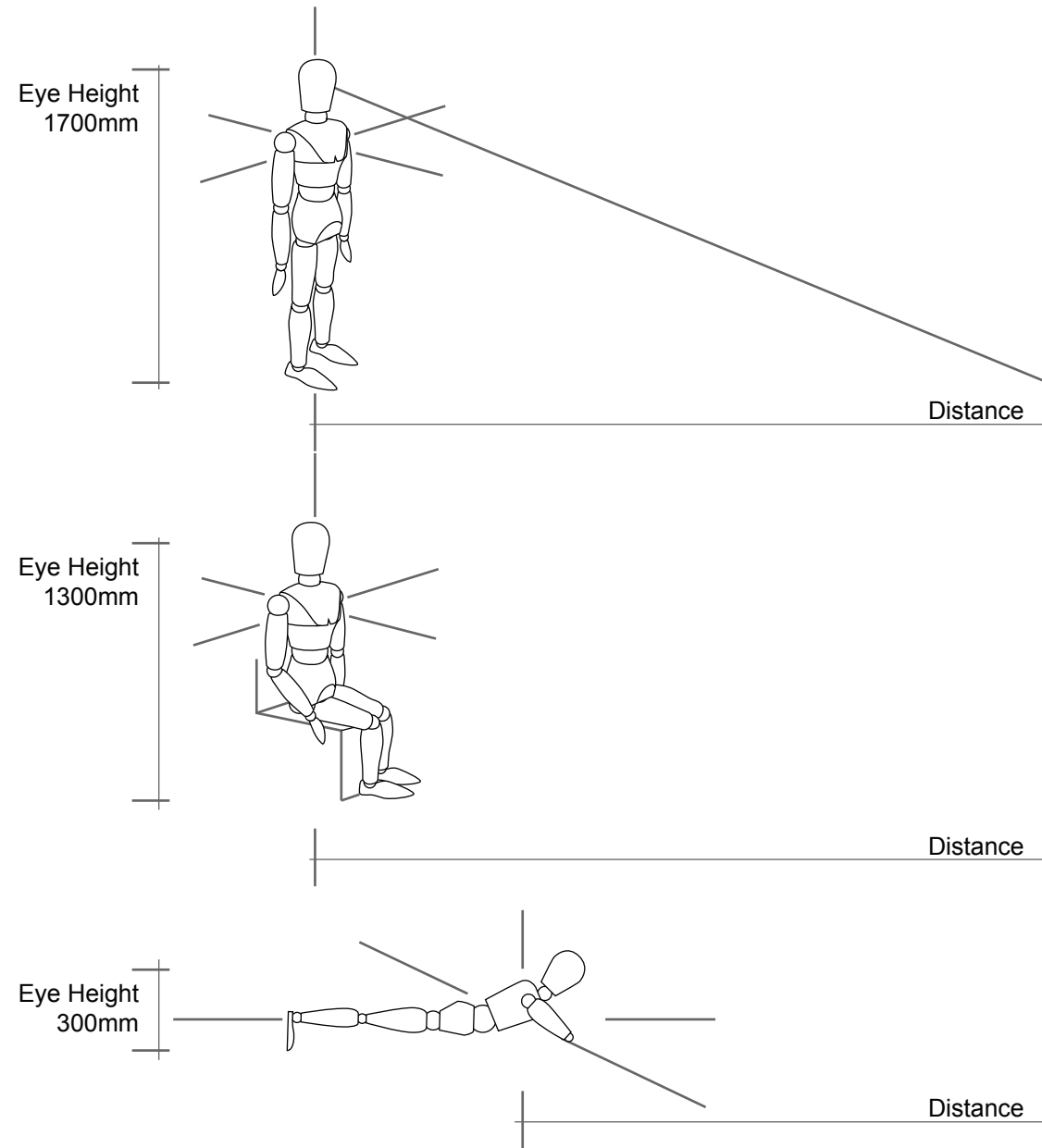


Diagram 11 Visual access according to position

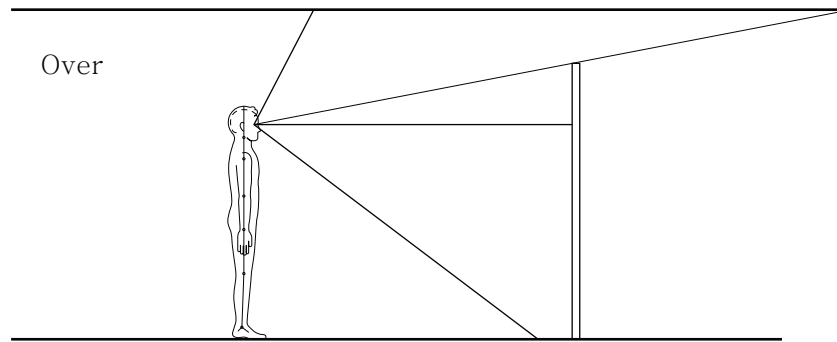
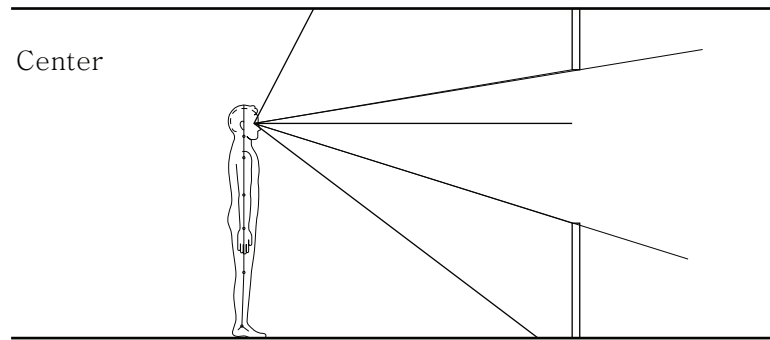
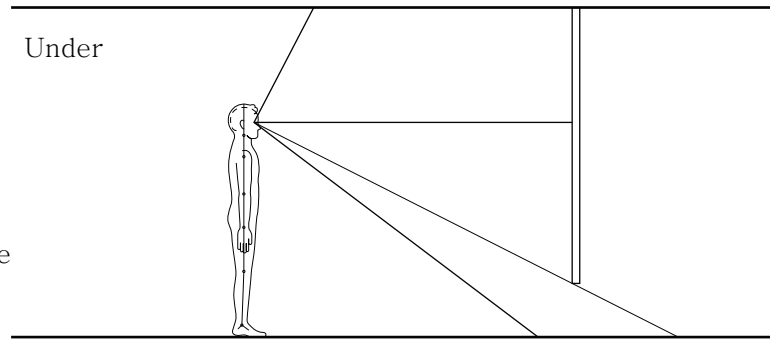
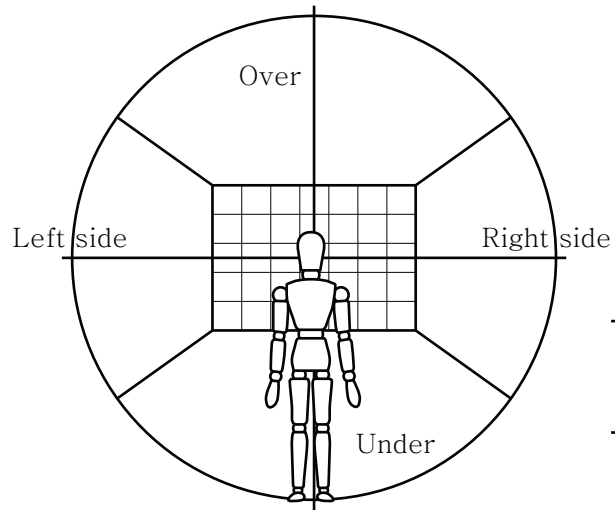


Diagram 12 Visual access according to wall (surface)

3.8. Perceiving Space through Movement

Perception is an act of communicating with a space through our bodies. Our body communicates with the space by creating movements as a response to the spatial stimulations. Although the sense of sight is considered most important since a great part of perception is processed visually, movement and experience which are created by a combination of various senses is being held as important as sight.

In order to understand the vast relationship between body and space, it is essential to grasp the particulars.

Absolute motion: induces specific movements and activities

- the object perceives and creates movements internally
- > fixed furniture, behavior generated by fixed furniture

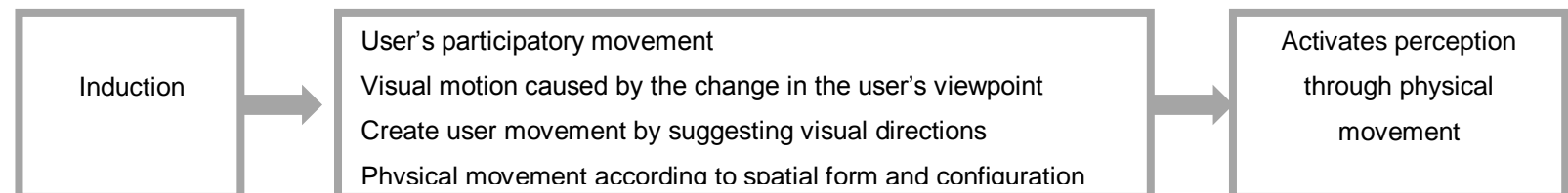
Relative motion: builds visual objects in response to movements

- the object generates and experiences movements externally
- > change in behavior through free and flexible furniture

Dynamism is characterized by the sequence of thought; the change of direction in the straight and curved lines. To perceive is to own one's space and expose oneself to the world. It is possible to express an emotional space where the user's perception and sensorial factors are shown through different movements. The spatial factors in these experiential spaces stimulate the user's senses, emotion, intuition and thought in a visual way enabling a behavioral expression. Spatial components that maximize the user's visual stimulation and activate physical reaction can be summarized as follows:

3.8.1. Absolute motion

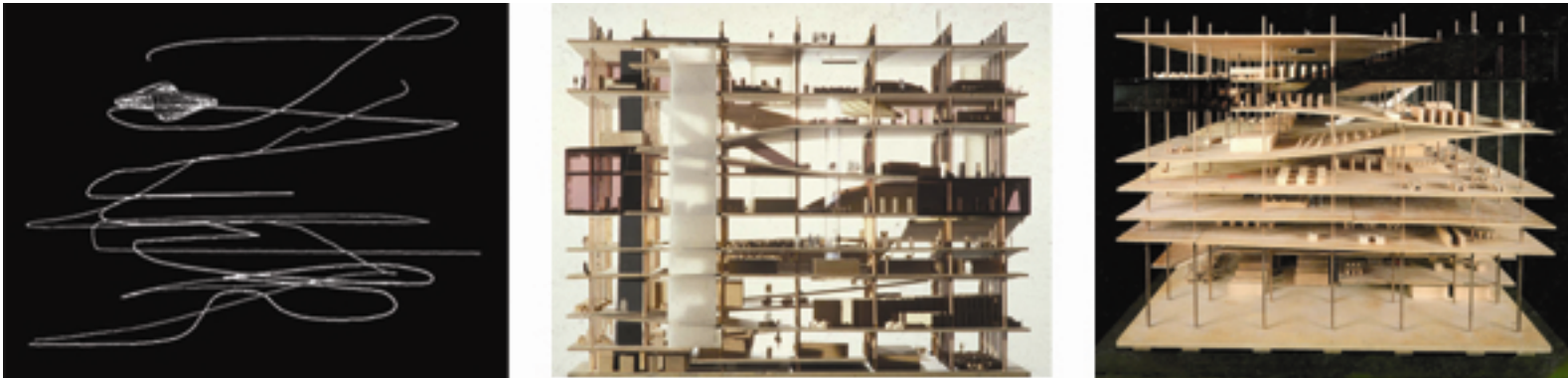
3.8.1.1. Inductive Component





Pict 1 Church of the light, Tadao Ando

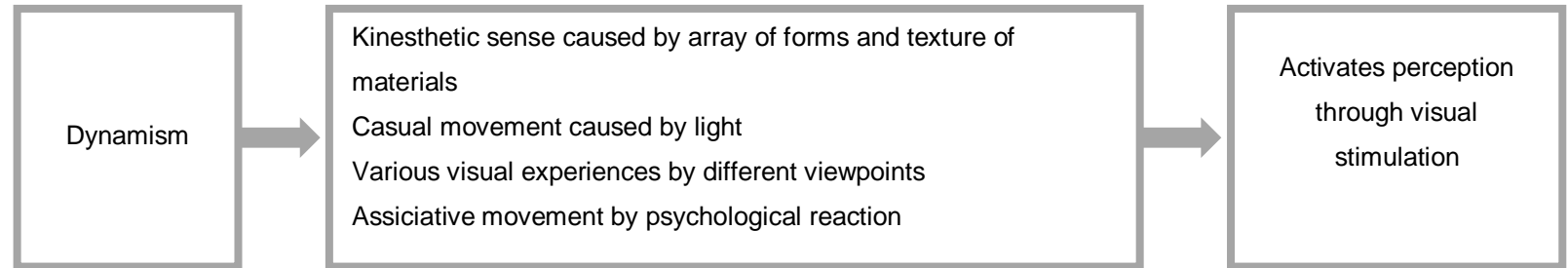
The most distinctive architects that form **visual flow** and communication through spatial components are **Tadao Ando** and **Mies Van der Rohe**. **Ando's Church of the Light (picture)** activates the user's perceptive experience by intentionally putting the wall from the entrance – where the user's movement begins – till the interior arrival area.



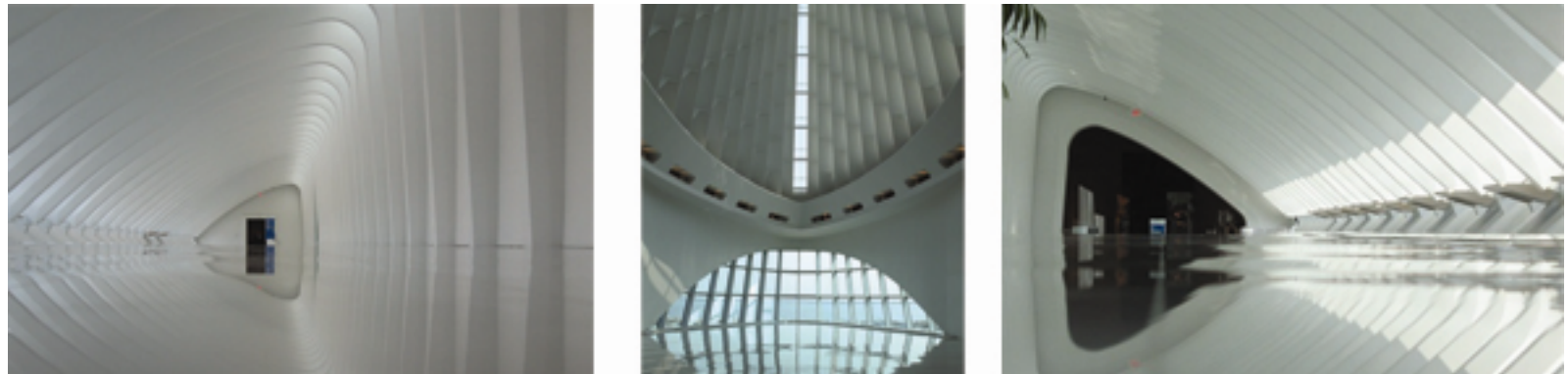
Pict 2 Bibliotheque Jussieu, Rem Koolhaas

Rem Koolhaas' Bibliotheques Jussieu uses the continuous slope that connects the ground floor with the top floor, to design the interior like a huge promenade. This constantly changing circulatory system makes people perceive and experience various spatial sequences by evoking natural movements.

3.8.1.2. Dynamic Component



Dynamism does not allow the user to be a passive observer influenced by other objects or structure, but encourages subjective behaviors and activities. It is completed as the user and the space forms a mutual interaction, creating some kind of perception. It also creates empathy by inducing spatial and scenic configuration and encouraging movements. In experiential point of view, the subject of movement is not the space but the user. When the user moves around, the surrounding environment changes and different spatial expressions are created. Thus, the user experiences and perceives the various changes of the spatial system that is expanded through physical movement.



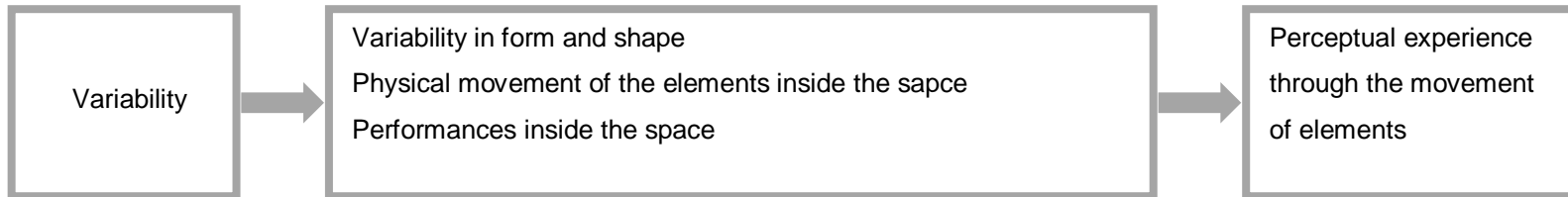
Pict 3 Milwaukee Art Museum, Santiago Calatrava, 2000

Scientific development of the 20th century has brought the advancement in the concept of time and space, mechanical and historical technology. With this advanced technology, a space where physical movement is visualized by making it change or move both partially and as a whole has made the user experience different dramatic effects. The roof structure of the Milwaukee Art Museum

shows actual movements that effectively adapt to functional changes. This introduces the possibility of applying a dynamic concept into a static space, and also creates a new spatial image to the users.

3.8.2. Relative motion

3.8.2.1. Variable Component

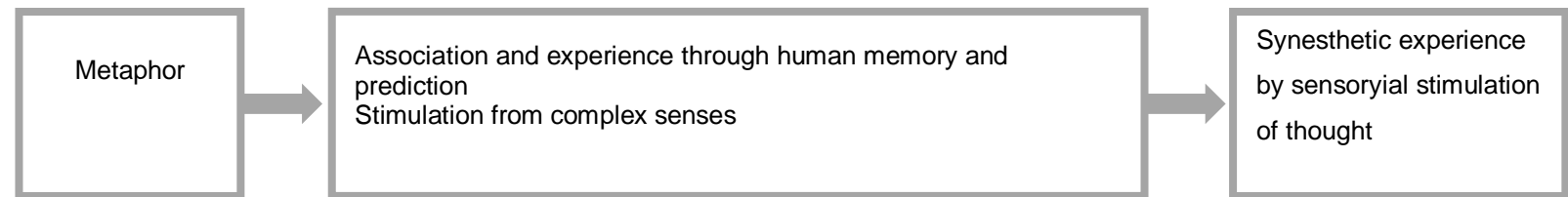


Changing the elements that form spatial structure can evoke not only visual but a set of complex physical stimulations. This is well shown in **Steven Holl's Hined Space Housing, Fukuoka(1991)** and **Sorefront Gallery(1991-92)**. They provide new perceptive experiences using temporary devices that create dramatic effects as spaces change. Showing variability is not a mere demonstration of scientific technology but a 4 dimensional space configuration that puts human experience into consideration. The configuration in the Storefront Gallery is the rotating entrance with various forms. Depending on the angle, the outer wall of the building visualizes and actual closing and opening movement, making the users create a new performance-like image. The change in the building's image enables the users to perceive how the space alters and gives them the satisfaction of a dramatic experience. In other words, spatial variability can be embodied as a dramatic effect through expressive methods such as movement, which actively stimulates physical senses.



Pict 4 Sorefront Gallery, Steven Holln 1991-92

3.8.2.2. Metaphorical Component



Metaphorical component is the psychological force, tension and sense of motion that appears as fluid forms and materials are used to create movement and visual effects. Dynamism caused by a vast flow, illusion caused by materials, figurative images that convey a sense of movement provides continuous and dynamic properties into the human ego. These images evoke empathy through reactions, thoughts and feelings.



Pict 5 Zaha Hadid and the Russian Suprematist Exhibition, Galerie Gmurzynska, Jun 13 - Sep 25, 2010

Although dynamism appear strongly through fluid forms and materials when the users move, metaphors that remind people of movement are strongly visible even in fixed points. These spaces should be considered as dynamic subjects, and the spatial elements can be expressed as emotional responses to forms like living things, bending of waves, and debris. Non-formal shapes or texture of materials create visual spaces when combined with light. The vitality of organic curves itself are suggestive of life. The following are methods to configure relative associations:

Proportion – the relationship between part and part, part and whole is formed

spatial measurements are established by physical measurements

the beauty of architecture is obtained when the measurement of each parts are appropriately proportioned (Vitruvius)

one can create a beautiful design by understanding the right proportion (Alberti)

geometric proportions are visually beautiful. Optical illusion is created when the surface is divided (complements weaknesses) .

Rhythm – change in movement; an instrument for beauty that gives psychological pleasure through unity

Forms a sense of continuous motion. It can be divided into repetitive rhythm, progressive rhythm and radiative rhythm.

Balance – equilibrium of power, visual stability

Sense of weight and equilibrium created through evenly distributed line, shape, texture and pattern.

Symmetry – forms a balance in power through a same shape or an axis, creating a stable space

Emphasis – grabs people's attention by emphasizing a specific part

Change – sense of variety created when different shapes and colors are used; can be chaotic if overused

Unity – gives a sense of order and security; monotony can be avoided if slight changes are applied

Contrast – an efficient means to strengthen visual perception

It associates with movement by creating various visual effects such as light change and reflections using lucid materials on curved spaces. These associations are movements that use natural effects and coincidence, visualizing spatial effects under the assumption that the observer never stops moving and that light always changes. Even though there are no physical movements made by the space itself, it stimulates different human senses through spatial configuration and direction; it is an expression of an indirect movement that is perceived psychologically.

Recognition, in its most primitive sense, is carried out through the movement of our bodies. It uses the limbs to continuously create 'a questionable situation'. The relationship between our body and space is not static; rather, it is turbulent, uncertain and constantly in search of something. Our body uses all familiar movements when it experiences and perceives the built target.¹⁵

In those spaces, movements and perspectives work as a turning point for a more dynamic way of thinking. Furthermore, the change inside a space perceived from the beginning until the end of every movement can be infinite. In those spaces, movements and

¹⁵ Choreography of the architectural space : the disappearance of space in time, Wolfgang Meisenheiner, 2006,p23

perspectives leads the user to see something different or to move into another space, from the current point of stay. This process of experiential reality and time development expresses the situation of the space. Furthermore, the change inside a space perceived from the beginning until the end of every movement can be infinite. Our body's sense of behavior diversifies visual focuses. By moving our position(height), we can change what we see. In other words, we can consciously move our perspective(focus) to achieve an unconscious emotional change.

By movement, we don't only mean the big gestures; it could also be the simplest muscular activity such as eating, breathing or sleeping. Among these simple movements, breathing is by far the most important one because it is greatly related to our emotions. For example, anxiety or anger causes us to breathe faster and more heavily which is a physiological reaction against imminent threat and stress factors. It is also notable that the key to bring peace and tranquility from these negative emotions lies in breathing. Space and body interact with each other as a human body circulates inside a space, breathing easy.

Our body is the instrument for thought and expression. The most important movements in life are not artificial, but found naturally from within. The internal-external relationship of space is most evidently experienced when the space is visually modified due to different movements. Because of the human nature in visual perception, individual spaces are mainly recognized in a horizontal direction. Thus, when considering most motions as ascending, the direction can be divided into two groups: vertical motion and motion along a slope.

All possible human movements within a certain space can be simplified into two main categories: vertical (e.g. sitting, standing, and going up or down) movements and horizontal shifting. A horizontal shift in the user's position changes the perspective in situation and environment, creating a different spatial image.

When a mechanical device moves a fixed bottom plate vertically, a dramatic spatial change is experienced. On the other hand, vertical movements along a contiguous slope can be characterized as a non-intermittent experience.

Our body's form and the structure of its movement is eventually related to the structure of space; it is a holistic system of experience that becomes one with space, and an organ in movement that is beyond the meaning of body as an object. As a result, human movement is the medium of expressing emotions as well as a method to show both human and spatial aspects of an activity.

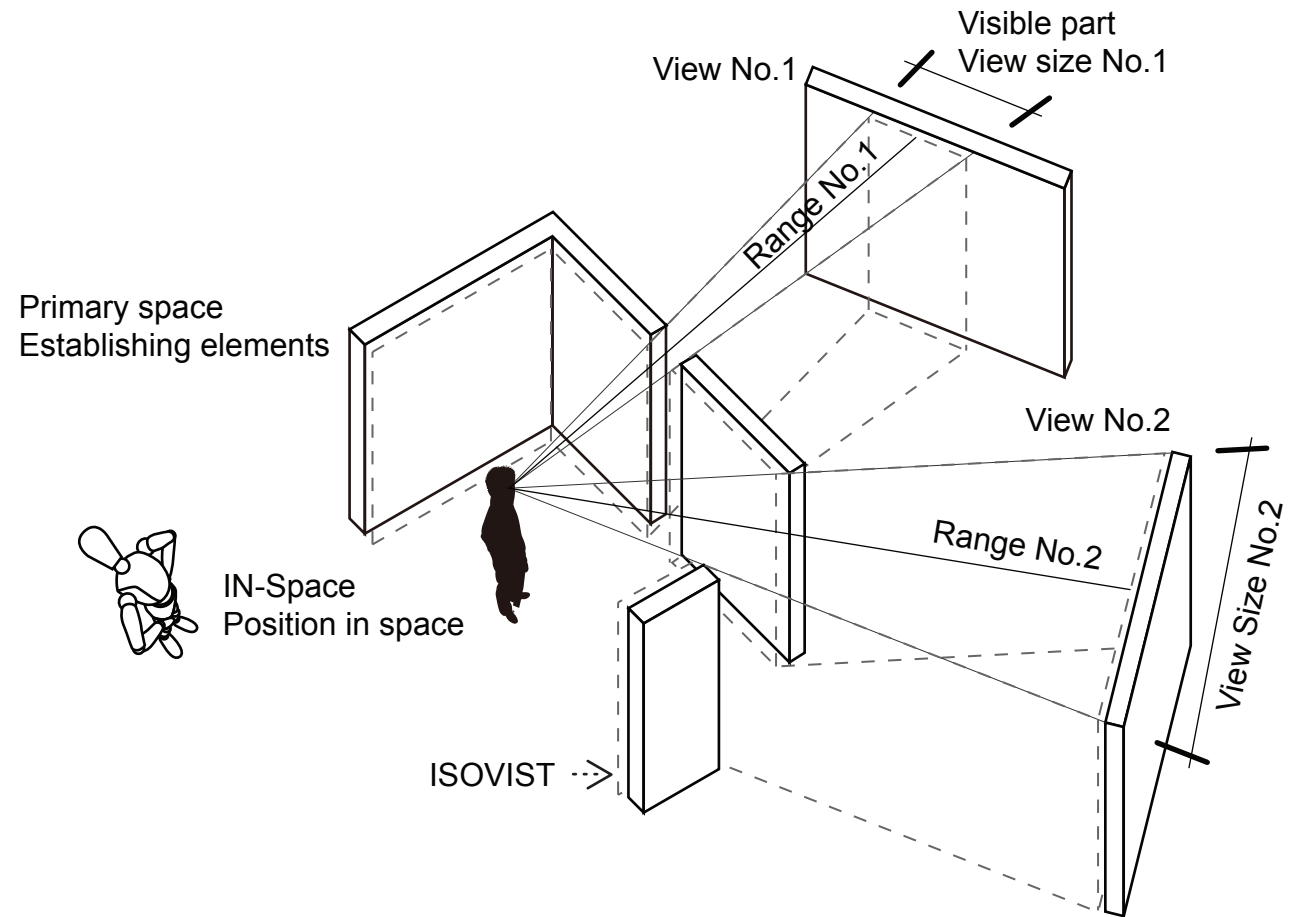


Diagram 13 Visual access and exposure

3.9. Architectural experience by human body: Place, Perspective, Mutual Interaction

By analyzing the sensorial factors shown through various movements inside a space, we can understand the characteristics of a space that is emotionally experienced.¹⁶ The way people experience things daily is a combination of visual/perceptive(eyes) and tactile/existential(body) factors. “Architecture cannot be understood through rational reasoning but only through physical experience.”¹⁷ That is, human perception has its roots in physical experience, and it is the basis of understanding the emotions generated while experiencing a space and its form.

In addition, the movement of the body and view point in an architectural space can shift from one space to another. This changes the process of experience as well as the spatial image with the passing of time. In the process of studying human reaction inside a space, there have been various attempts to build and adjust spaces according to the body movements.

Aristotle speaks of form as the nature of things, and he separates it from the materials that constitute them.

We generally experience architecture through our **eyes**. However, the real experience comes from the combination of visual and tactile senses. “Architecture cannot be understood through rational reasoning but only through physical experience.” That is, human perception has its roots in physical experience, and it is the basis of understanding the emotions generated while experiencing a space and its form. Our body is the instrument that links us with other people and the outside world, and through it we realize our body captures not only a mere space but also its whole surrounding environment, tradition and history.

M. Merleau Ponty wrote, “Our senses should be perceived as an animated communication between the body and its environment.”

This is because it is our body that most closely approaches and responds to the objects other than ourselves.

According to C. N. Schilz, “the existential purpose of a building is to make a place out of a piece of land, in other words, to reveal the latent meanings of an existing environment.” The physical and visual movement inside a space can show the situation, purpose and features (i.e. shifting one’s gaze from one space to another or physically moving to another room.) If the shape of a room seems inhuman, it is because the room is constantly repeating the same spatial unit. Although this strategy may bring optimal functionality, it cannot concord with each user’s individual

¹⁶ A Study on characteristics of experiencing sensibility space in the perception of Kineticism ‘Movement’, Kim, jun-young, journal of the Korean Institute of interior design, 2010. 06

¹⁷ Tadao Ando, “Shintai and Space”, phiaidon press, p453

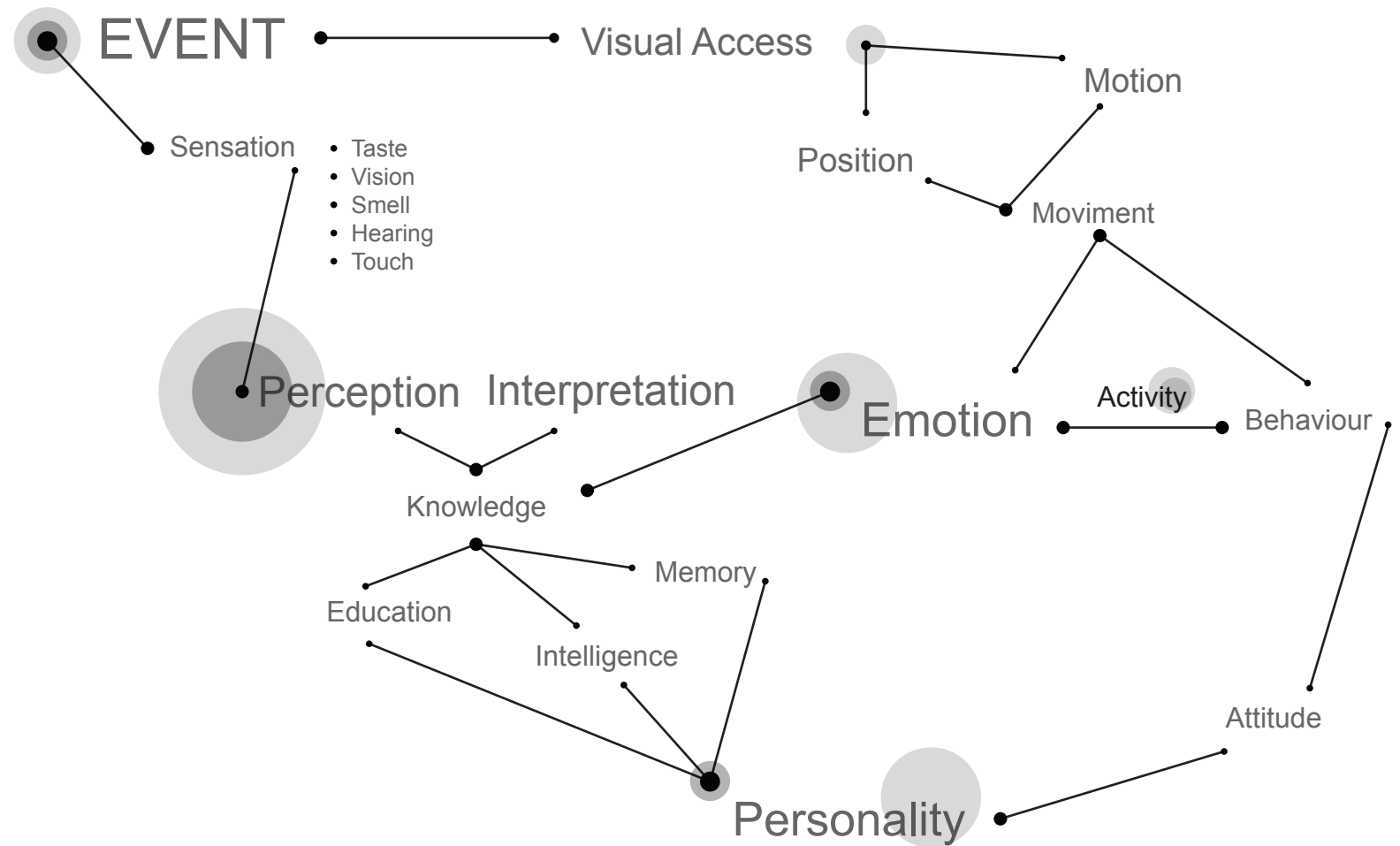


Diagram 14 How make emotional activity

3.10. Emotional Stimulation through Movement

Constructivism in the 20's opposed the expression of spatial volume and proposed instead the movement of time, known otherwise as rhythm. The Constructivist sculptor, **I.Lassaw**, stated that "rhythm is the flow of lines and shapes perceived as an optical illusion as well as the actual movement." When our body recognizes that it is interacting and regulating the surrounding space, the space becomes part of our body. The continuity of motion, possibility and changeability of space add richness to our lives.

Floor, walls and ceiling are the main physical components that constitute a space. We can create different shapes and movements by altering these factors, though the type and direction of movements depend on the architect. In order to use it in a wider range, flexibility is the key factor that changes a personal space into a public one.

Different senses can be stimulated according to the composition and coordination of space, and this can be said to be the psychologically perceived expression of an indirect movement.¹⁸ The physical and psychological stimulus of a space is perceived through an interconnected process of the five human senses. In addition, information is also perceived through human intuition, where personal feelings, memories, emotions are intervened in the thinking process. These emotional experiences do not end in the level of mere sensing and perceiving, but help to activate human emotion by creating an organized feedback relationship. In other words, a new change of emotion can be created through our body's perceptive and psychological experience within a space. Floor, walls and ceiling are the main physical components that constitute a space. A traffic line is the movement created by the user of this space, a path towards his objective. The user's movement from one space to another follows the 'cause-path-goal' scheme. The effect of this physical movement is that it alters the perspective, creating a different possibility for the space. This is called phenomenological embodiment. Because of this, movement is used more as a human sense rather than a logical reason; it is the means of transforming an objective special experience into a subjective emotion.

By changing a static and unilateral space into a dynamic and relative one, we can trigger different senses and experience a variety of emotions. Experiences related to movement, in particular, help the user participate in the space's changing process. These different

¹⁸ An empirical study on emotional space design, Oh Young-Keun, 2010. 12

presentations encourage the user's perspective and traffic-line to change, which eventually leads to curiosity towards the space. In order to induce user behavior, spaces should contain self-initiated activity, serendipity, diverse stimuli and communication – factors that help activate different emotions through their power and energy, and thus leading to a more effective spatial structure.

Movement is the means that changes an objective experience into a subjective emotion using various human senses, because when we perceive space through human-spatial interaction, it creates a great effect in our emotional reaction. Physical stimulation is perceived through the five human senses. The information detected by these senses gets involved into our thinking process such as personal feeling, memory, emotion etc. and eventually is greatly influenced by hormones. Since emotions are hard to control, a dynamic space that systematically activates human emotion through mutual feedback can be created. Thus, the user could feel a totally new emotion through a perceptual and psychological experience.

When a variable and dynamic movement is produced in a certain space, there by encouraging the user's perceptual experience, it can bring empathy and the desire to participate. In other words, emotional stimulation through spatial movement can trigger perceptual interaction between the space and its user.

3.10.1. Experiencing space by stimulating internal senses

Synesthetic experience can be categorized into two different areas: the experience that relies in basic senses and the experience that stimulates the internal senses (thinking senses) such as memory or mental values. The latter goes beyond the basic sensorial experience, passing to the world of memory and predictions. These experiences integrate with the complex human senses, and trigger emotional, psychological reactions associated with the space, proving that not only physical or direct stimulus but also secondary stimulus, internal senses can generate emotions.

Movement caused by natural phenomenon can refine an emotional space when it first interacts with space and then with the user's perception. This means that when we interact with a space using internal senses, the meaning of movement becomes sensitized; various psychological associations are triggered; and complex sensorial stimulations can be experienced.

3.10.2. Empathy through perceptive stimulations

Empathy, in its original sense, is the psychological process of filling sensorial phenomenon with mental context. The combination of perception and emotion is not a mere associative process. It can be formed by experiencing human emotions since they pervade

inside all perceived objects. German psychologist and philosopher T. Lipps divided human spatial perception into geometrical and aesthetical space. Since the latter shows vitality and strength through organic curvatures and slopes, it reminds people of a dynamic life form and helps them empathize.

Spaces that show movement through shapes and materials provoke empathy (perceptive experience and psychological reaction) and make themselves look dynamic. This means that our emotions are controlled and deeply influenced by movements perceived from different spaces and surrounding environments.

3.10.3. Sensorial activation through body movement

The way in which we handle necessary information from a spatial image as we perceive a particular space is called sensorial process; it helps us perceive a variety of spaces through body movement, interpreted as sequential scenes. These scenes can be portrayed as highly variable and lively, or as narrative and fluid. Accordingly, a space constantly changes depending on the user's movement and perspective, and as a result, the user obtains different sensorial stimuli. Our movement not only brings visual changes but also an integrated sensorial and emotional experience through its interaction with space.

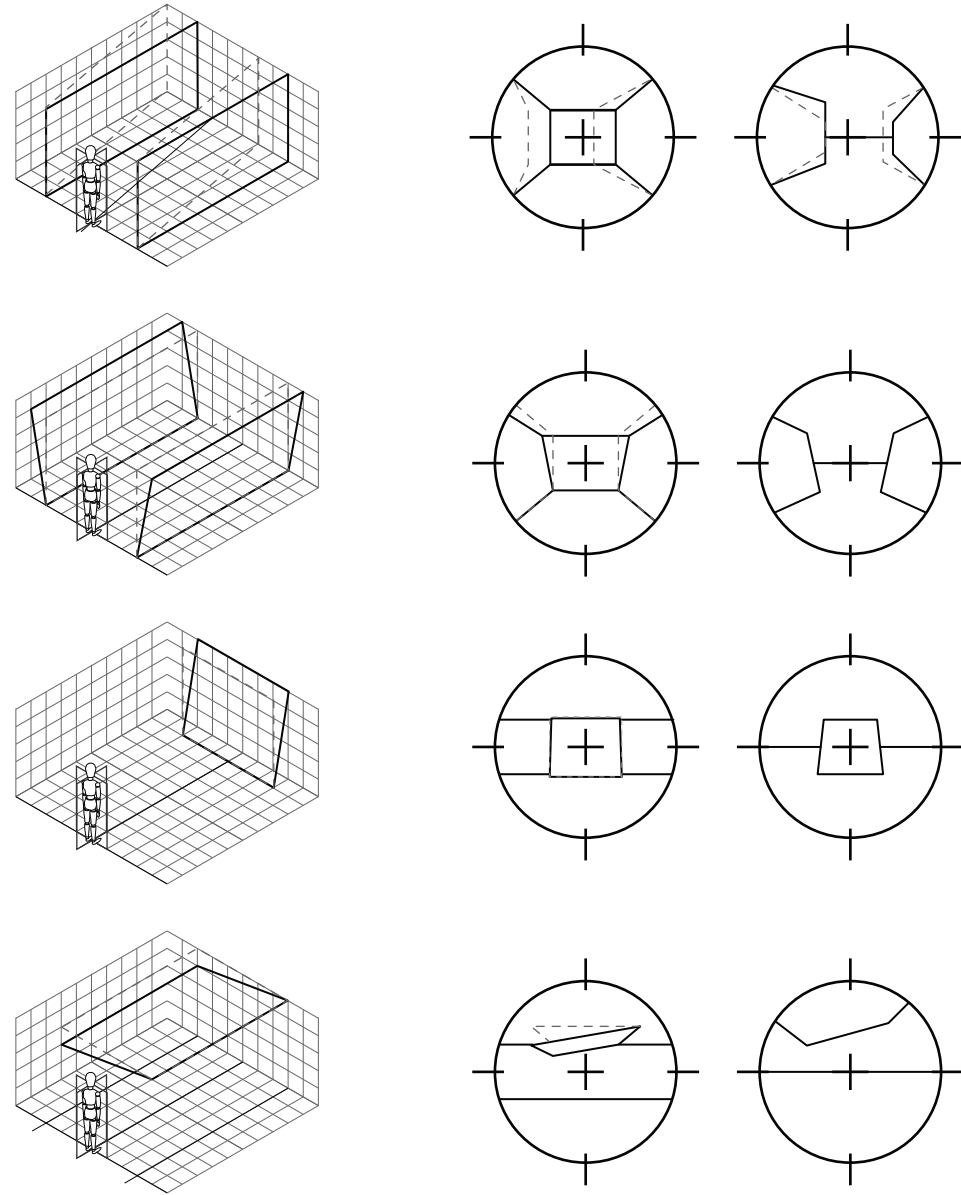


Diagram 15 Empathy through perceptive stimulations according of surface angle

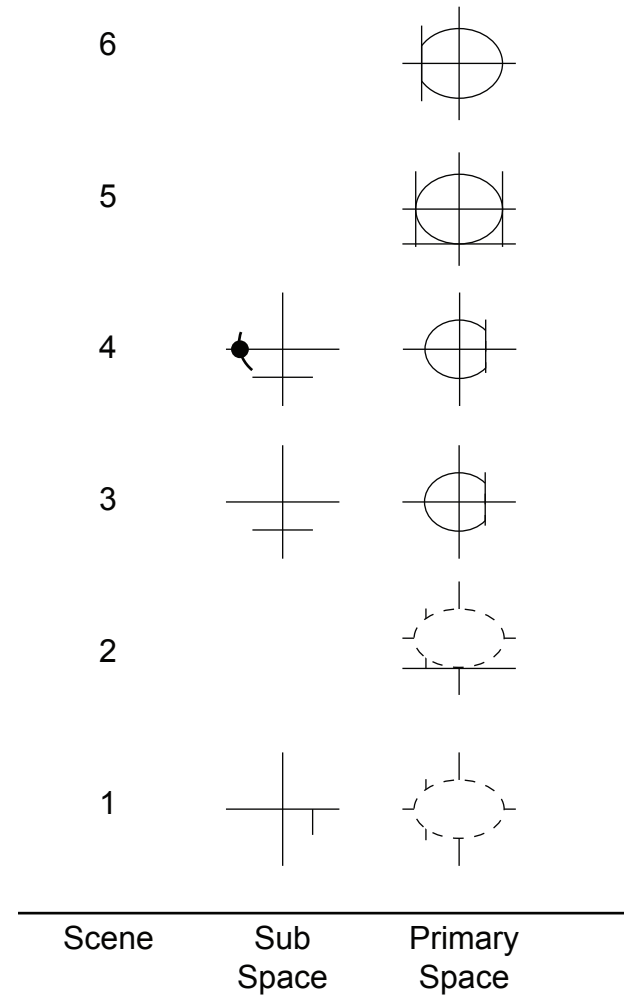
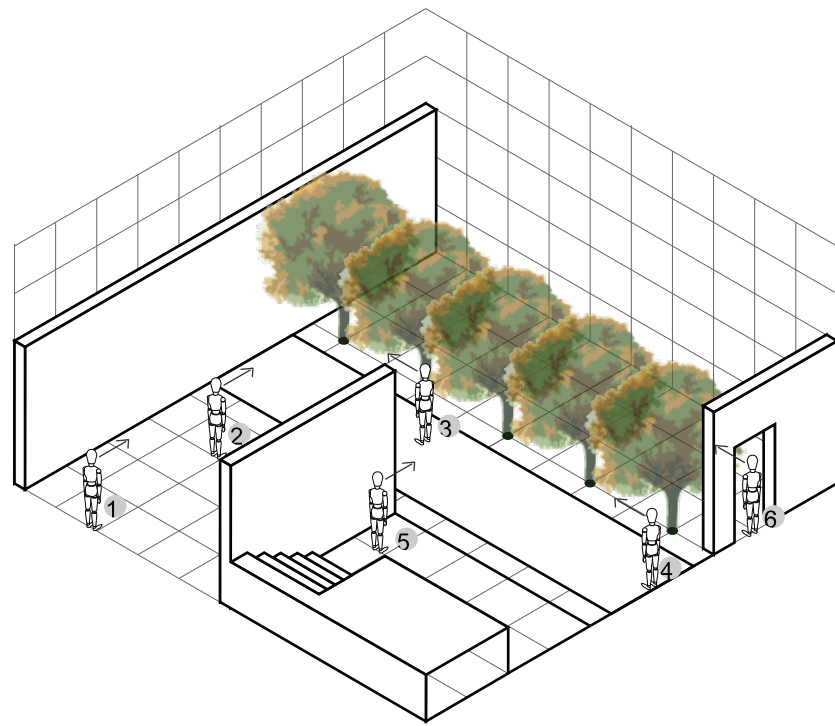
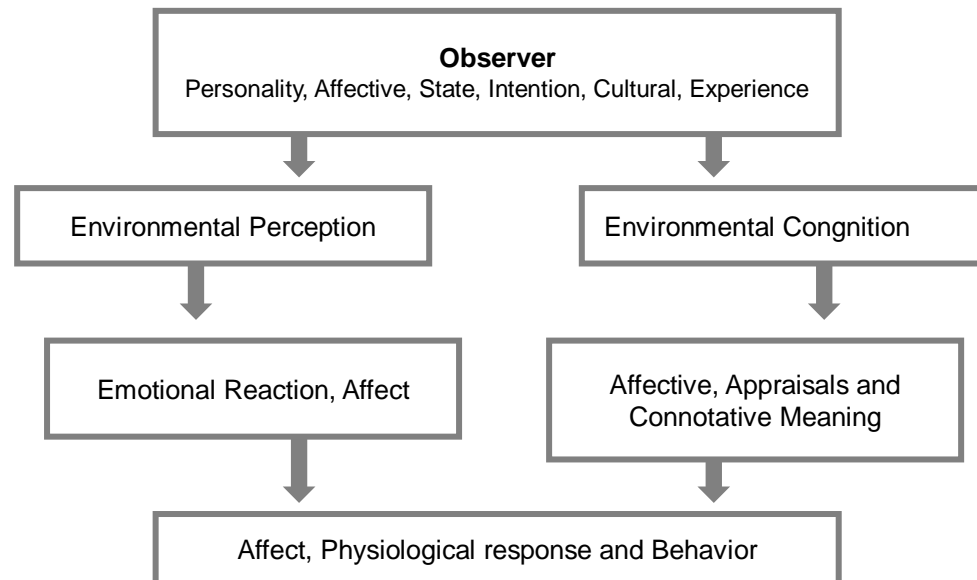


Diagram 16 Sensorial activation through body movement according of Visual access

4. Color and Space

Luis Barragan said “Serenity is the great and true antidote against anguish and fear, and today, more than ever, it is the architect’s duty to make of it a permanent gust in the home, no matter how sumptuous or how humble. Throughout my work I have always strived to achieve serenity, but one must be on guard not to destroy it by the use of an indiscriminate palette.”¹

Karim Rashid said that the feature of space has a complex relationship of mannerisms, cognitive and spiritual, and physiological connectivity in the senses. Pleasure is more psychological than physical. Health is more physical than psychological. Beauty is both. Beauty is epitomized through the combinatory arrangement of all these factor. It is highly important to our daily sense of wellbeing and to our ethical idea. If beauty were to disappear from the world, the world loses its soul.²



Alexander Byrne, A model of evaluation response to the environment

¹ Luis Barragan’s speech from Pritzker Prize, June 3rd, 1980

² Relax, Interiors for Human wellness, Introduction by Karim Rashid, Birkuyaer

4.1. Color as the Emotional factor of a Space

Everything that changes and generates is beautiful. Ancient Greek philosophers believed that beauty was immanent in all subjects as a fundamental order. Pythagoras made a shout of joy when he discovered that the delightful sounds of string instruments come from the mathematical order of the string's length. Plato made a further step stating that 'beauty comes from the maintaining measurement and proportion, and when these are not kept, the unpleasant comes.' It is clear that the idea of beauty itself changes and generates continuously.

In the world of space design, perfect beauty does not get created instantly. True beauty of a space is formed as a certain light comes in creating an effect, and the user reacts to this by changing the object's position in order to maximize the usability of the space.

When looking at beauty in an evolutionary point of view, we realize that regardless of human presence, it has always been expressed through one timeless common factor: color. Its influence in mankind can be also felt in architectural spaces, where it brings out quality, user reaction and preferential sentiment because it is one of the fundamental design parameters in Interior space. Color is part of the visual experience within a space and should include the space's extent, time and the color's attribution. Most importantly, color in a space is not to be considered as a singular concept. Furthermore, balance between the amount of color and the amount of surface is an important factor in influencing the user's psychological state; adequate change in dominant colors, accent colors and secondary colors can bring positive psychological effects.³ The balance between these colors creates different psychological effects in both short-term and long-term-used spaces. Color contains two opposite properties which generates both negative and positive reactions: it stimulates and tempts us, evoking impulses and displeasure, but also gives us comfort and stability.

The physical, physiological and psychological effects of color are particularly apparent in an interior space.

Do we fully understand the function of color?

How does color function and what are its effects?

Colors used in a space enable the user to perceive and react to the environment. Although these colors are fixed, the user perceives

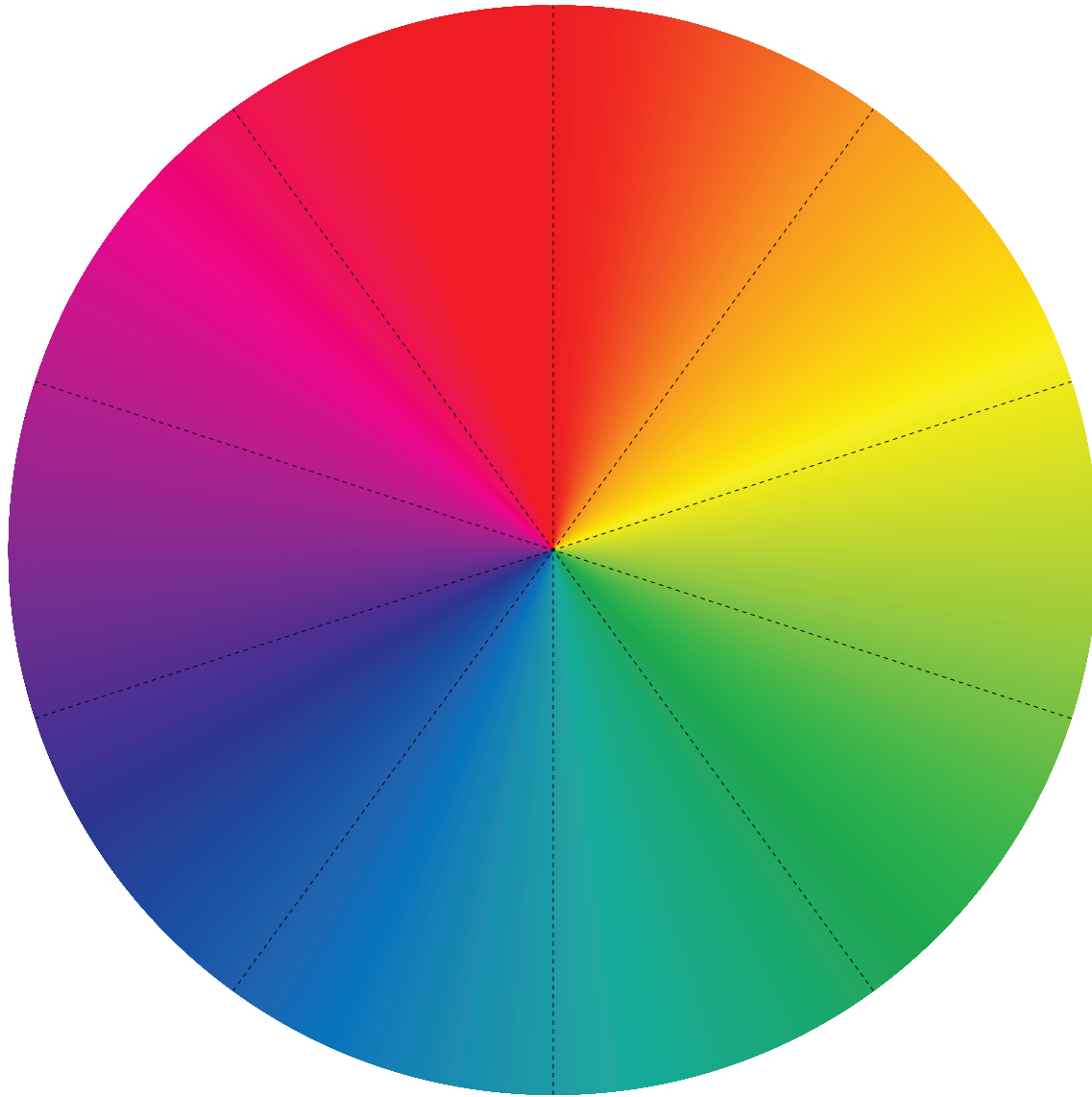
³ Color for Interior Design, korean institute of interior design, 2000, p55

them as a flowing element that changes through time and movement. Human perception focuses much on color since it has great sensorial influence, and that is why it holds an important role in interior space where function constantly changes according to the needs of society. After the era of functionality and convenience, the linguistic and semantic effect of color in the user's sentiment is prevailing. The aesthetical factor of color, with its growing receptive or mutual function, should be fully incorporated in interior spaces so as to add more richness and appeal.

Color is considered essential in an interior space since people perceive color even before perceiving shape. Just as first impressions among people are important, a color's first impression can also strongly show its function. Moreover, a later impression applies to a user who spends a lot of time inside a certain space. The effects of this later impression can be different from the functionality and psychological reaction from a first impression because color holds both positive and negative effects. For instance, people get a strong positive impression when entering a red room for the first time. However, as time passes, this effect of excitement goes beyond a certain level, turning into distraction and anxiety (negative effect). In this context, perceiving color in a space is to share the situation which the color is in, and to create a mutual interaction between time, property and user. Frank Jackson and Robert Pargetter define the idea of color used in a space environment as the following:⁴

- 1. Color is what an object possesses, and it's based on the background that it is perceptible.**
- 2. Color changes according to the viewpoint and situation.**
- 3. Clear, realistic and useful colors on an object are completely different from those combined in other situations. They are always random.**

⁴ Frank Jackson, Robert Pargetter, Reading on color, an objective's guide to subjectivism about colour, MIT Press, 1997, p71



Characteristics of Architectural Color	Role	Characteristics
Practical	Provide an existential meaning Control the quality of the architectural environment	<ul style="list-style-type: none"> - Form a practical semantic system for the architecture (as an immediate and visual instrument) - Co-existence of perceptive and sensorial properties - Architectural parameter
Relational	Direct interaction with humans Supportive function	<ul style="list-style-type: none"> - Mutual interaction system in an environmental, human, cultural range - Co-exists with the architectural context - Forms a relationship between human and architecture, space and space
Verbal	Analyzes the architecture Means of communication	<ul style="list-style-type: none"> - A design tool that shares morphological characteristics - A system of analysis and communication - Creates detailed messages
Perceptual	Creates identity Forms a symbolic meaning	<ul style="list-style-type: none"> - Expresses the function, form, symbol of the architecture - Forms a perceptual validity - Tool for perceiving information - Creates the features of the space

4.2. Psychological Characteristics of Color

“Using neuro-imaging techniques, we were able to show that brain regions that mediate linguistic processes participate in neural networks which are activated by perceptual decisions.”

Kang-kwong Luke

“The colors that the earth lies in our eyes are clear signs of those who think.”

Corano

Color is not used solely for decorative purposes. Its symbolic meanings and physical influences affect us both consciously and unconsciously. Color generates excitement, relaxation, calmness, clarity and so on, so it should be used for living, studying atmosphere, or to create an efficient and agreeable environment, and not for personal purposes. What color can express as an emotional space beyond its basic functions is limitless. It is a functional, formal and symbolic term that represents the visual characteristics of the environment, and when these are repeated or widened, color exhibits its simile-like properties, instead of metaphorical or meditating ones. These particular characteristics clearly reveal their meaning through visual experience. Colors have the power to evoke subjective sensations, which can be warm or cold. They particularly have a symbol that is capable of expressing an idea, an emotion, a sentiment; humans perceive colors and react to them. Thus, we all attribute a meaning to colors, linking them to images, contents and memories. It is important to understand in particular, the psychological qualities and emotional effects that color has on people.

“In the psychological effect of color, physical impression is important because it creates a corresponding mental agitation.”

Kandinsky, 1884

According to the above statement by Kandinsky, people's psychological impression is influenced by the physical impression of color. Color is created inside our brains and it is recognized as the vivid perceptual tool for basic visual perception and survival. In case of interior space, color is the cognizant element that determines their nature and forms the characteristics. We already know the strong influence of these physiological colors on human emotion because we not only see them but also feel them with our hearts while they touch us and move us. In other words, when we see colors or shapes, we perceive an image of emotion as well. The emotional function of color moves our hearts, makes us think and behave unconsciously and functions differently according to each individual's

level of emotion. This is because the visual perception on color evokes different emotions depending on the person's personality, environment, memories, gender and age. The opposite, which is a common impression on color, also exists. The human eye has adapted to nature and the environment for a long time, unconsciously experiencing colors without any kind of doubt. It has developed the ability (or paradigm) to capture the most impressive color or the main characteristics of a repeating color while processing and perceiving different images and information. These color paradigms, whether formed consciously or not, influence our lives as physical, psychological, harmonious and complementary factors, or as means of providing energy, vitality, inspiration and even more, spirituality.

“(...) in perceiving a color we experience the objective meaning. Each color is an emotional signal that is precisely determined in an unconscious manner. The chromatic signals constitute an emotive language that is understood at an unconscious level. (...) in perceiving a color we also live there, unconsciously for the most part, the emotional effect.”⁵

In Luiss Swirnoff's 'What is Color,' the author states that color evokes by influencing, forms meaning by association, is precise, non-verbal and a non-quantitative realm of poetics that communicates with people. Such perception of color can be explained through the relationship between stimulation and reaction within a human-space interaction system. Furthermore, as a stimuli that causes various psychological reactions, color is 'a sense or emotion that simultaneously activates thought and perception.' These psychological functions of color may appear instinctively or also through different associations coming from the relationship between environment and object. That is, the user's response to color, color scheme and environment always begin from a psychological or physiological reaction, but may later be altered through memory and emotion. Color, in its purest sense, is detached from time and space. It is perceived through the dimensions of color, brightness and saturation. Unlike in pictures where colors appear continuously as one meaning, colors used in interior spaces are understood when the user responds to the diverse system of the environment. The characteristic of color used in an interior space is that it creates a more mysterious image, not by itself, but when contrasted with other elements. It is a property that both exposes and hides its existence to people.

Any kind of feeling, be it excitement or tranquility, can always be considered in two points of view: **arousal & pleasure or unarousal & displeasure**. Colors and sentiments do not combine casually. Their associations are universal experiences deeply rooted in our thoughts.⁶ Colors are products of human interaction with the surrounding environment, objects, and light effects. This interaction takes

⁵ La diagnostic Luscher, Luscher, M., Astrolabio, Roma, 1995, p12

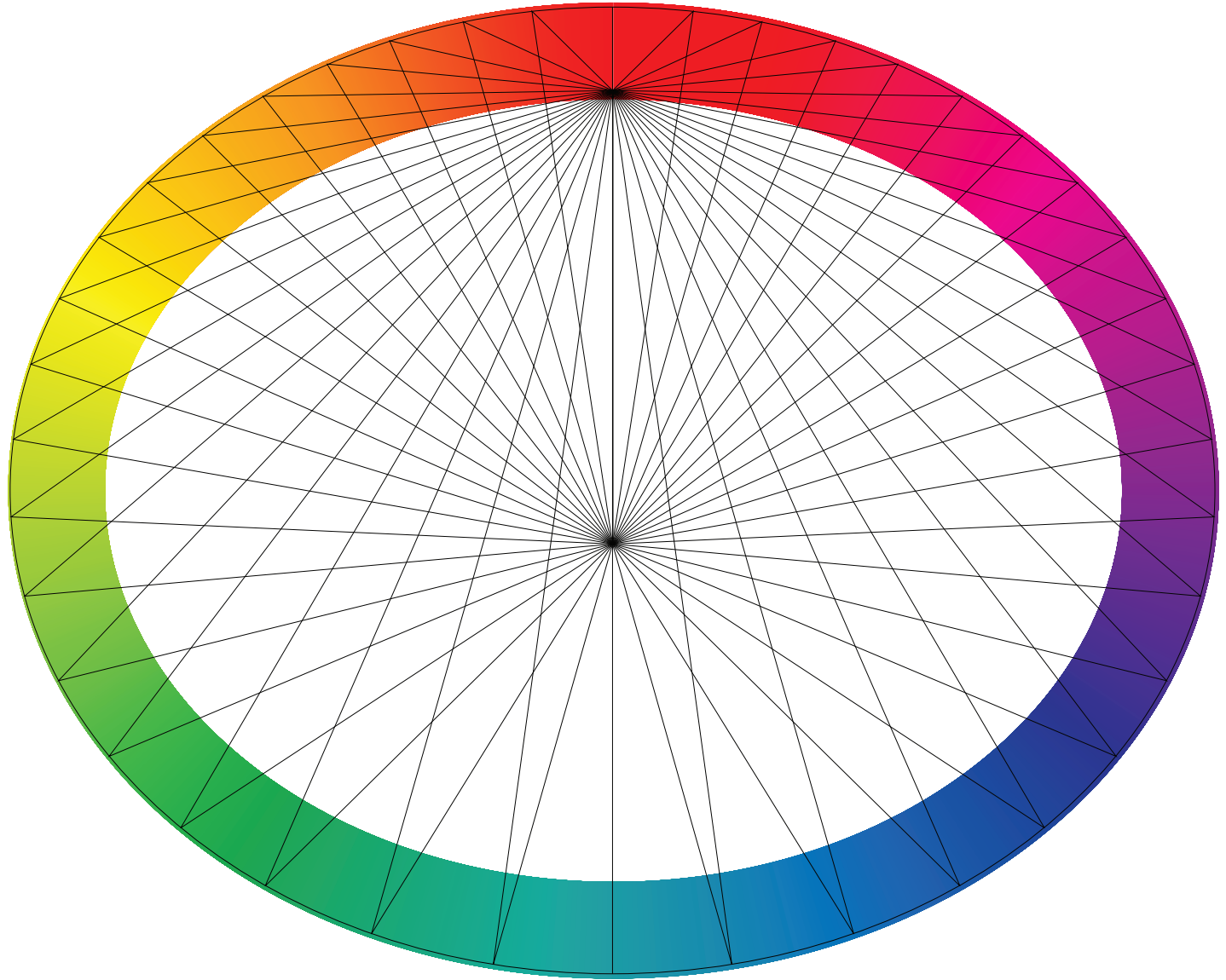
⁶ Heller, 2004

place in the course of perceptual processes, then, the colors lose the property of objectivity, becoming subjective properties that put forth the complex problem of an objective quantification in the property of color. (Marini, 1995)⁷ Other than being the means to represent one's sentiment, colors are used to express beauty with their inherent aesthetic properties. This can be seen in Post-Modern architectural style, where color is used in a basic space to add glamour and aesthetic inspiration through an emotional approach. The physical impression when people are in contact with color causes mental agitation, which directly influences our emotions and leads us to an aesthetic experience.

Rather than being a process of determining a specific entity inside a rational and reasonable standard, it is a process of embodiment that takes place inside sentiments, in which the "self" disappears to feel the existence of an absolute being. This is because it happens inside our minds, strongly influencing our sentiments, and is perceived by all of our senses.

The feelings that accompany certain colors are part of the psychology of color, a set of reactions that automatically associate with that color. Color becomes part of every harmony and cannot be ignored due to its enormously threatening and persuasive force. Color has an enormous power of psychology and physiology, and because of this reason, it is fundamental to understand its many aspects and meanings, and above all how to handle it.

⁷ A Colori : strategie di progetto per l'utenza debole, Raffaella Frangoni, Alinea Editrice, p29



4.3. Characteristic

4.3.1. Real Characteristic

Colors are not only emotionally perceived within a space but also have practical characteristics. This is because colors work as physiological and physical stimuli to the human sight. According to a theory, colors would not have existed in this world if our brains did not recognize them. Colors exist because there is light, the object and the perceiver. Physicists classify the basic characteristics of color, perceived through the reflection of light, in 3 different categories:

Saturation	> Purity (s=chrome)
Brightness	> Luminosity (b=lightness)
Tint	> Dominant wavelength (F=hue)

By saturation, we mean the the color's purity or intensity. A color with high saturation contains neither black nor white, therefore in possession of the highest level of intensity. High saturation is stimulating while low saturation is quiet and calm.

The saturation produced by the amount of light that a color reflects is called clarity. The brightness of a color, therefore, is shown by a gradation of tones when it is mixed with white or black (loses luminosity and color strength). Depending on the brightness, colors can have a pleasant color scheme and look beautiful. A bright color with low saturation conveys a flexible and clear impression but draws less attention.

Tint is the color itself, or a specific color to a particular wavelength. The mixture of a color with different amounts of white or black creates chromatic variations (or tonal gradations) that belong to the original tint. When mixed with a rising amount of another tint, on the other hand, the result is a chromatic scale.

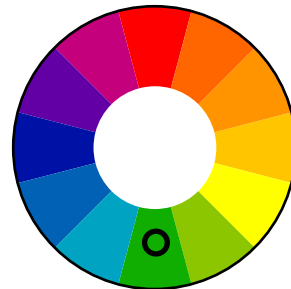
The physical principles of color help us understand the characteristics of color as well as its emotional effects. Cold colors tend to be light and distant within a space, whereas warm colors appear to be dense and approaching. Everything changes if we juxtapose a cold pure color to a warm impure color, making the pure color prominent through its brightness. A color appears to be heavier when it is opaque and lighter when it is clear or bright.

Color is a vital phenomenon perceived in our brain through sight. However, considering that it is a type of stimulus it can be perceived

as a different color from the original one depending on the person. It can also be perceived differently according to how the ray of light gets reflected from the object. The colors that we see daily are continuously affected by the change of light source, direction of a light beam, properties of an object's surface, the observer's mental and physical state etc.⁸

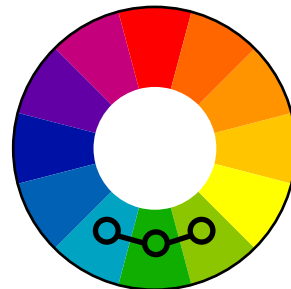
4.3.2. Interactive Characteristic

An appropriate color arrangement is what decides whether the image of a certain color combination is good or bad. A harmonious color scheme, using more than two colors, creates a synergetic effect that one single color cannot produce. In other words, the spatial effect can be improved by intentionally combining different colors. Since the context of a specific color and its relationship with other colors are formed simultaneously, understanding the range of color, position and association with other colors is extremely important.



4.3.2.1. Monochromatic

It is possible to create a monochromatic combination using variations of the same color tonality with different brightness and saturation. This color scheme creates a calm and unified effect, but at the same time monotonous and somewhat flat.



4.3.2.2. Analogous color scheme

Analogous color schemes use colors that are next to each other on the color wheel. They usually match well and create serene and comfortable space. Analogous color schemes are often found in nature and are harmonious and pleasing to the eye. Choose one color to dominate, a second to support. The third color is used (along with black, white or gray) as an accent.

⁸ Word od color: Showing color and seeing color, Korean society of color studies, Koean international publish, 2002, P.74



4.3.2.3. Triadic color scheme

A triadic color scheme uses colors that are evenly spaced around the color wheel. Triadic color schemes tend to be quite vibrant, even if you use pale or unsaturated versions of your hues.

To use a triadic harmony successfully, the colors should be carefully balanced - let one color dominate and use the two others for accent



4.3.2.4. Split-Complementary color scheme

The split-complementary color scheme is a variation of the complementary color scheme. In addition to the base color, it uses the two colors adjacent to its complement.

This color scheme has the same strong visual contrast as the complementary color scheme, but has less tension. The split-complementary color scheme is often a good choice for beginners, because it is difficult to mess up.



4.3.2.5. Rectangle (tetradic) color scheme

The rectangle or tetradic color scheme uses four colors arranged into two complementary pairs.

This rich color scheme offers plenty of possibilities for variation.

Tetradic color schemes works best if you let one color be dominant.

You should also pay attention to the balance between warm and cool colors in your design.

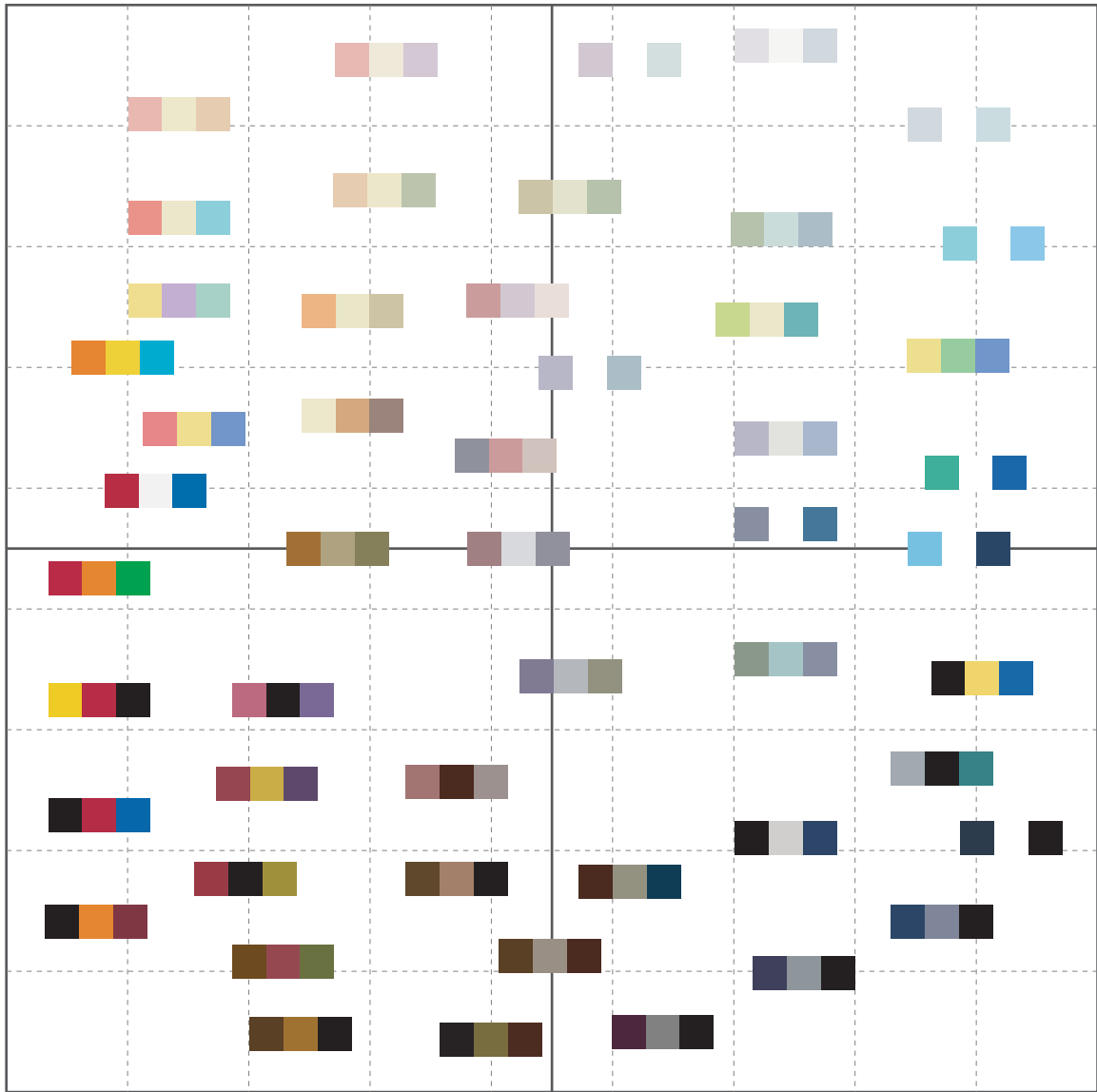


4.3.2.6. Square color scheme

The square color scheme is similar to the rectangle, but with all four colors spaced evenly around the color circle. Square color schemes works best if you let one color be dominant.

You should also pay attention to the balance between warm and cool colors in your design.

At times it could be disturbing and unsophisticated since there is much difference between the colors, but when used appropriately, it can create a space filled with diversity and change.



Three - Color image scale

4.4. Color Image Scale & Emotional Reaction

"Colors act upon the soul. They can stimulate sensations, awaken affection and ideas that calm us or excite us and provoke sadness or happiness."
Goethe

The most fundamental area of interest in designing an emotional space is human response; deciding whether something is beautiful or ugly, pleasing or offensive lead to countless different behaviors. Based on their creative abilities and experiences, experts design 'pleasant and beautiful' spaces for its inhabitants and users. It has been long questioned, however, whether these beautiful spaces suggested by architects truly convey the intended meaning and emotional effects to its users. This is because every individual has different preferences, and these are most often led by color. Users tend to form an opinion about an object based on their own favorite color, but their aesthetic preference does not always match with the function of the space. In order to solve this problem, experts need to focus on the user's point of view while they plan a space that is universally satisfying.

The daily psychological change that determines the quality of our lives can be divided into emotion and sentiment. Although personal sentiments are less intense than emotions, they equally affect our thoughts and behaviors, response intuitively against external stimulation and change according to personal experiences or situations. In other words, personal sentiments not only change depending on the type and intensity of external stimulus, but also on personal characteristics. According to Chekin, an American chromatist, human judgment on shape is rational whereas the reaction towards color is purely emotional which is why colors are deeply imprinted into our minds. He also explains that human behavior is caused by 90% emotion and 10% reason.

Experts need to have a common language in which to create, communicate and execute detailed concepts for spaces and many other types of work, from beginning to end. Among these languages, color is the most difficult to define because though it is expressive and influential, it is also extremely personal and symbolic. If colors and their symbolic meanings are used appropriately in a space, they increase the functionality as well as the level of experience and convey messages through association.⁹ When we perceive colors of a space or object, we perceive them as one image and not individually. Moreover, considering that we use abstract terms such as 'cute' or 'pretty' when we speak of the image of a certain color, it is possible to illustrate the color of a space with an emotional language –

⁹ S. Unwin, Analysing architecture, 1997, p55

adjectives that evaluate and express the perceived characteristics. The physical properties of a space are conveyed through cognitive adjectives, and the feelings and impressions obtained by the user are communicated through emotional adjectives. However, the relationship and definition of these two types of adjectives are not yet clarified. Thus, unclear emotional languages are grouped as images or pictures where colors form a common sentiment. Then, these sentiments are expressed with adjectives and their relationship with colors is diagrammatized in the Color Image Scale (Kobayashi 1990) – a system that helps to use color in space and render a particular atmosphere. This scale, made up of 130 colors based on the tone classification by Munsell and PCCS (Practical Color Coordinate System: Japan), reflects the lifestyle and cultural characteristics through emotional reactions.

The research on color preference through the Color Image Scale has statistically and systematically classified the images of colors from diverse users, and also established the basis for a scientific and reasonable usage of color. Moreover, the apparently subjective (though originally designed to obtain 'objectivity') tool for color analysis improved the level of understanding and application by verbally connecting color with its psychological expression. The Image Scale has measured the particular image a color conveys, and has placed them on an XY coordinate. The image words are a database of feelings, and have been organized below along two axes: warm-cool and soft-hard. The scale below has also been subdivided vertically into colorful, calm and refreshing¹⁰. The adjectives on the Image Scale are not considered as a single dot, but rather as a ripple in which the meaning gets weaker as it expands. This is because color possesses multiple-sided characteristics. Kobayashi's Image Scale has diagrammatized the scale for emotion to understand the effect that color has on our feelings. It is hypothesized that the color and its emotional language (word that describes the image of the color) should be consistent; this means that what people feel when exposed to a certain color should not change because of personal taste or evaluation method. However, since every individual has different backgrounds, it could be said that the relationship between color and sentiment in the image scale is not completely precise.

A method that complements the problems present in Kobayashi's Image Scale, measuring the user's emotional reactions in a more objective way, is the EPA (Evaluation – Potency – Activity). Developed in 1957 by Charles E. Osgood (creator of the SD method) together with George J. Suci and Percy H. Tannenbaum at the University of Illinois, the EPA measured emotional emotions through stimulation. Its defect, however, is that the adjectives changes every time it calculates a result. An improved version of the EPA is PDA (Pleasure, Arousal, Dominance). It was presented by the American environmental psychologists James Russell and Merhrabian

¹⁰ Colorist: A practical Handbook for personal and professional Use, Shigenobu Kobayashi, Kodansha International, P11

Albet in 1974, as the classification of human emotional reaction to the environment. This method applies the adjectives from EPA into the SD, creating 6 different pairs of adjectives belonging to each PAD.¹¹

Pleasure - Unpleasure		Arousal - Nonarousal		Dominance - Submissiveness	
Happy	Unhappy	Stimulated	relaxed	Controlling	Controller
Pleased	Annoyed	Excited	Calm	Influential	Influenced
Satisfied	Unsatisfied	Frenzied	Sluggish	In control	Cared-for
Contented	Melancholic	Jittery	Dull	Important	Awed
Hopeful	Despairing	Wide-awake	Sleepy	Dominat	Sub missive
Relaxed	Bored	Aroused	Unaroused	autonomous	guided

Pleasure – Dispeasure contains personal feelings, expressed positively or negatively through behavior and facial expressions. In **Arousal – Nonarousal**, an emotional state causes psychological reactions in our bodies, creating eletrocortical and autonomic arousals that eventually lead to the excretion of hormones or cause certain behaviors. **Dominance – Submissiveness** reacts according to comfort, freedom of choice and privacy. Dominance of a space is the level of freedom in which an individual feels when performing different behaviors. Every individual wants freedom within their own territory, and when it comes to social environment, people want freedom as long as it does not disturb others. Because of this, when man and environment become close and unified, one would feel superior in a dominant environment and feel comfortable and obedient in a non-dominant environment.

Through positive experiments James Russell and Mehrabian Albet¹² have drawn out many results on “space color,” the main factor that causes emotional reactions. Although preferences, appropriateness and perceptive evaluation related to spatial environment change according to each situation, the factors that cause emotional reactions can be measured by the clearly classified and evaluated PAD. The 3 factors of PAD do not show continuous reaction but are regulated by the SSA (Stimulus Screening Ability). Russell and Mehrabian (1974) saw that the level of arousal worked in proportion with the velocity and amount of information. For example, a complex space shows a higher arousal level than in a simple one, and a red room raises the level of arousal more than a grey room. In 1995, Mehrabian developed the following formula in order to explain the change in the level of arousal when people are

¹¹ Eun-mi Yu, A study on the evaluation model of color image in architectural space, Hongik University press, 2009, p64

¹² James A.Russell & Albert Mehrabian, Evidence for a three factor theory of emotions. Journal of research in personality, 1977, p273-294

continuously exposed to external stimulation.

Information rate = Information content / Time of Exposure

According to the above formula, when people are exposed to a stimulus for a long time the information rate decreases, creating a phenomenon called 'Habituation'. As we stay in a red room for a long time, the first impact of the room's color becomes less strong because we get used to that stimulus. Based on the emotional changes generated by the passing of time inside a space, the following PAD analysis can be obtained.

→ Habituation	
Pleasant quality	Unpleasant quality
Pleasant, Nice, Pleasing, Pretty, Beautiful	Dissatisfying, Displeasing, Repulsive, Unpleasant, Uncomfortable
High arousing Quality	Low arousing = Sleepy Quality
Intense, Arousing, Active, Alive, Forceful	Inactive, Drowsy, Idle, Lazy
Dominance	Submissiveness
Exciting quality	Relaxing quality
Exhilarating, sensational, stimulating, exciting, interesting	Tranquil, serene, peaceful, restful, calm
Stressing quality	Gloomy quality
Frenzied, tense, hectic, panicky, rushed	Dreary, dull, unstimulating, monotonous, boring

Through the correlation between Pleasant – Unpleasant and Arousal – Nonarousal, 4 orthogonal reactions (Exciting – Relaxing – Gloomy – Stressing) are triggered in Dominance – Submissiveness. When analyzing the two evaluation model of emotions, Osgood's

EPA and Russell's PAD, emotional reactions are generated according to the effect a certain color creates. Considering the variable(cognitive factor), or the time factor, that causes emotional reactions, the result changes depending on the first reaction when a user is exposed to a room and on habituation. At first, positive reactions can become negative ones, and factors that originally caused tension can lose their effect as habituation happens. As a result, under the assumption that the user's emotional response changes from habituation to stimulation when continuous information and stimulus is given, a moderate level of activity causes arousal and refreshes the emotional reaction that has been habituated.

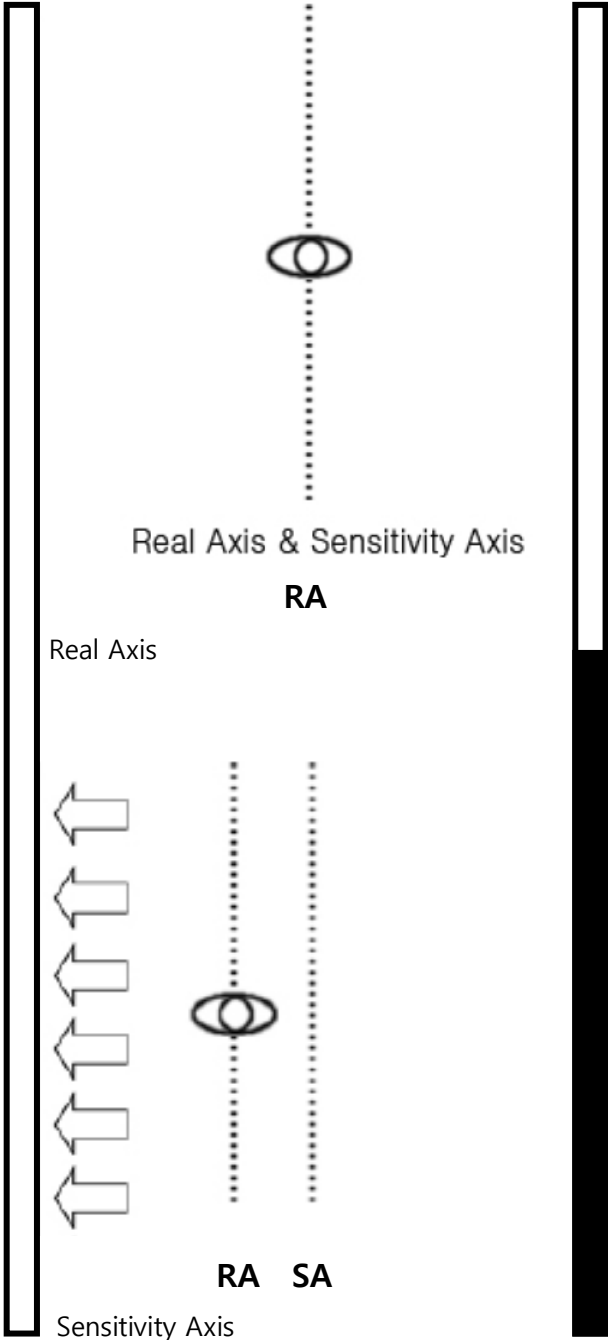
The user's emotional change (habituation and stimulation) in a space can be defined as the following:

1. Emotional change caused by habituation as time passes
2. Emotional change caused by continuous change in the quantity of information

In order to prevent the shift of a positive reaction into a negative one or a level change in negative reactions, weak but continuous stimulations are needed. The following formula shows how psychological variability can be calculated:

$$180 \pm \alpha (\text{Stimulation : Color as emotional effect} + \text{movement as reactional effect}) = \text{change in information contents}$$

Pict.1 Real position of the perceiver
(when the two parallel walls share the same color)



Pict 2 Sensitivity position of the perceiver
(when two parallel walls share different colors)
Positional change that the perceiver feels due to an emotional effect
caused by color

4.5. Color: the Stimulant that Derives Emotional Response

“My interest lies in creating richness and surprises.” **Phillip Starck**¹³

Color perception works as a stimulant that evokes various psychological responses by creating a relationship of stimulus – reaction within an interchanging system between human and environment. This means that it creates an instinctive reaction in people by simultaneously activating thought and perception. To generate these psychological reactions, a physical system should be first created. This physical system, or space, is an area composed of floor, ceiling and wall. Color, a factor that influences our minds, is added to make a psychological interior space. These types of spaces become what Luis Barragan has called ‘emotional architecture,’ containing our feelings. In other words, they adapt to the users, following their lifestyles, work and time flow. As emotional spaces that give light to human sentiment and essence, they need to influence our lives, rather than just providing convenience and functionality.

Color is an element of division that achieves general harmony, holds things together, destroys and emphasizes. It is also a psychological element since it creates or removes a sense of space, depth, density and size. Because of this, we use color not only as a means to create a certain atmosphere but also as a stimulator of sentiments that improves the room’s functionality and activeness. With this, the monotony (counteractive effect of habituation) and negative sentiments get stimulated to bring out a changing effect.

To form an emotional space using color, it is important to know “what” colors are being used. However, understanding “how” these colors are used and “what effects” do they have on the users is even more important. The emotional effects and level of habituation depends on color scheme. In order to control habituation and bring out a more positive emotional response, various types of reproduction is essential. This is especially true because modern people need spaces that put their restrained feelings in motion with the help of changes and movement in color. There are 3 factors that color needs in order to create emotional effects in a space: color effect obtained through structure, color effect within a structure obtained through light, sequential color effect obtained through movement.

¹³ EurlitssurStarck, Edition du Center Pompidou, Paris, 2003, p61

4.5.1. Color Effect Obtained through Structure

Walls are a part composing a whole building. Although they look simple, they show the entire complexity behind the relationship between human and space. **Edgar Morin**

Colors have been used for centuries, and their associative, physical and psychological effects are deeply rooted within our lives. They are figurative elements that create strong psychological associations, relativity, visual and emotional movements. Among various factors, walls express most strongly the visual effects of color as well as the symbolic effects of space. When people stare at a wall from their viewpoint, their mind flows into the space and fills it just like water flowing into a bowl. Walls lead *people's eyes to move* according to its form. **Mies van der Rohe's Barcelona Pavillion (Pict 3)**, is the perfect example where this happens. The wall that blocks people's view from moving within a reasonable and organized structural area, directs them to move their view towards the end of it. The traditional role of a wall used to be protecting the user from outside threats and dividing the space according to its function. *However, walls in an emotional space don't just simply exist but evoke the user's movement by interacting with other elements that form the space.* In a divided space, factors such as shape, size, surface property and color of the wall have direct psychological influence onto the users.



Pict 3 Barcelona Pavillion, Mies van derRohe, 1929

When users enter into a space, they meet with the area surrounded by walls, the surface of the wall and color simultaneously. Emotional color space is created as walls form the space and when memories and experiences form a life story; an endless communication between life and architectural aspects is made. Just like when an area's sense of place materializes along

sunset and change of seasons, these walls create an area where spatial values that influence people's emotions are formed. They are not there to simply separate or make a space. The wall in which colors are applied are not static elements that need to be decorated, but living things that share human life, society and culture with psychological and dynamic functions. Walls coexist with us by being alive as a mass, volume, object for psychological communication, emptiness and a being that creates an area. Apart from being open or closed, walls with colors approach us psychologically, interacting with other elements that form the space. Norberg-Schulz said that walls do not surround a space but rather integrate the inside and outside; and the opening concretizes the relationship between the two.

The effects of color inside a space can be divided as walls with color and walls without color. What would our psychological reaction be if both surfaces of two facing walls have different colors?

It creates conscious and unconscious responses through the user's perception. As shown in the previous diagram, **RA(Real Axis, picture 1, page 78)** represents distance; **SA(sensitivity Axis, picture 2, page 78)** is the average psychological distance. When two parallel walls share the same color, RA is positioned in the center(actual position of the observer) of both walls because it does not create any visual effects. However, when the two walls share different colors, it creates visual movement and emotional influence, changing the position of SA.

According to German chromaticist **Otmar Geckenberger**, the chromatic factors that influence spatial effects can be classified into accent, intensity and tone.¹⁴ Accent can be specified as the emphasized color, intensity as the chroma of a color, and tone as the relationship between chroma and brightness of a color. These elements can be easily applied into architecture and interior space, being used as an effective method to move visual attention. When different colors are applied into the two walls, the position for sensitivity moves towards where the visual and perceptive effect is stronger.

There is never a case where a color is in a space by itself because different senses coming from stimulations caused by structural divisions or expressions happen simultaneously. The colors we perceive are usually surrounded by other colors or relate with colors that has been previously perceived while shifting our viewpoint from one place to another. These types of spatial and temporal relationships of color schemes affect how we perceive color. Furthermore, depending on how color is used, the same space can convey a different sense of depth, expansion and height which helps create a variety of atmosphere. These emotional details enable

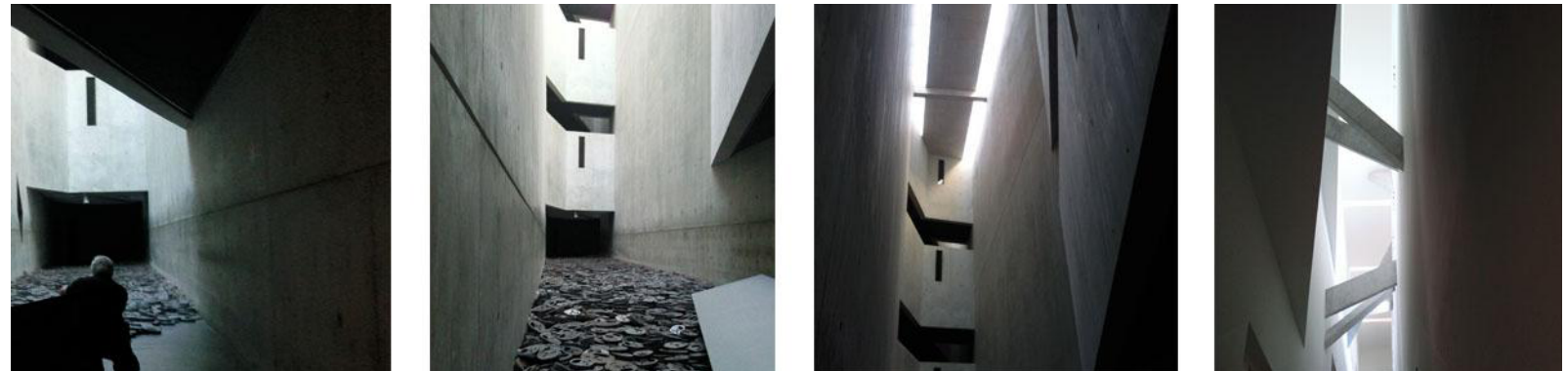
¹⁴ Otmar Geckenberger (2001), *Farbenlehre für Handwerksberufe*, Deutsche Verlagsanstalt, Stuttgart und München.

the users to feel intimate with the space they are in.

The function of walls in an architectural space isto separate and connect the space. Thus, walls limit space. The effect of a wall varies and is particularly depending on the following factors: the **form of the wall**, the **size of the wall**, and the **angle between wall and wall**.

“Paths are limited by walls, and these paths give us satisfaction sinc e they are considered as vertical gardens due to the trees, vines and flowers¹⁵.

Closed walls, often used by **Luis Barragan**, surround houses and mingle with natural elements, functioning as a garden that forms a natural boundary from the roads. In other words, walls form an introverted space by separating the interior from the exterior through a *height that exceeds the user's viewpoint*. *The streets are aggressive and unfriendly. However, walls create a sort of silence and a personal, intimate space*. By accepting these spaces as part of our daily lives, we can submerge into a deep meditation where tension gets naturally and completely eliminated¹⁶.The garden created by Luis Barragan's closed walls becomes a static and extremely introverted space. Functional division is not clear here, since the space is surrounded by other spaces. These spaces are more than functional shelters; they stimulate the user's emotions and evoke their sensibility.



Pict 4 Jewish Museum in Berlin, Daniel Libeskin, 1999

The walls of the **Jewish Museum** (Pict 4) function as means to trigger visual and behavioral experiences by forming free spaces that relate with the surroundings and interact with other spaces. By adjusting the angle in which walls meet, people can perceive the space

¹⁵ Keith L.Eggener, Luis Barragan, New York, Princeton Press, 2001, p29

¹⁶ Luis Barragan speach in Califoniacarnado, 1981, 10

during the instant and casual approaching. Furthermore, different situations are created so that people can physically feel the space through inconsistent openings and the volume of undetermined spaces. The colors of walls are different in order to stimulate sensibility through physical structures. The window in the irregular shaped exhibition space is uniquely designed, and the space that connects the two exhibition areas suggests the encounter with a new situation by changing the volume.



Pict 5 Lois and Richard Rosenthal Center for Contemporary Art Zaha Hadid, 2003

Zaha Hadid used vivid colors for design purposes and as a means of showing an image. The **Museum of Contemporary Art** (pict 5) contains few colors to emphasize the additional mass in the interior. In addition, its paths are also emphasized through color, dividing spatial composition and thus creating a dynamic spatial system.



Pict 6 Agora Theater Lelystad, UN Studio, 2007

UN Studio, the architectural studio that applies digital manipulation to produce non-standard spaces, uses the color classification method. By giving different angles to the surfaces and adding color where the angle varies, it creates the effect of separating and

expanding from the original structure. This makes it easier to distinguish the space according to the user's position or the functionality of the space.

Color emphasizes and at the same time distinguishes spatial elements and functionalities, creating an orderly space that is easy to locate. The difference in color brings visual superiority, emotional stimulation and adds clarity because it creates attention; these are the factors that heighten people's level of preference towards a certain space.

4.5.2. Color Effect within a Structure Obtained through Light

“Color is the place that relates with light, not just something that is applied onto buildings.” **ZahaHadid**¹⁷

Light is the second most important environmental factor after food, since it controls our physical functions. It can be divided into natural light and artificial light; the can penetrate into a space much easily while the latter can be applied into wherever position the user wants. A space's quality depends on how these lights are brought together.

Applying color into a space composed by the user's perceptive experience, in which light is perceived and interpreted, renders higher sensibility. Light that is directly illuminated or reflected creates the shape of an image; it uses the structural characteristics of the space giving a three dimensional feeling to the flat surface. In a physical cubic space, colors that coexist with light tint the space and become related to it. When using colors created through light reflection in a space, light needs to be considered as the most important source. As light gets absorbed into the structure, colors look as if they are tinted. If the walls are white(non-colored), colors find their way into the space along with light. They create a new space, forming volumes onto the walls. The method in which colors function in a space is closer to a three-dimensional painter's perspective than a traditional two-dimension usage.¹⁸

To make a sensibility space, the architect has to propose a space in which the user can perceive light, rather than a space where shape is composed by light. Light is an important factor that draws color into the space; however, the focus should be put on the user's sensorial and perceptive function within the relationship between light and space, than simply creating a visual light effect.

¹⁷ZahaHadid, GA Document Extra 3, Interview with ZahaHadid, London, 07.1995, P19

¹⁸ Julia Brown, Interview with James Turrell, Occluded Front, Los Angeles: The Museum of Contemporary Art and The Lapis Press, 1985, p25



Pict 7 The other Horizon James Turrell, 1998

Installation artist, James Turrell, allows the viewer to perceive the visual image of his work and feel non-physical and psychological factors. One of his works called 'Spatiality without Things' focuses on psychological experiences and bodily perceptions; the process in which the viewer perceives light in a dark space corresponds to MerleauPonty's phenomenology (consciousness through the body). Turrell wanted to draw light into the interior space. He used light not as a means to create focus, but as a creative element that expresses unlimited space. He also used color for the viewer and its meaning. Perceptive experience, light and color are used to emphasize human sensibility. Through the influence of natural light and artificial light, the atmosphere of a space shows diversity.

“Internal experiences were formed by external situations. Looking at an interior space itself means to view the space that is seen. Internal space becomes an outer expression. The internal light meets the external light: here, deciding the exact spot in which the light enters from can be meaningless.”¹⁹

4.5.2.1. Structure, Light and Shadow

Light is exceptionally important for a space. The development of structure and materials enabled the unlimited inflow of light. Light shows itself in a space through structure; it emphasizes, softens and defines structure by lighting the contours of the main parts. In other words, structure is chosen according to the purpose of the space; structure limits and regulates light; light exposes once again the structure. Through the interaction between light and structure, their essential roles can be executed.

¹⁹ James Turrell, James Turrell (sound recording), Chicago : The school of the Art Institute of Chicago, 1999 p25



Pict 8 Koshino House Tadao Ando, 1981

The sensibility of a space changes depending on the position of light, and people's viewpoint can be the standard position. A ray of light that falls from above one's viewpoint creates a heavenly sublime feeling. A light that comes from the same height of one's view exposes and emphasizes the outlines, while light that is illuminated from below one's perspective gets directly reflected by the floor and comes into view. Light generates curiosity towards a space on the other side of the window and creates a dark space that draws attention. Tadao Ando's work effectively shows the position of these physical openings.

Shadows formed by lights that enter inside by following the structure of a space alter the atmosphere, in a different way from other factors. They are more than shadows from walls, windows and furniture; the figurative shape they form creates a sense of movement inside the space. These types of light and shadow shape the physical notion of shade and influence human's psychology as well as emotion.

The brightness of a space depends on how much light there is and how much a surface is able to reflect it. Moreover, how light is being drawn in from outside decides how shades are distributed. Since shape itself does not hold any shades, clear colors show when the proportion between brightness and darkness is well balanced. When color meets the effect of shade made by shadows, it creates an emotional space that is mystical and extraordinary. This is because lights coming from different times of day generate different colors in a space, adding more sensibility. Colors expand or reduce space, and fill the space with emotions by creating metaphorical effects.

Wall texture and material for openings(transparent, translucent and opaque) need to be chosen carefully in order to get the best effect from incoming lights and to soften the intensity of illumination. In Ando's architecture, light changes according to the passage of time,

creating a colorful sensation, and it is also manipulated through penetration to generate a certain atmosphere. The inflow of light further expands its influence, together with the user's point of view and traffic line. For instance, when the user's viewpoint shifts linearly as light comes in from an opening at an angle of the space, one can see that the boundaries between walls, or wall and ceiling are unclear; due to the light coming from the opening, the space's limitation expands and creates ambiguity.

“Architects have forgotten that people need half-light(or half-filtered light). Indirect light in a bedroom and living room brings a feeling of serenity. We need to try hard to restore our mental stability and mitigate our worries. By eliminating glades and scattered lights, we can forget unpleasant feelings and regain the joy of thinking, working and communicating²⁰.”



Pict 8 Baragan House Luis Barragan, 1948

BaraganHouse creates its own atmosphere through half-light. It illuminates the inside not with its own color but through the influence of colored walls, leaving a subtle but lasting impression. Colored walls influence the color of other walls and create a contrasting effect in shades, with the help of light. The half-light reflected on the wall casts a shadow on an empty wall. The latticed window eliminates the glare and controls the amount of light; the shadow from the lattice creates movement inside the space as the position of the sun changes through time.

Le Corbusier was influenced by the following Mondrian's statement: "An empty space in architecture is colorless, and colors serve as volumes."He expresses the essence of spatial figure and emptiness through white, creating a space that assimilates with its surroundings. Furthermore, he applies Mondrian's 4 accent colors to the space in a semi-indirect way to arouse sensibility. Le

Clive Bamford Smith, Builders in the sun five Mexican Architecture, Architectural Book Publishing, 1967, p74

Corbusier stated that “Colors evoke a sense of space. They are the factors that contribute to our physiological abilities for architectural harmony. What they do is not descriptive but vibrant and iconic. That is its purpose and not its means”²¹.



Pict9 Rue de la Champelle Le Corbusier, 1955

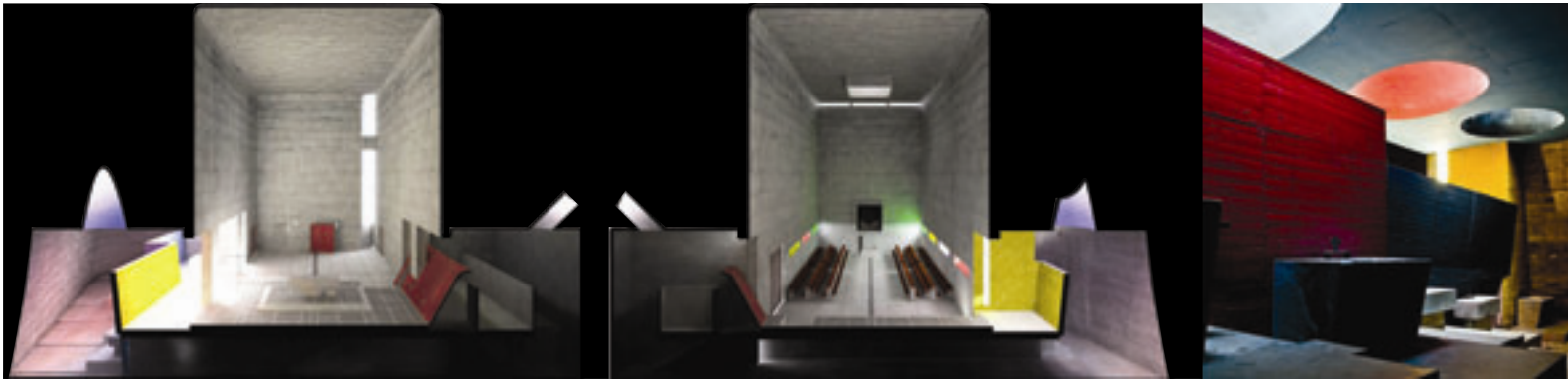
The stained glass on the outer surface of the thick concrete walls of RonchampChapelle, allows the light to spread from the deep part of the concrete wall, tinging the colorless interior with different colors. The curved roof and walls created by the free casting property of concrete naturally leads the user’s gaze to follow the lines. Due to the free formed surface of the outer openings, the light gets filtered in through the colored glass and gets reflected by the window’s 30° and 90° cut. Darkness falls o the empty shadowed walls that have no windows. This small church is a complex structure with various interlocking solids, but when seen as a whole, it is a dynamic single body exposed to the vast horizon that surrounds it.



Pict10 Eglise Saint-Pierre. Le Corbusier. Firminv. France. 1969

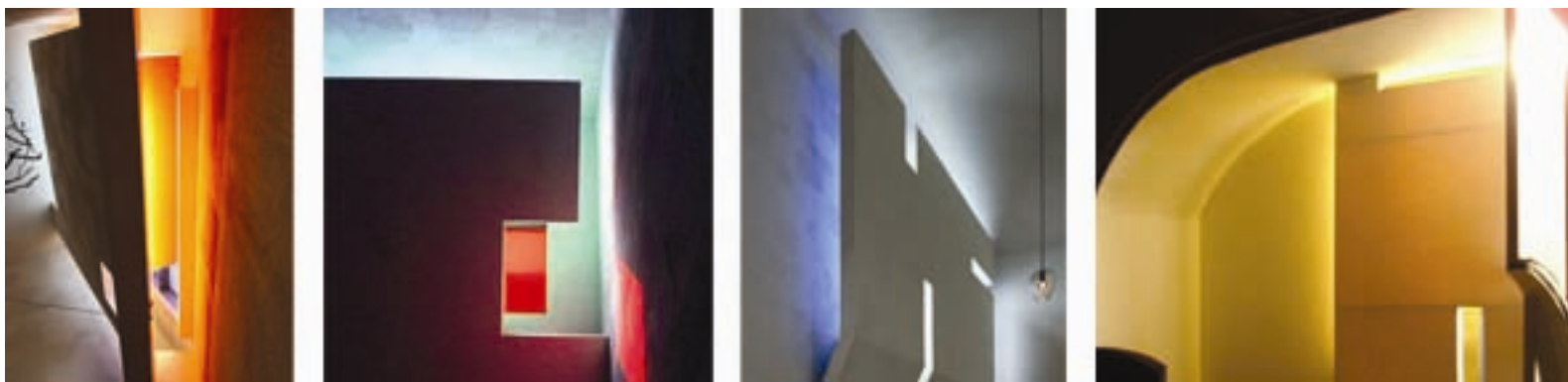
Faber Birren, Color & Human response, 1997, p86

The walls of Eglise Saint-Pierre hide tints of red, yellow, blue and green in between them, adding more mystery.



Pict11 Couvent Sante Marie la Tourette, Le Corbusier, 1953-59

Couvent Sante Marie la Tourette was constructed aiming to express the austerity of medieval architecture. The monastery's simple form and extreme roughness of the concrete is in contrast with the sophistication of the space and the splendor of direct and reflected lightings. Within the dull surrounding environment, this work of architecture tries to express a high level of spirituality by drawing in natural light from the outside and letting it fall in the interior through a rooftop cylinder. Just like in RonchampChapelle where light penetrates the stained glass creating a mysterious and holy atmosphere, Church of Saint Pierre uses the cilindric holes on the ceiling to add divinity in the light that falls naturally along the shape and harmonizes with the surrounding colors. While direct colors are merely perceptual, colors tinted by light increases the sensibility and holiness of the space.



Pict12 Chapel of St. Ignatius, Steven Holl, 1994-97

Steven Holl's Chapel of St. Ignatius was developed from the concept of "Bottles of Light." Seven bottles, light and religion come together in harmony to form a space, and six different lights stimulate human sensibility. It is similar to Le Corbusier's Ronchamp Chapelle since it uses the plasticity of concrete to tint the space with light, but it shows more metaphor by drawing in color through the reflection of light. In addition, the light that enters from an array of oval windows function as yet another spatial factor. Within one single space, different areas maintain their own independence, through separate ceilings and light effects. The roof's sense of individuality is obtained through a high-quality finishing of tilt-up concrete slab panels. The thick and rough oak door has seven oval lenses that capture light; these eye-shaped small windows are installed at different angles, welcoming the users inside by emitting light at night.

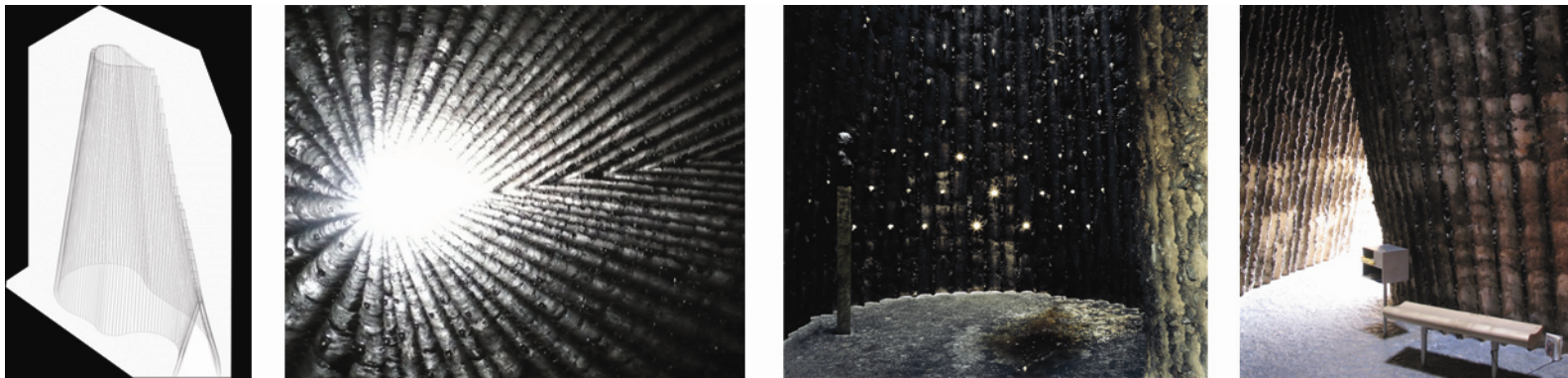


Pict13 NY Department of Philosophy Steven Holl

A new stair shaft below a new skylight joins the 6-level building vertically with a shifting porosity of light and shadow that change seasonally. Prismatic film was installed on the south-facing stairwell windows which occasionally break the sunlight into a prismatic rainbow. The Ground level, utilized by the entire University, contains a new curvilinear wooden auditorium on a cork floor. The upper level floors contain Faculty Offices and Seminar Rooms which are done in different shades and textures of black & white, according to the texts in Ludwig Wittgenstein's book 'Remarks on Colour'. The works of architecture presented previously create motion through the changes of shadow; Holl's stair shaft generates the same dynamic effect through prisms installed where light enters.

4.5.2.2 Texture and Light

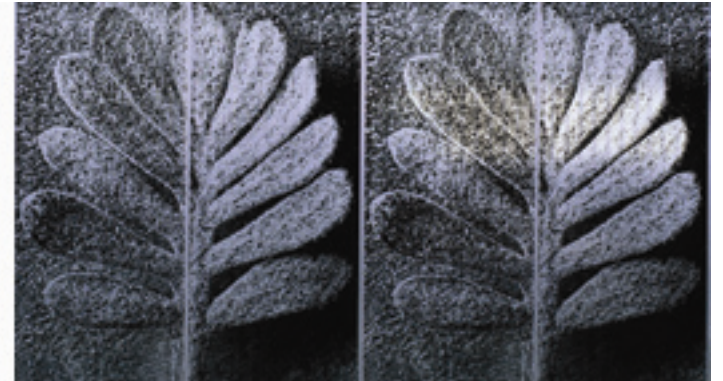
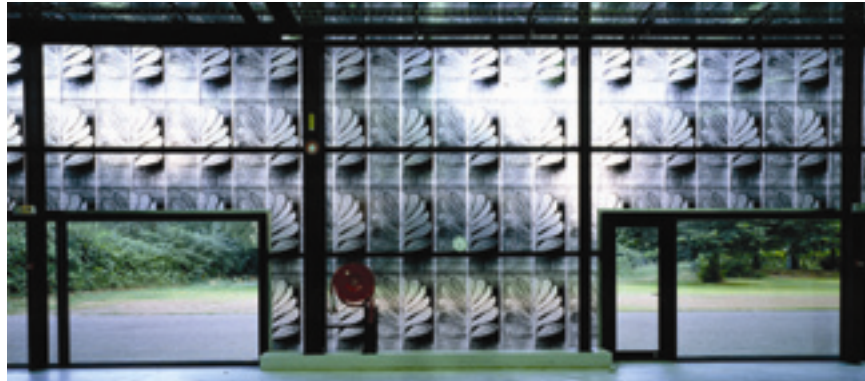
The role of light in texture is extremely interesting because the new sensorial characteristic created by their combination renders a more impressive image. Since all objects that have a certain shape react directly (e.g. **reflect, bend, absorb, diffuse, split, scatter**) to light or radiation, materials with tactile texture respond sensitively to light, creating spectacular effects. All objects possess their own particular characteristic, or in other words texture. Texture is a secondary factor that combines both visual and tactile senses. Changes in brightness alter or emphasize spaces, shape and texture of objects. In fact, texture disappears on the brightest part of the object or when the shadow is completely eliminated. Light can be extremely dramatic when the brightness pattern is carefully controlled, and this effect fills the space with visual sensibility.²²



Pict14 Bruder Klaus Chape, Peter Zumthor, 2007

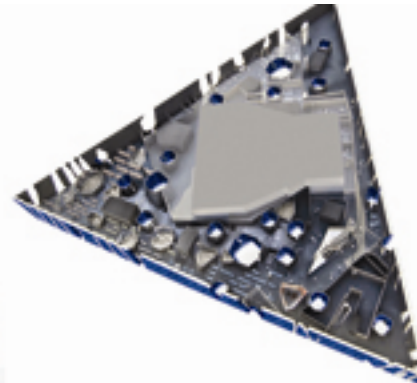
For example, in **Bruder Klaus Chape**, the unique roofing surface of the interior is balanced by a floor of frozen molten lead. Gaze is pulled up by way of obvious directionality, to the point where the roof is open to the sky and night stars. This controls the weather of the chapel, as rain and sunlight both penetrate the opening and create an ambience or experience very specific to the time of day and year. Particularly, the unique manufacturing process of the surface allows people to recognize the direction of how the light comes in, and also the texture of the surface without even touching it. These curved textures create soft shadows that form a dark-colored image.

²²Kin JE-GON, Study on light and space in Light Art, Hongik university, 2003



Pict15 Walls of the Ricola Europe SA Factory, Herzog de Meuron, 1993-94

Walls of the Ricola Europe SA Factory are a mixture of exposed concrete with metal as the secondary material. Its smooth surface ensures a certain amount of reflection. As wooden materials are added, the concrete wall becomes like a metallic tube, and when these materials meet light they create a shadow that lowers the color tone.



Pict16 Forum 2004, Herzog de Meuron, 2001-2004

Artificial shadows are created by giving a stippled effect onto a highly reflective material, to lower the brightness.

4.5.2.3 Sequential Color Effect Obtained through Movement

The colors used in a space have the power to transform and excite our everyday lives. As explained previously, colors create different effects depending on time, light and shadow, transparency, material, details, texture and so on. **Ludwig Wittgenstein's (Austrian philosopher, 1889~1951)** puts people's lack of visual experience as an example when discussing about color. His notion on color is a physical one; he states that a space that surrounds color cannot be considered separately from spatial experience. "Space, time and color are the object's format." By 'object's format' he means the result of a direct experience.

Users form an image of the space and develop emotional sentiments by following a preconceived plan and traffic line. Through these real architectural experiences, they get in touch with aesthetic encounters and feel the potential of the various meanings that a space can have. Furthermore, spaces are no longer mere shelters that provide protection to humans, as their meaning is expanding.

A design method to allow an aesthetic experience to users in an interior space is to reverse what the users 'see' and what is 'seen.' In other words, by shifting the object that is seen and the person who sees it, the users experience the provided scenes that appear before them as they move along. These spaces maximize the concept of 'emotional architecture,' pursued by Luis Barragan. They are usually presented as unusual and emotional spaces within daily life.

When we say 'continuity within ordinary spaces', there exist several other detailed meanings:

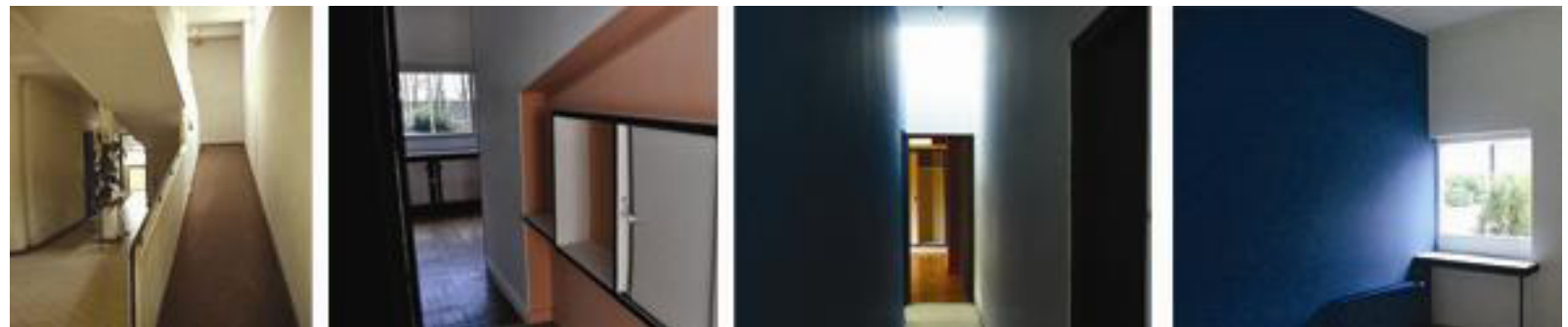
1. Aerial continuity: A and B share the same air.
2. Visual continuity: What is seen as we move from A to B and from B to A is different, but they are still the same space.
3. Walking continuity: People move from one spot to another.

The color effects that appear while experiencing spatial movement happen through more than two colors, the position of light and its overlap. Light emitting colors fill the space with color and sometimes create new patterns through translucent layers or surface cuts. They also make other countless effects with how light scatters when it reaches the surface of an object.

Even when the viewing position remains the same, it could give a different feeling if the object changes. By controlling the intensity of sunlight or artificial light, the color of the object varies due to its perceptive characteristic. Changes in reflectivity of surfaces with or without glossiness, difference between transparent and opaque colors and colors that are transmitted or reflected transform spatial

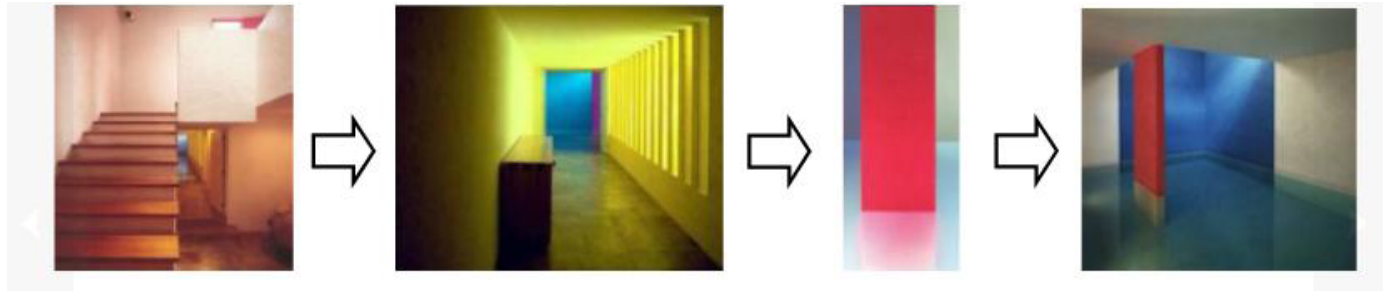
experiences. Moreover, using natural materials to make an outer layer can render a different color or image according to the influence of the weather. The notion of time during the perceptive process is not an objective approach but is rather closer to Merleau-Ponty's phenomenological time, in which 'our own existence is time' and considers that time and space are one.

Substances are different from minds; they are objective and independent entities. Substances are the source of perception, and are at the same time projected and recognized through perception. G.Bachelard considered energy as the most important medium that connects time and space. Substances are completely determined when time and location are given. Here, time is an important factor that regulates the condition of particles. Time, however, is in constant move, continuously changing with it the spatial image. By 'image change' we mean 'movement of image' or the structure for direction and discovery towards a new spatial relationship. Movement is by far the most powerful visual force among human experience. The directional change is greater under the influence of space, texture and size rather than by the movement of the form itself. A space's fluidity depends a great deal on the change of light, and texture can be emphasized by using strong light, shadow or strongly represented details. Light not only stimulates organic movement such as change in direction, but also activate the world by assimilating changes of light with time within a pre-designed space. When an object is exposed to light, it alters from one state to another, taking a life-like characteristic. Objects are transmitted to the visual level by light with the help of minimum organic matters such as uncertain force, movement and change. The meaning of 'movement' is refracting light and positioning. It exposes the current time and the ecology of the space by the changing visual images through the movement of the user or shadow caused by natural light. The objective perception of time and space cannot be realized without movement. These types of light effects in time and space are also influence psychological aspects. Movements created by the constant diffusion and emission of light interact with materials and structure, creating reflections and shadows and becoming the psychological factors that determine the atmosphere of the space.



Pict17 Villa Savoye, Le Corbusier, 1928-1931

When Le Corbusier designed his villas, he used color considering the movement of the users; used color to divide spaces, remind the users about the passages and strengthen the symbolic meaning of space. He used vertical movement when designing the lamp, differentiating the color of the wall that the users perceive when going up and coming down, so that they could define their exact position.



The entrance hall > Passage
 Pict18 Gilardi house, Luis Barragan, 1976

Passage > Pool

Red Post

Pool > Dining room

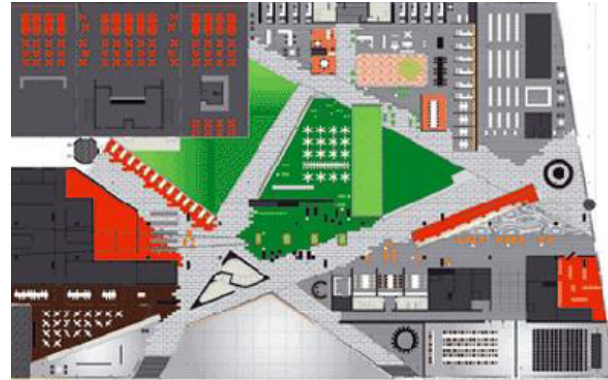
The flow of attention and the traffic-line's bending in the **Gilardi House** create movement with the help of the incoming light effect. It intentionally draws people's attention to move accordingly with the traffic line and experience the proposed colors. After passing through the wooden floors and white walls, people feel a sense of rhythm as they move along the uniform yellow corridor. Then, they are lead towards the red and blue walls of the swimming pool seen at the end of the hallway. Since the total area of the red and blue walls seems different depending on the viewing position, we can say that the spatial image transforms by color combination.



Pict19 Chapel in Tlalpan, Luis Barragan, 1952 -1955

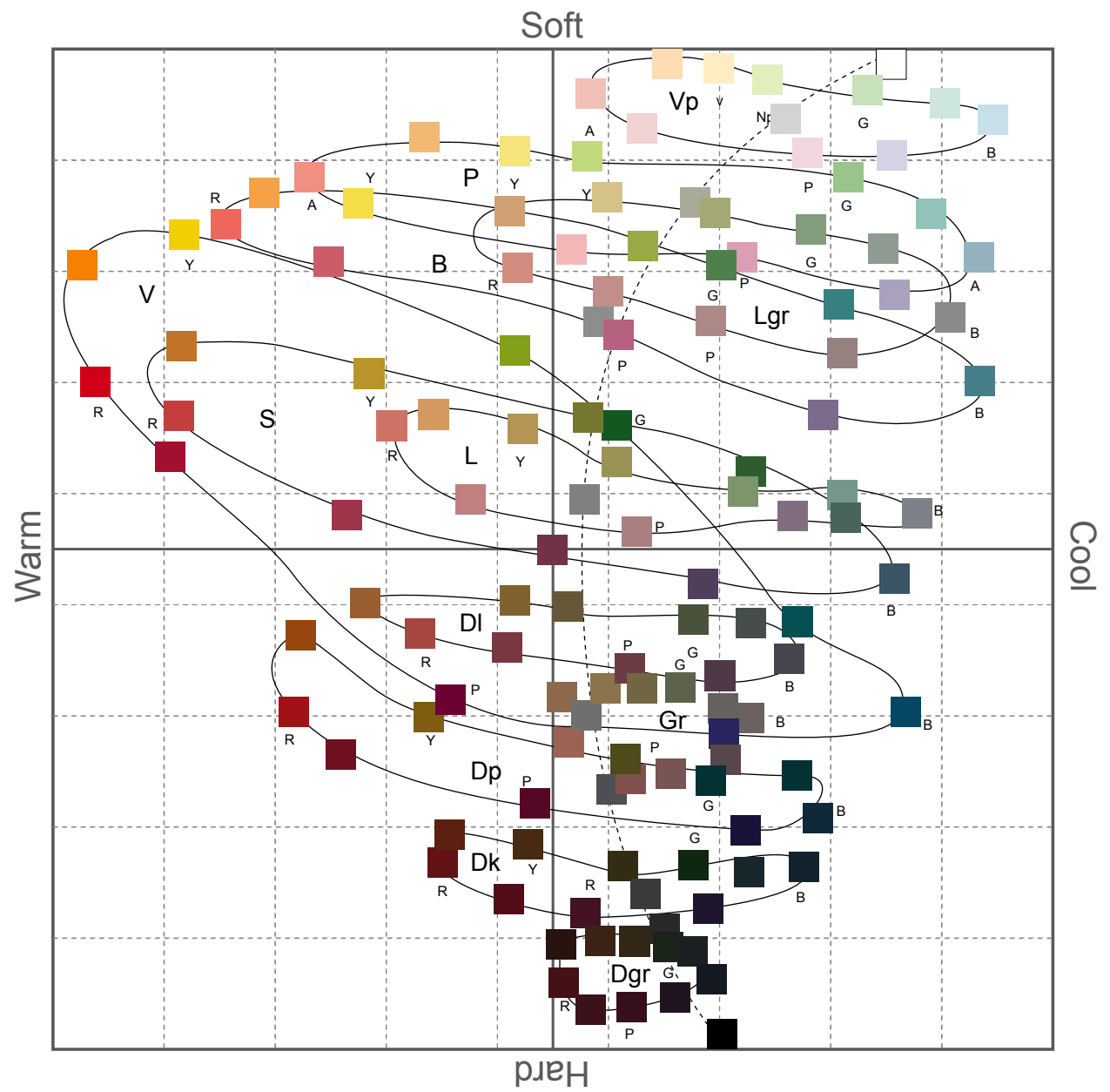
Tlalpan Chapel is a place where one can realize the existence and blessings of God through the intentionally-designed infinite light. He extracted only yellow rays when designing the space of worship to purify people's minds and produce a holy atmosphere. The

square chapel is consisted of a choir room on the upper floor of the entrance hall, where the yellow rays of light are being illuminated. The rear walls of the choir room have windows with yellow glass. The light that penetrates these windows transforms the white lattices in yellow, and the light that goes through these lattices diffuse, filling the whole space of worship with golden rays. Since these windows face east, the strong morning sunlight gets shattered into smaller rays as it goes through the lattices, and then illuminates the three-surfaced mirror installed on the wall of the chapel's altar. It creates a mysterious atmosphere as the chroma changes according to the light's intensity.



Pict20 IIT Student Center, Rem Koolhaas, 1997-2003

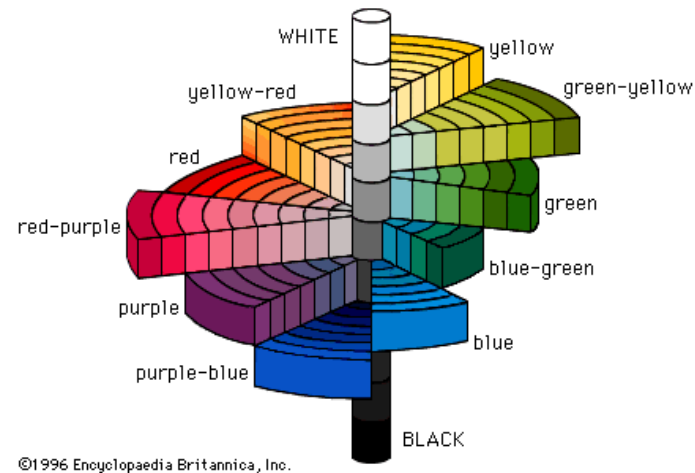
The IIT Student Center's interior space changes depending on where the users start moving and where they head to, because colors are used according to the function of each space. It also enables the users to choose their own movement and discover various paths, in order to create a much more interesting space where the color image changes whenever the user chooses a different path.



4.6. Single Image Scale

The emotional effect of colors is that it creates a variety of associative images. They are the product of our cultural, social and natural images absorbed both consciously and unconsciously, thus sharing a complex relationship. In order to work out the results on the previously studied PAD emotions, colors should be applied in a space. But we should analyze first the monochrome image scale for a better understanding

In order to precisely examine how emotional images are perceived according to the properties of each color, the position of the 11 levels of shades, ranging from white to black, that became the basis of its 130 colors were extracted from Kobayashi's image scale. The position of primary colors – red, yellow and blue – were then extracted, followed by the positions of orange (YR), green and violet (P), the secondary colors. To solve the problem of the difference between each primary colors' brightness level, all the positions were determined by calculating the brightness level and distance from Munsell's color space. As a result, we can finally figure out the correlation between the original position of both primary and secondary colors and their emotional adjectives.



In a space with a monochromatic image, the difference in each color's image can be instantly compared by visual information such as the difference in distance and position of color; the farther the distance, the greater the psychological difference and vice versa. We can identify the position of all colors within the image space if we place the color images on the coordinates of the scale according to purity and tone. Overall, warm colors are positioned on the 'soft' scale, while cold colors are on the 'hard' side; bright and vivid colors are dynamic, dark colors are hard, dark and plain colors are static and hard, pale and grayish colors are soft and silent. We can see that tone is a more important variable in transforming detailed images than color.

For further examination, the distribution of red is connected by dotted lines according to the changes in tone; the solid color that started from being dynamic becomes hard as it turns darker, and eventually becomes static by getting closer to a plain tone. Similar changes

can be observed on other colors as well. Warm colors are usually more dynamic and cold colors are relatively more static, especially in highly saturated colors, although for colors with low saturation there is not much difference.

All existing objects reveal their colors through light. We first recognize them as cognitive images, but as we become influenced by the emotional factors of these colors we perceive them as emotional images. The emotional influence of color, therefore, can greatly alter our psychological reactions and physiological comfort. Goethe said that colors not only affect our visual senses but also influence our emotions through our eyes. Each color has its own special influence; sometimes they work in harmony but other times when the influence becomes too strong, it causes discordance. However, the fact that they constantly influence humans remains unchanged, and these influences affect our emotions through the meaning, metaphor and physiological responses inherent in each color. In other words, each color evokes special sentiments according to its own emotional image.

Through his book 'The Essence of Color,' the Austrian social philosopher **Rudolf Steiner (1861-1925)** attempted to reveal clearly the cosmological and fundamental properties of color, and has integrated the basic concepts of color, including the theory of color therapy.²³ He states that color is closely engaged with our lives together with our living environment; feeling joy through yellow, dignity and devotion through red, and by looking at blue we can feel the tenderness that makes us want to cry.

Similarly, contemporary color psychologist **Faber Birren** has analyzed the functional characteristics of color in order to promote happiness in psychological, visual and physical ways. He evaluated the basic rules of the colors that are being applied in human environments and concluded that in places where there are no changes, a state of 'sensorial deprivation' occurs.²⁴ When our senses do not get stimulated, our brain feels dull and no longer performs the same responses. In other words, habituation gradually alters the fresh reaction of the first stimulation deteriorating it into an opposite response. For instance, an infant exposed to a space with intense colors such as red, the reaction is immediate. However, as time passes the reaction falls below average, eventually bringing distraction. Thus, the need for an environment that restrains habituation and activates psychological and physical functions is crucial. This book will examine the reactions to the 11 different level of shades (from black to white) extracted from the image scale, evaluate the psychological responses to the emotional images generated by primary colors (R, YR, Y, G, B, P) and study the possibility of emotional change in PAD.

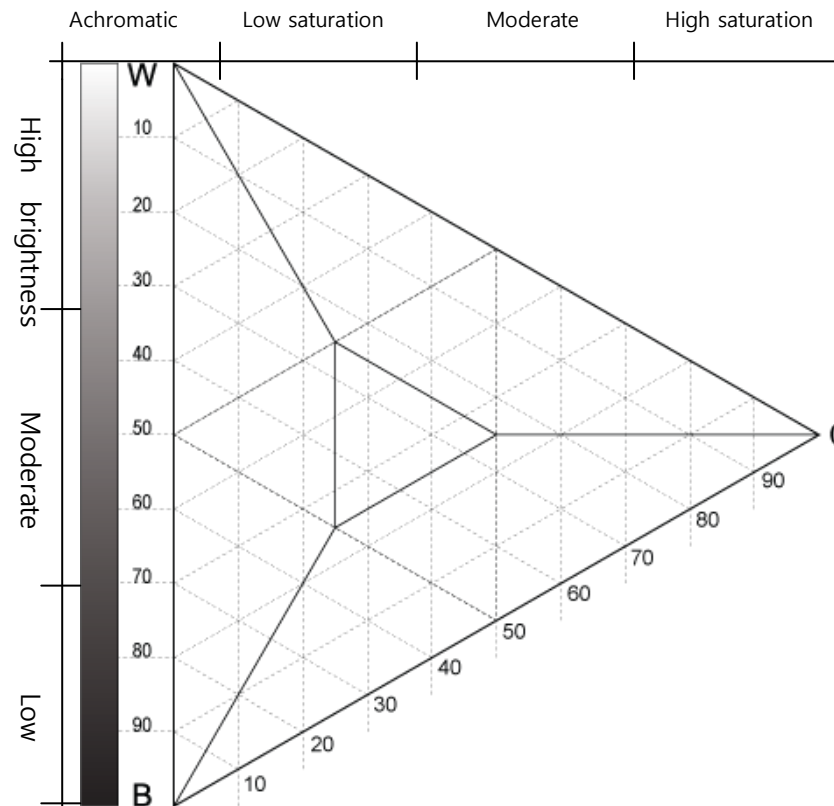
²³Rudolf Steiner, The Essence of Color, Eokgwan Yang, 2000, p116-117

²⁴Faber birren, Color & Human response, sigongsa, 1997, p157

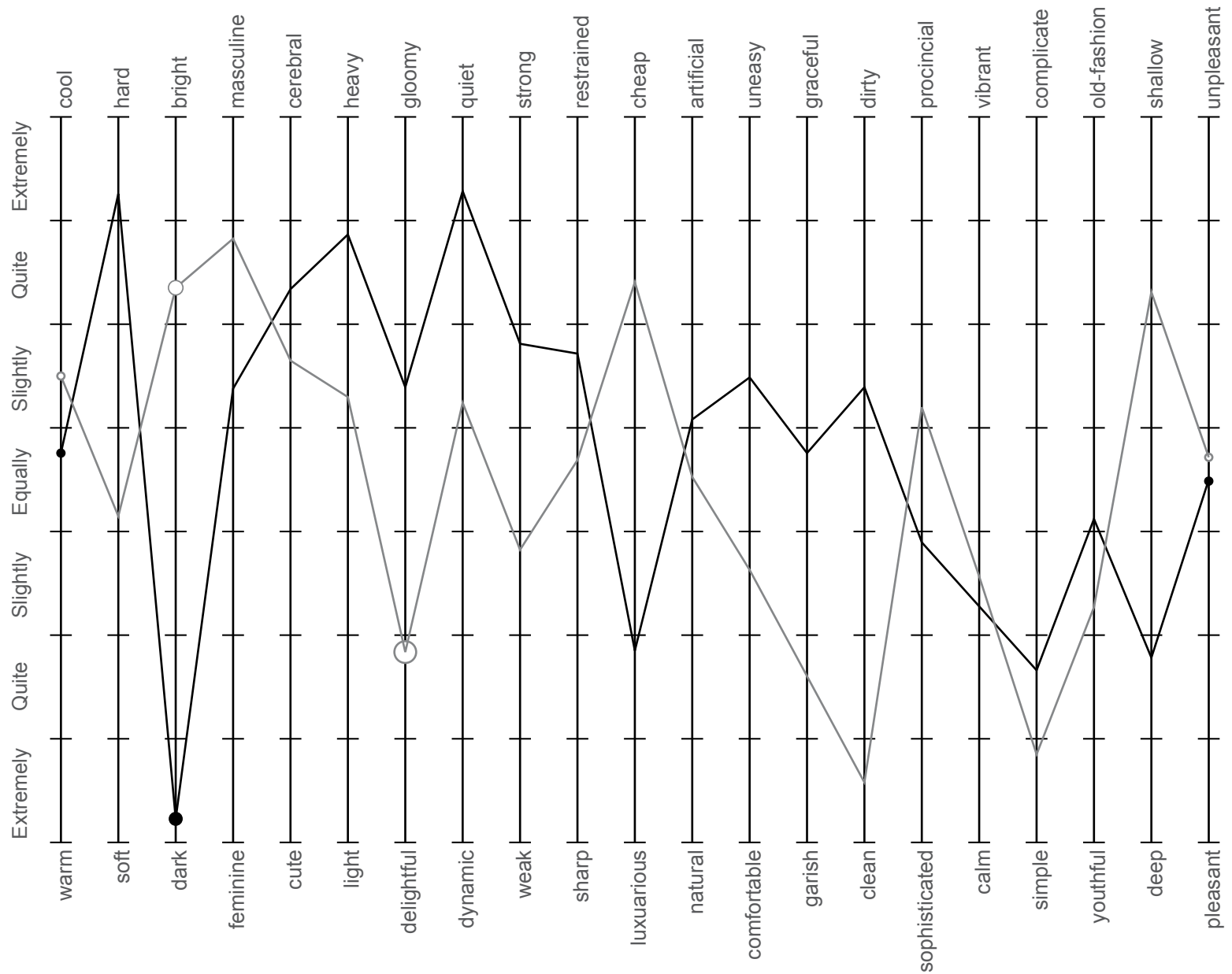
Color not only functions as a cognitive and emotional stimulator in all aspects of our daily lives, but is also an important factor that mediates our life and our environment. Its influence is vast, especially as a component of interior spaces, stimulating our sensibility along with shape. In the following diagram and table, colors are firstly divided into saturation and brightness, each being subdivided into 3 different levels: high, moderate and low. They show the correlation between each level in terms of psychological, spatial and visual guidance effects.

As the color becomes higher in brightness and lower in saturation the psychological stimulation is low, while when both brightness and saturation are low, stimulation turns out to be high. The highest stimulation comes from moderate brightness and saturation because visual perception grows stronger on primary colors. Warm, bright and vivid colors(e.g. red, yellow) are considered advancing colors; cold, dark and turbid colors(e.g. blue, turquoise) are receding colors. Although advancing colors make small objects seem bigger, receding colors make spaces look larger. When advancing and receding colors are used together, it generates a surface that looks rough and irregular.

High saturation	Moderate	Low	W
High spatial effect, sense of expansion and depth.	Low level of stimulation and fatigue.	Lowest level of stimulation and fatigue.	High brightness
Sense of depth and expansion is present. High level of psychological stimulation, fatigue and perception..		Low spatial effect. No sense of expansion.	Moderate
Low color factor and high psychological effect on black.	High level of stimulation and fatigue.	High elvel of stimulation, perception and fatigue. Seems more narrow as it gets closer to black..	Low brightness



4.7. Emotional color effect

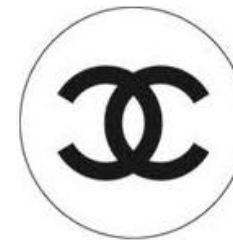


SD Scale Measurement Results: Black and White for PAD Evaluation, Evaluation based on Ju-yeon Kim, 2004 Using psychophysiological responses

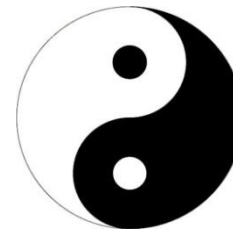
4.7.1. Black and White

Humans perceive all colors through the reflection of light. Black and white, however, are called 'achromatic colors' because they do not possess any saturation but show only different levels of brightness.

It is easier to understand what these two colors symbolize when they are put together, since they tend to have opposite properties. The characteristics of each color become more prominent through their contrast. In short, all that is not black is white, and all that is not white is black. It was only in contemporary culture that these opposite properties started to be used together to create an intense impression. In general, black represents authority and sorrow, being influenced by the robes of the clergy and mourning dresses, while white symbolizes innocence, femininity and higher positions such as the white-collar. Experts say that when white is used with black, it creates both authority and elegance. During the 30's, patterns that based on the combination of black and white with geometric shapes produced the best effects through the Art Deco movement. The harmony of these two colors was also frequently used in Minimalism and Modernism to convey an intense, yet sophisticated and elegant image. In fact, Chanel's logo with white background and black symbol is widely considered as the emblem of prestige and Modernism.



Another example of an effective representation of black-and-white contrast is the ancient Chinese Taijitu, the symbol for the concept of yin and yang; white (yang) refers to the male's heat, activeness and brightness while black (yin) refers to the female's coldness, passivity and darkness.



Since black and white can be mixed with any chromatic color, interior designers use these colors to make various color tones. The expression 'tone down' or 'tone up' is derived from here. When the mixture of black and white, or gray, is added into any color the original emotional property is reduced; the closer it gets to white the more expansive and less stimulant it becomes because the color reflects more light, and as it gets closer to black the opposite happens because it absorbs light.

4.7.1.1. Black _ Purity

Positive: Sophistication, glamour, security, emotional safety, efficiency, substance.

Negative: Oppression, coldness, menace, heaviness.²⁵

Black is noble and firm. It is a color that seems to be the most magnificent and sublime of all, yet it is also the least conspicuous color. It is a non-color, or the absence of color, that is used to render other colors even denser, and unlike white, it has a deep hue that comes from combining all existing colors. Although it lacks emotional actions and free flow of sentiments, it gives a sense of order and transforms imperfection to perfection. On the other hand, it has the tendency to either be stuck in its own world or completely dominate others.

Black gives the feeling of perspective and depth, but a small percentage of this color causes a reduction of legibility. It absorbs all the other colors, and is used in cases for excessive energy and blocks. So when we need to highlight other colors, especially bright ones, using a small percentage of black and gray would be effective. Furthermore, when combined with red or orange, which are intense colors, it creates extremely aggressive combinations.

Due to its property of absorbing all other colors, it symbolizes chaos as well as the birth of all living things. In other words, rather than being one single color, it accepts all the complex properties of all colors, which means that it contains all the positive and negative characteristics. Black is usually used to represent negative things but it also possesses good meanings such as mystery, prophecy, miracle and so on. As the color of all seeds that create new lives, something different exists inside this color. Because of this reason, black also represents new ideas or beginnings.

Up until the invention of light, night was synonymous with black because it absorbs all colors. In a psychological point of view, it has a 'defensive' property meaning that it hides itself and avoids self-expression. It is also a color that looks stylish, attractive, serious and prestigious in the area of fashion and interior, because of its contracting and encompassing property.

Since black absorbs all light, it is significantly less stimulant to human perception compared to other primary colors. However, it improves the ability to concentrate and helps other colors to stand out.

²⁵ <http://www.colour-affects.co.uk/psychological-properties-of-colours>

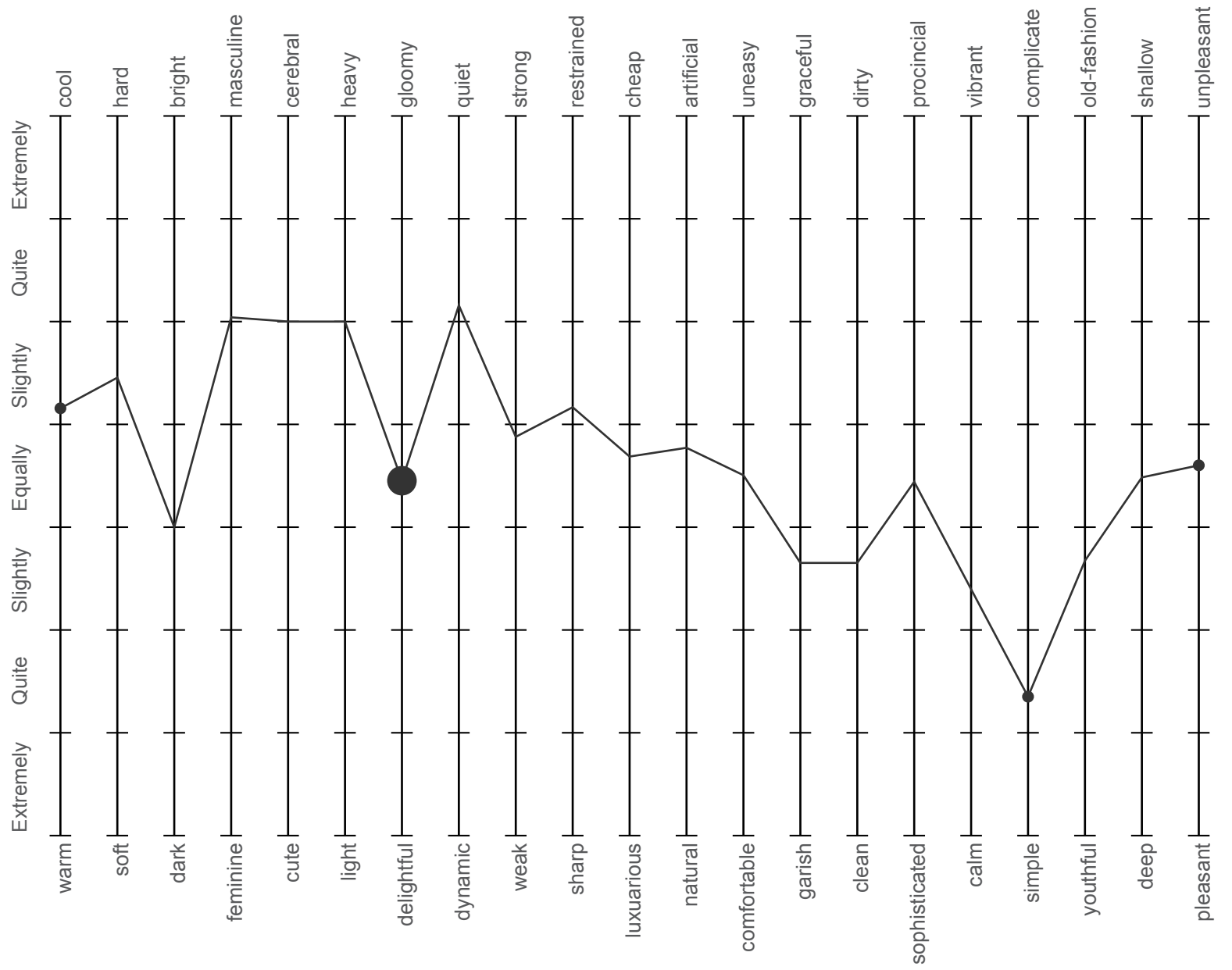
4.7.1.2. White _ Refinement

White represents complete balance and conveys a strong image of innocence because it reflects all lights. It is associated whenever people wish to purify their own thoughts and emotions. It can be emotionally cool and tense, but also clear, light and elegant. This color has high-reflectivity because it does not physically control its color. Rather than expressing itself, it absorbs all other colors when used together; a non-threatening and non-irritating, but at the same time clean, fresh and flexible characteristic that allows people to perceive the most fundamental shape of an object. In addition, it interacts dynamically with visual perception depending on where it is placed, and provokes optical illusions on objects by partially modifying their shapes in order to create geometric perfection.

White works perfectly when used as a background color; nothing against everything that stands out. Modernists attributed this color as a force that is almost mystical. One of the most famous is Le Corbusier's 'When the Cathedrals were White.'²⁶ According to Richard Meier, the objective and pure volume of a space can be expressed through the form's volume exposed by light and the nuance of its shades.

Color psychologists associate a liberating character to this color: for **Pfister** it is the color of freedom, openness and sincerity; for **Luscher** it is the color that liberates the physiological and psychic plane. Although white symbolizes tranquility and innocence due to its property that reflects all colored lights, the peaceful atmosphere becomes overwhelmed by loneliness when people are exposed to it for too long.

²⁶ Colori, Dettagli d'architettura, Oscar Reia Ojeda & James McCown



SD Scale Measurement Results: Gray for PAD Evaluation

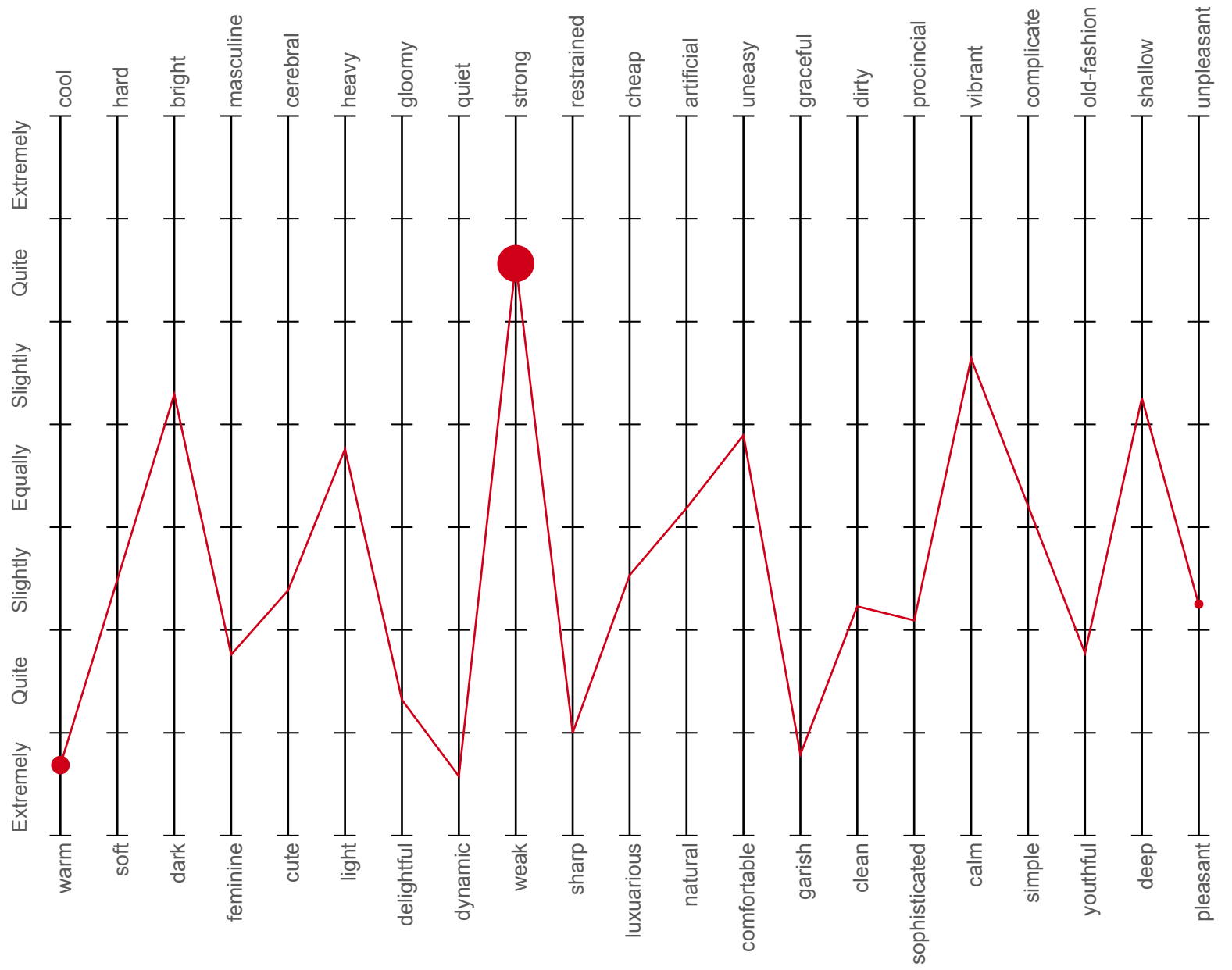
4.7.2. Gray_ Neutrality, Acceptance

Positive: Psychological neutrality.

Negative: Lack of confidence, dampness, depression, hibernation, lack of energy.

Gray is the mixture of black and white. Although its conservative and quiet properties give it an image of calmness and concentration, it can also become boring or lifeless so it works better when used in harmony with other colors than by itself. The softness that white does not have is present in gray, but without the heavy pressure of black it loses self-expression. In other words, as the bridge that links consciousness and unconsciousness, gray possesses both negative and positive meanings. The stabilizing effect grows stronger as it gets closer to white, and the power to hide itself and emphasize other colors increases as it becomes darker. The combination of gray and other colors give birth to countless different tones.

Gray is also referred to as the color of shadows because it is not present in the color wheel. It generally represents foggy cities, smoke caused by industrialization and unclear shadows, symbolizing loneliness and darkness. It is also the color of Tadao Ando's exposed concrete, which is commonly used in modern architectural spaces. However, as the time exposed to this particular color becomes longer, it easily causes depression and boredom because the level of stimulation is low and does not express its own color.



SD Scale Measurement Results: Red for PAD Evaluation

4.7.3. Red _ Power, Creates physical activity

Positive: Physical courage, strength, warmth, energy, basic survival, 'fight or flight', stimulation, masculinity, excitement.

Negative: Defiance, aggression, visual impact, strain.

Being in the range of 620-760nm on the visual spectrum, red is the color that affects us the most. It gives the very first visual perception causing a strong reaction, as we are born covered in blood. It is in fact a symbol for blood, representing the life within us but it is also associated with death, especially for red that is shown outside the body. The close association to death creates alarm and our body detects the danger, causing faster physical reactions and greater stimulations.

Red helps to activate the secretion of pituitary hormones. After being perceived by our eyes, in a short time, the chemical signal is transmitted from the pituitaries to the adrenal gland, producing adrenaline. Adrenaline that flows into the blood stream influences metabolism, and at the same time causes physiological changes. As a result, red stimulates neural sensations, raises blood pressure and the speed of pulse. These reactions take automatic action since the color stimulates directly the Autonomic Nervous System (ANS). There might be differences in the reaction time depending on the homeostasis of the individual, but it generally causes high blood pressure, fast breathing and active blood circulation.

It is a dynamic color with an intense image that draws attention. Due to its high level of clarity and visibility, red generates energy to the body and soul, passion that enables people to work continuously, variety of ideas and emotions. Its association with fire gives it a warm image and has the ability to make seem that time is passing slowly. Although it can provide effective reactions when used in areas where a great deal of physical movement is required, it is less suitable in spaces where people spend a lot of time because it causes tension, agitation and anxiety by stimulating the nerves. As physiological reactions become faster through continuous stimulation our body gets easily tired, and even worse, when certain stimulations are not substituted by an even stronger stimulations people tend to become dissatisfied and aggressive.

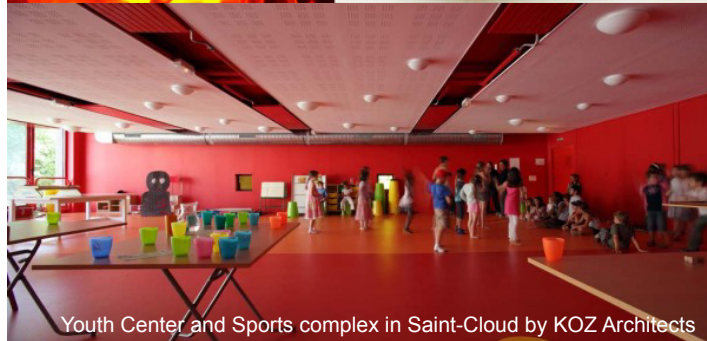
Being a beautiful and expressive color depending on its tone, Pink – the sub-color of red – gives vitality to emotions. When the stimulation level of this emotional color is lowered, it relaxes the nervous system and improves sight. It is not intense enough to make people fall in love with it at first sight, but as time passes, it provides stability and comfort. Pink is associated with sweet, soft and mild atmospheres so it is effective in soothing the agitated mind. Due to the remaining stimulant property of red, pink is also effective in creative thinking as well.



Fire



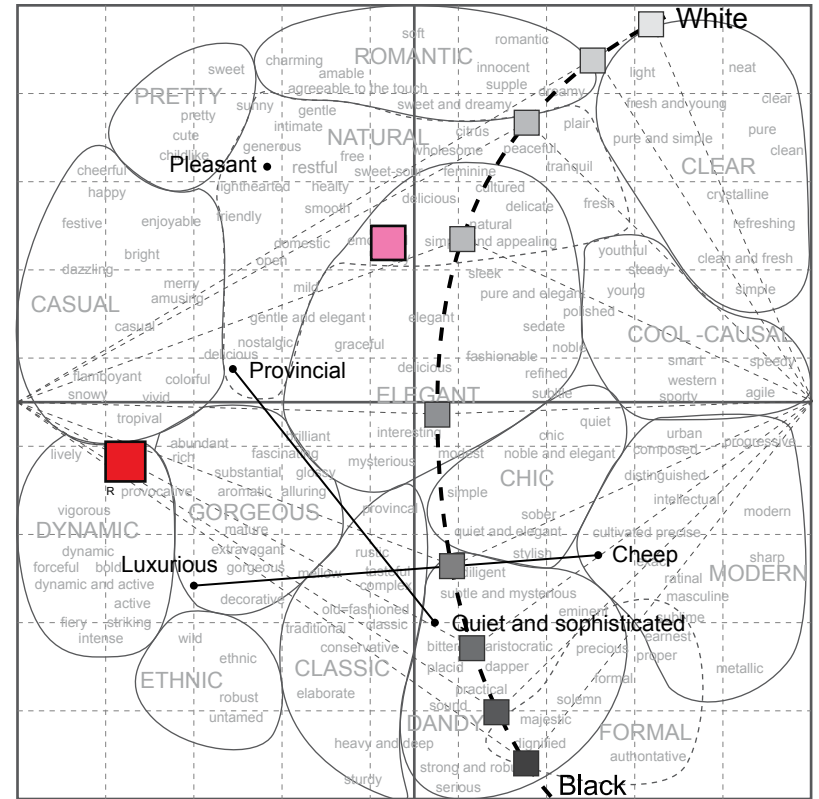
Blood



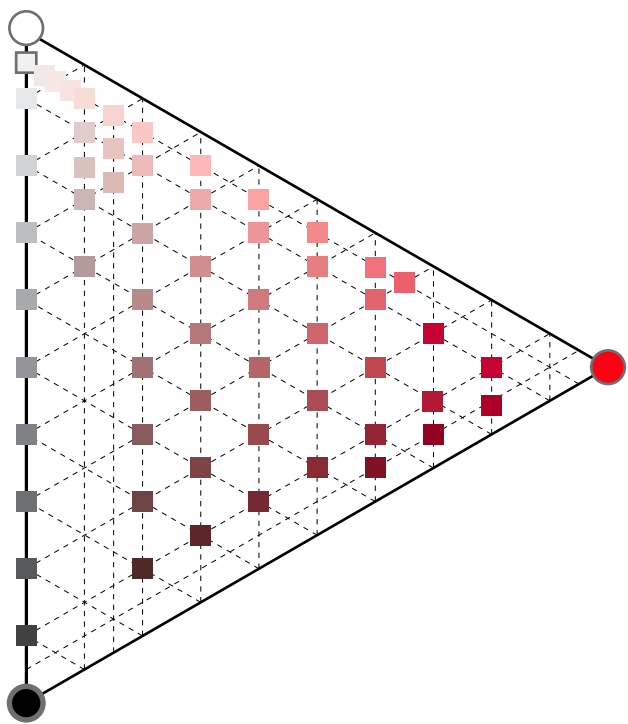
Youth Center and Sports complex in Saint-Cloud by KOZ Architects



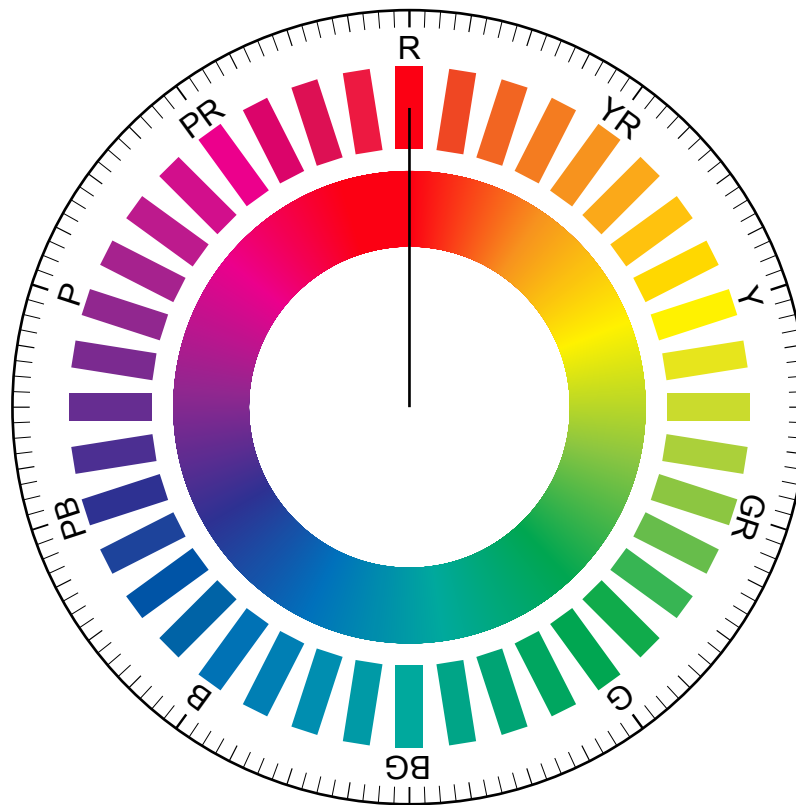
"Still life, Moving Life" set up by Piero Lissoni at Porro showroom via Durini 15 in Milan



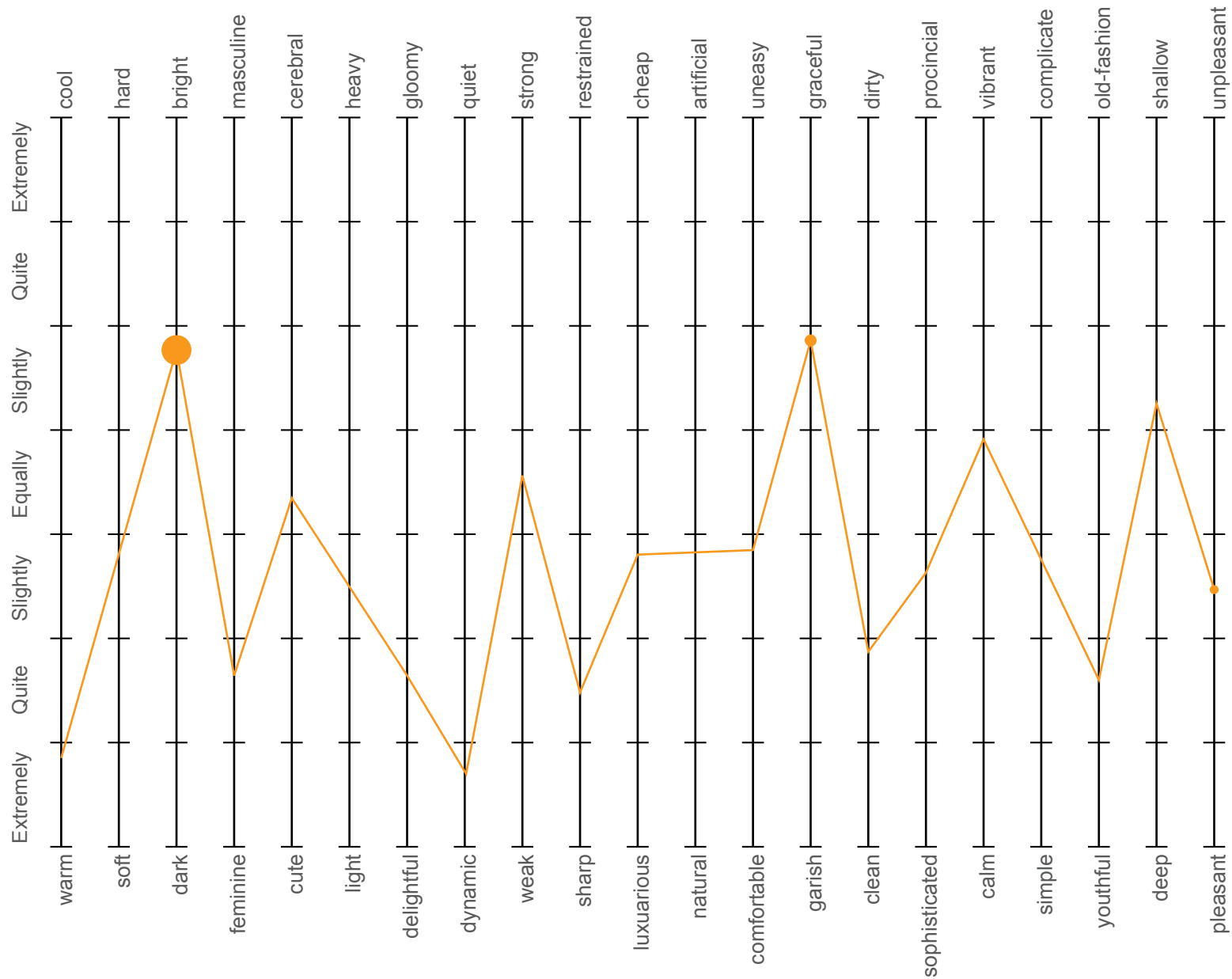
Single image scale by Kobayashi



Natural color system



Color cycle



SD Scale Measurement Results: Orange for PAD Evaluation

4.7.4. Orange _ Energia, Vitality

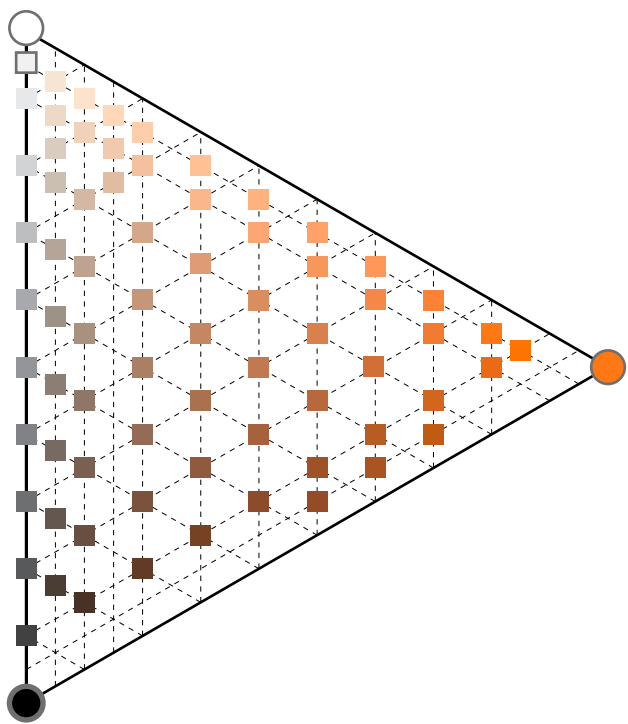
Positive: Physical comfort, food, warmth, security, sensuality, passion, abundance, fun.

Negative: Deprivation, frustration, frivolity, immaturity.

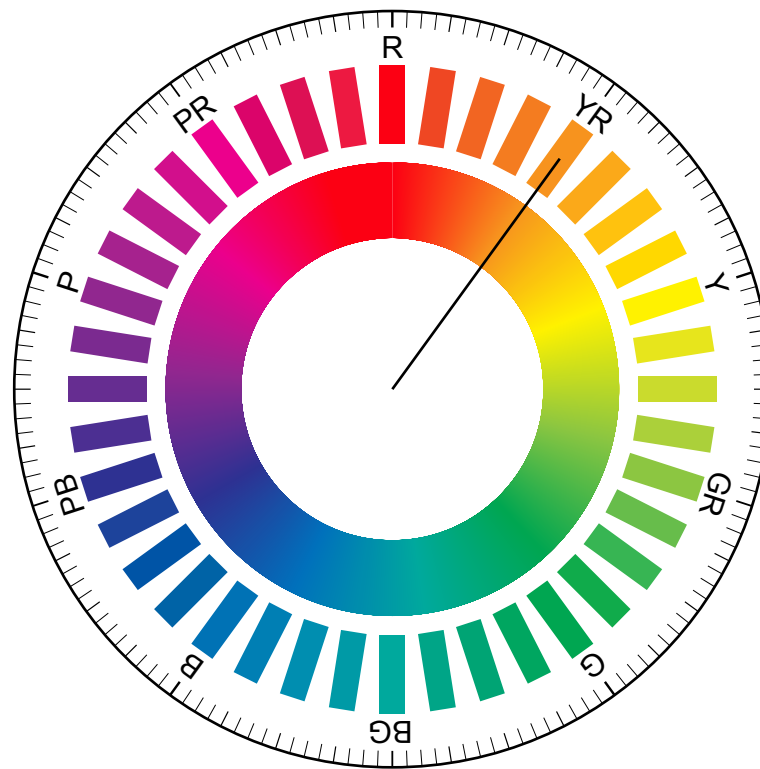
Orange lies between 590-640nm in the visible spectrum, and is the mixture of red and yellow, each representing power and the sun. It is a secondary color that possesses the properties of the two primary colors in a moderated version; the intensity of red is softened by the warmth of yellow, while the insecurity of yellow becomes stable by the dynamic power of red.. At times, it links passion with intuition as a positive response to the combination of red and yellow. Generally, orange creates the stability and freedom because it is associated with the warm light of sunset and creates the romantic atmosphere that evokes paradise, exotic flavors and aromas. It also symbolizes creativity and helps to regain enthusiasm and vitality. Orange represents the point of equilibrium between impulse and reason, which is a balance that can be easily broken by pushing it towards the spiritual or the opposite which is sexual and works as a sign for lust, misery and betrayal.

Orange is effective when one wants to emphasize the advantages already in possession, making it lively and open. Furthermore, it not only resulted to be helpful in improving social behaviors, generating happy feelings, reducing hostility and impetuosity, but also in bringing out innate human emotions that height activity, creativity and ambition. This color represents mildness and tolerance because it is not aggressive nor dangerous. Over time, however, the positive liveliness turns into vanity, so it is advised to combine it with blue or green to add some stability and tranquility. In order to inspire emotions and generate a warm atmosphere, it is best to use an orange that is brighter or darker than primary colors.

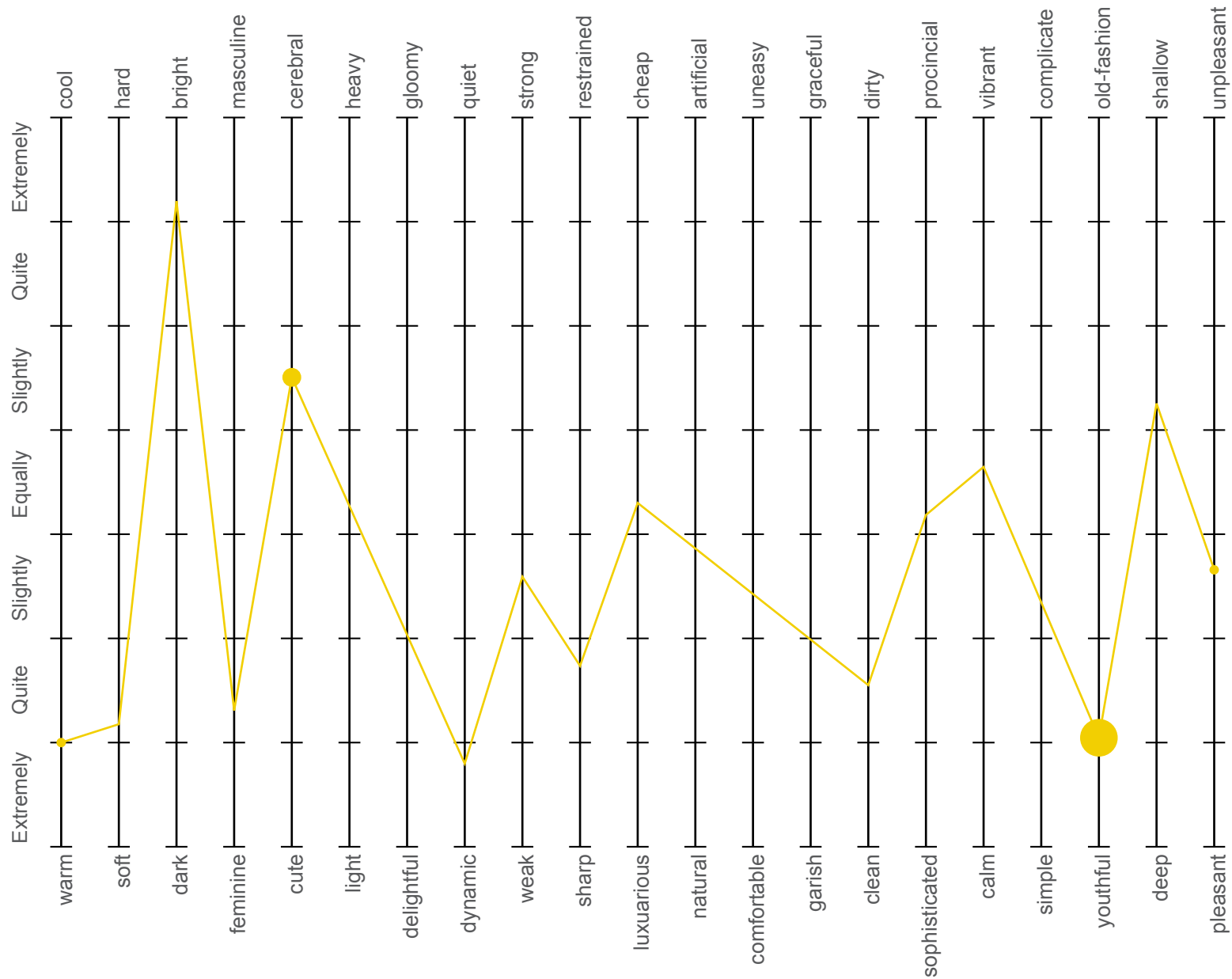
Associated with ripe fruit and vegetables, orange stimulates the appetite and mental activity by increasing the supply of oxygen to the brain and producing an invigorating effect. Orange is highly visible, so it is often used to draw attention and highlight the most important elements. It is connected to the nervous system, increasing the pressure on arterial and respiratory circulation and thus recharging those who feel tired.



Natural color system



Color cycle



SD Scale Measurement Results: Yellow for PAD Evaluation

4.7.5. Yellow _Activeness

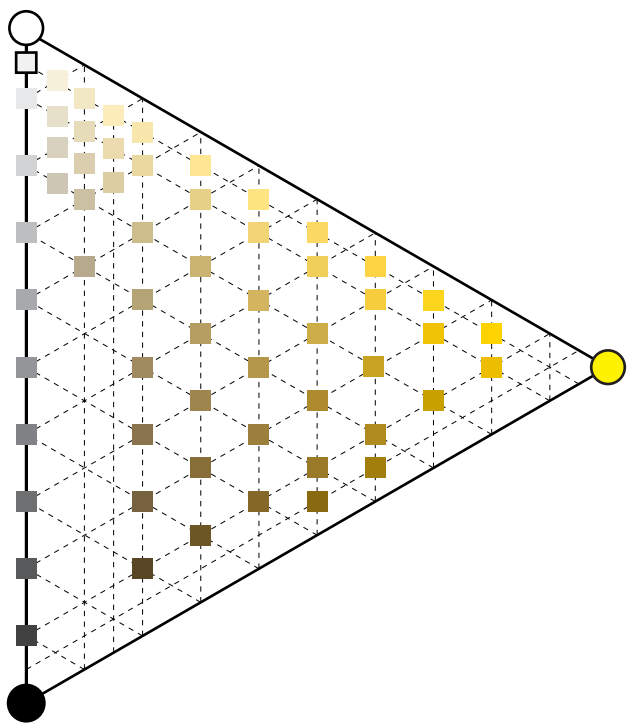
Positive: Optimism, confidence, self-esteem, extraversion, emotional strength, friendliness, creativity.

Negative: Irrationality, fear, emotional fragility, depression, anxiety, suicide.

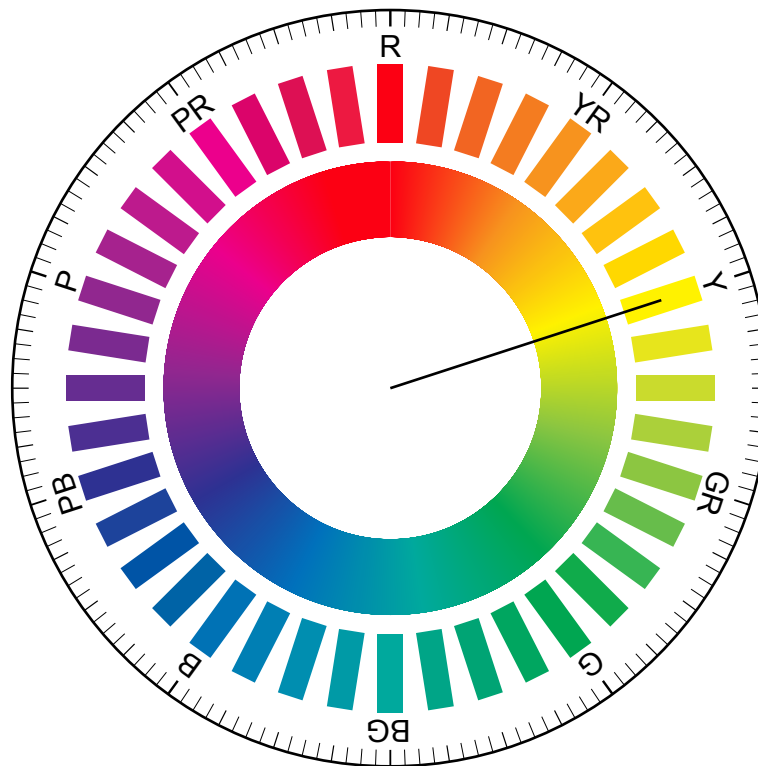
Being between 570-580nm in the visible spectrum, yellow is the brightest primary color and symbolizes the sun. It causes excitement, vitality and activeness due to its expanding property, making people cheerful and amiable. Yellow is also deeply related to religion; in India, yellow is considered holy because it represents light, truth and eternity, and to Christians yellow implies divine beings. It is a bright and joyful color, full of hope and optimism. Being associated with light, it psychologically manifests the illuminating power of consciousness. Yellow corresponds to the movement of expansion, a spontaneous centrifugal impulse. However, it can also symbolize diseases, treason and egoism due to its lightness and hyper-activity.

As the most distinct color in visual perception, having the highest brightness and saturation, it clears the mind by stimulating the brain and causes fast judgement. It also provides psychological stability through its warmth, and encourages creativity by stimulating the intellect and curiosity. In stressful situations, however, yellow can cause negative behavior or emotions because of its stimulating property that can irritate the mind. Otherwise, it is very effective for attracting attention, especially when combined with black which is in fact often used to indicate danger. Since it strengthens the brain by stimulating the nerves, the use of yellow is effective in spaces where high learning ability, concentration and creativity is required. On the contrary, due to its light and jovial characteristics, it is not advised to apply in areas of rest and relaxation.

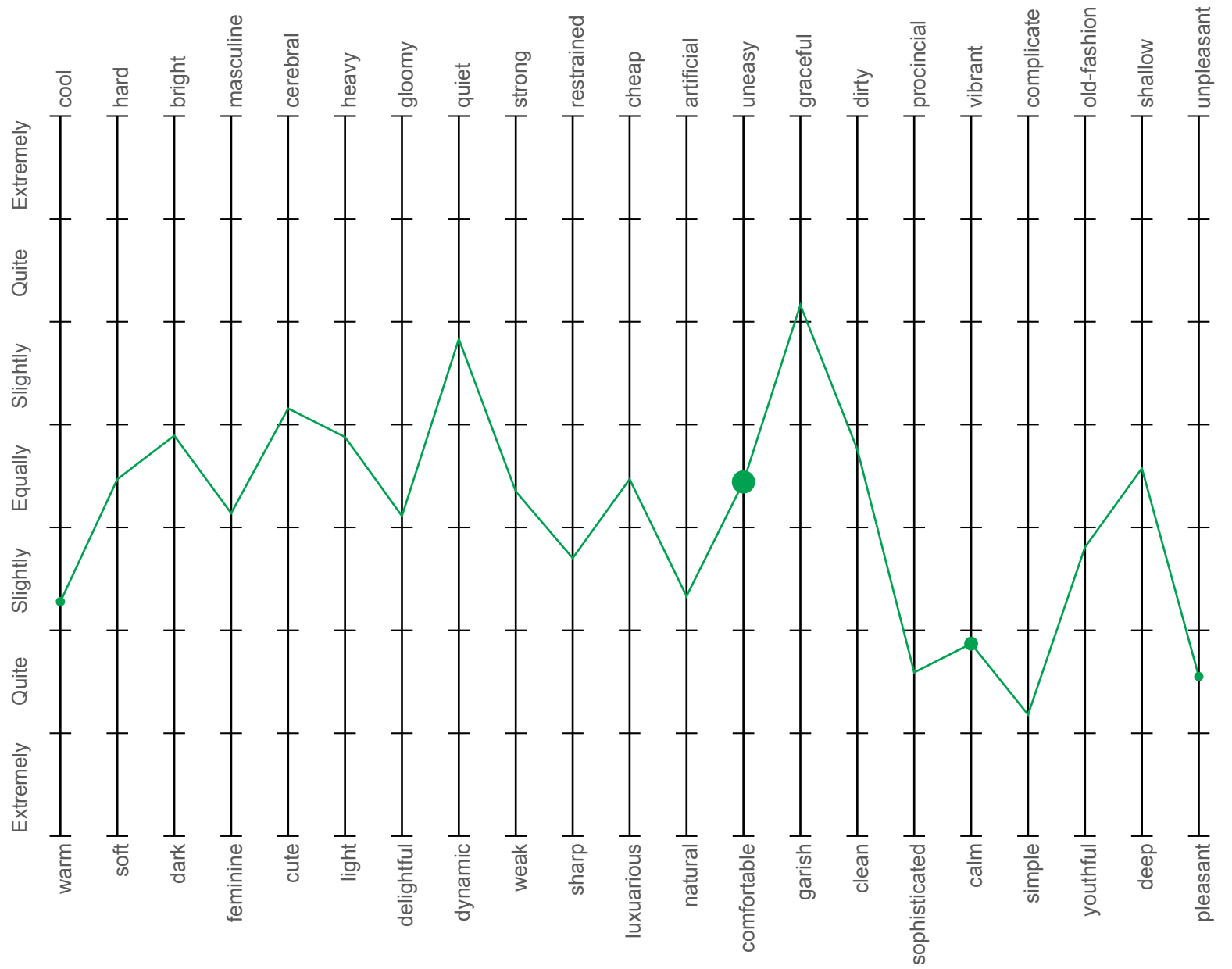
The color's clarity and lightness comes from its high-reflectivity. It stimulates the excretion of hormones which generate energy, heighten emotions and boost metabolism. It also has a positive influence on the heart and respiratory system and intestines. Although it is helpful in overcoming nervous breakdowns, depression and fatigue, it can also aggravate stress and tension depending on the time exposed.



Natural color system



Color cycle



SD Scale Measurement Results: Green for PAD Evaluation

4.7.6. Green–Balance, Peace

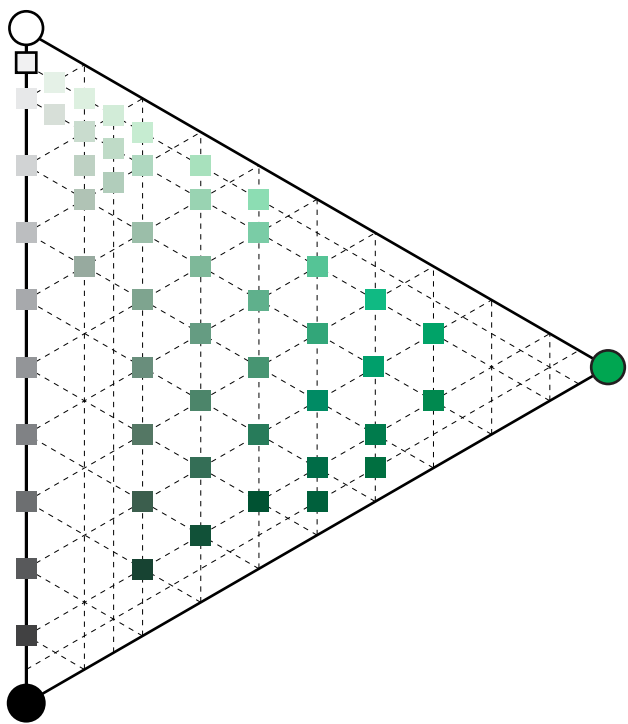
Positive: Harmony, balance, refreshment, universal love, rest, restoration, reassurance, environmental awareness, equilibrium, peace.

Negative: Boredom, stagnation, blandness, enervation.

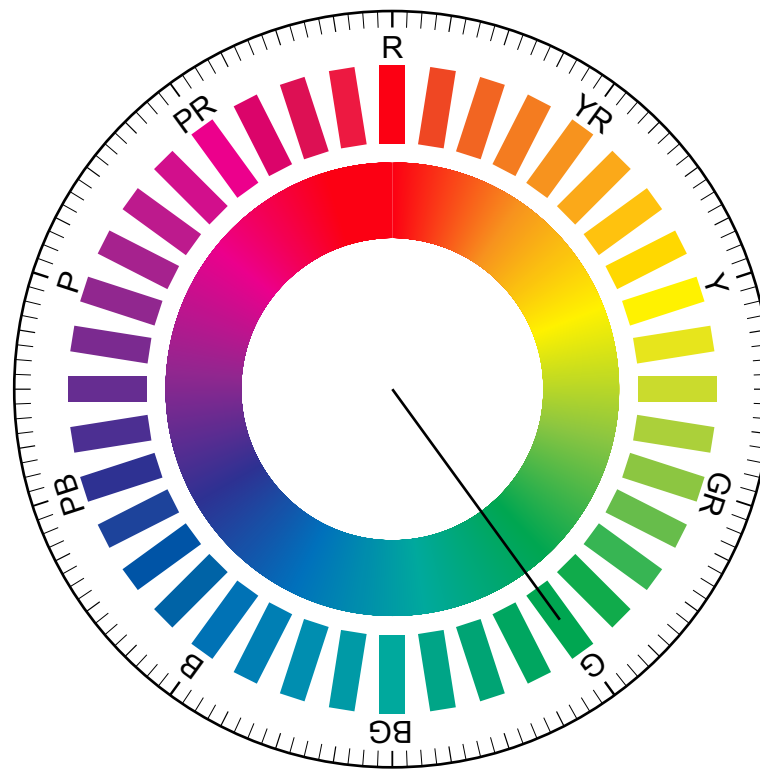
Green is the color of nature, the source of all living things. Located between 520-570nm in the visible spectrum, it ranges from spring's light green sprouts to a late summer's deep green forest. It is the mixture of the yellow sun and the blue sea, thus representing growth, revival and healing. Being the ideal state of ecological harmony and equilibrium, green provides life, rest, comfort, peace and stability.

The biological energy of green has always been combined with the power of healing and health, both physical and psychological. It has the value of stability, strength and endurance; but it is not a passive color. In fact, it contains inside a special force in the direction of self-control. Green influences the interior of all organism restoring their functions and equilibrium; it is particularly beneficial for the sympathetic nervous system and increases vitality.

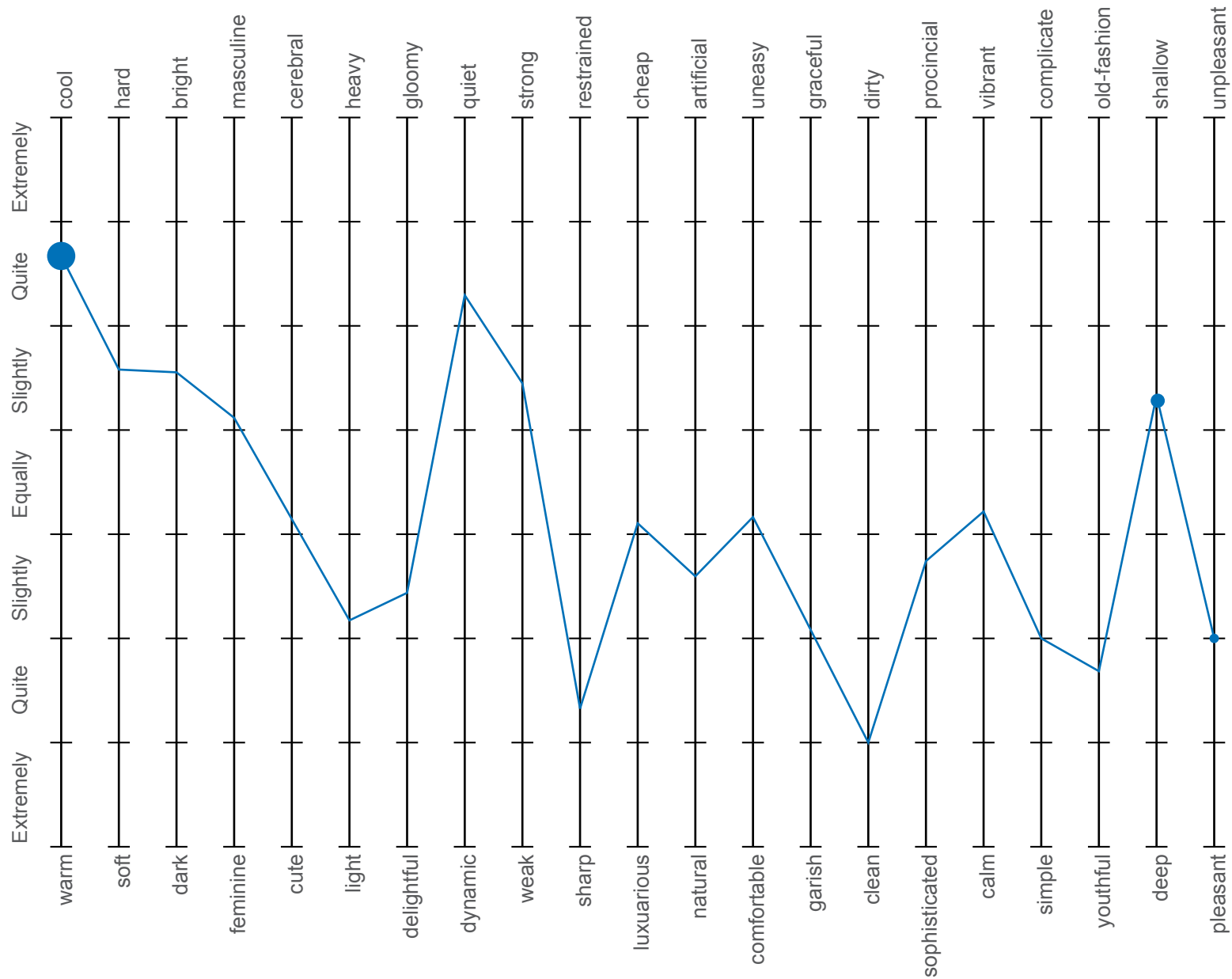
Since the retina of the eye doesn't adjust when exposed to this color, it is considered as the most physiologically relaxing color, helping relax all tensions present in cells, blood pressure and heart beat. Because of this, it is effectively used in spaces where people have to concentrate and work for long hours. In addition, it increases insight and intuition when it is closer to blue, and encourages intelligence and optimism as it gets closer to yellow. Although bright green represents birth and stability, dark green symbolizes deterioration which can lead to passive and pessimistic personality.



Natural color system



Color cycle



SD Scale Measurement Results: Blue for PAD Evaluation

4.7.7. Blue_ Tranquility

Positive: Intelligence, communication, trust, efficiency, serenity, duty, logic, coolness, reflection, calm.

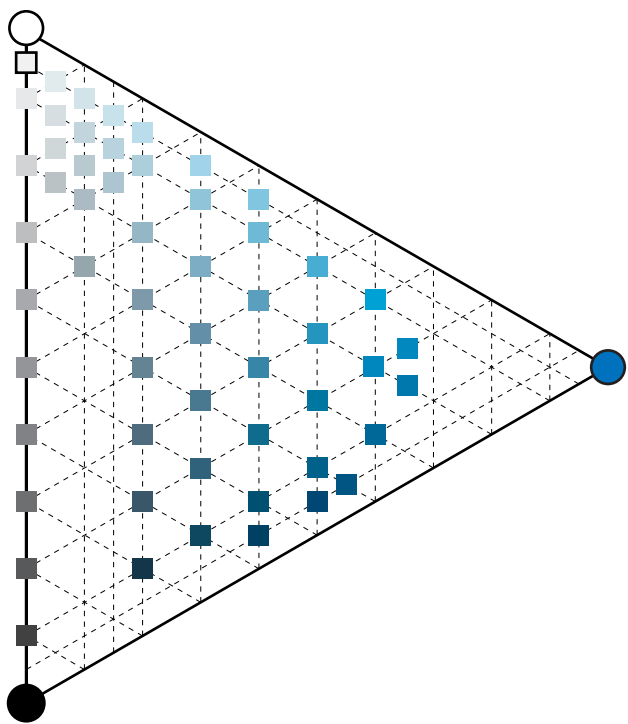
Negative: Coldness, aloofness, lack of emotion, unfriendliness.

In 2002, German psychologist and sociologist Eva Heller conducted a survey asking the association of color and emotion to 2,000 people. At the time, blue was chosen as the most preferred color, regardless of gender. "Since blue symbolizes the divinity and eternity of the sky, it is perceived to ordinary people as the color of harmony, friendship and trust," said Heller on this matter. Blue lies between 460-482nm on the visible spectrum. As the color of the sea and sky, it is not only the color that people most commonly encounter but also transcends cultures and countries. It is an infinite depth linked to the concept of eternity and fertility, since it is related to rain.

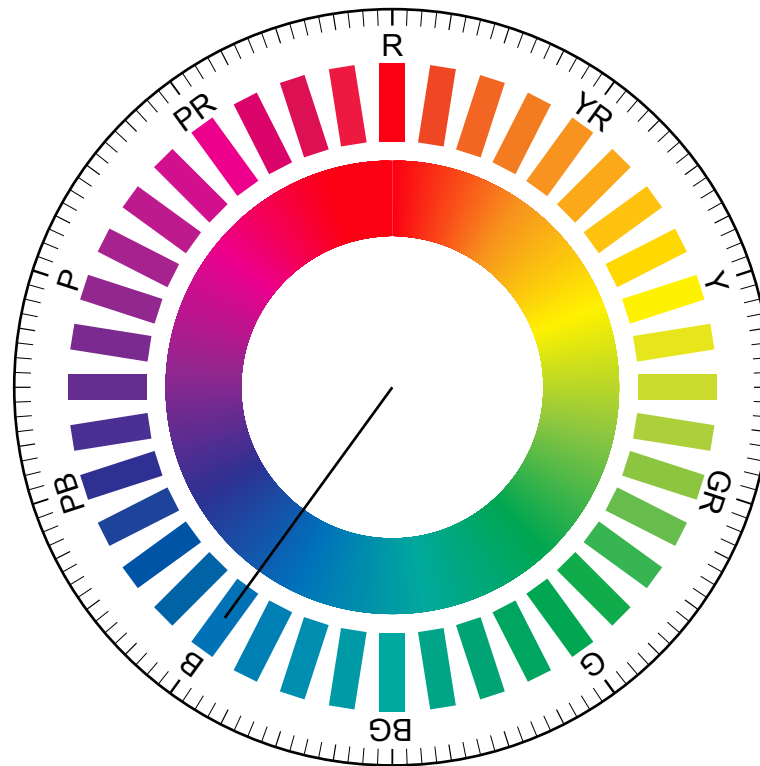
Blue has a soothing effect. When perceived by human sight, it stimulates the thyroid and parathyroid glands so that they release neurotransmitters that stabilize the brain. These hormones reduce excitement by causing loss in appetite, slow pulse, deep breathing and decrease in body temperature. Being the opposite of red, blue has a sedative physiological effect that determines the slowdown of vegetative functions (e.g. heart rate, breathing and blood pressure) and brings holistic stability. Moreover, since it suppresses emotion and lowers blood pressure, it helps to concentrate the human mind.

Blue is the color of feelings; its meanings refer to the affective sphere, calming sensations and contentment. Its cold and contracting property enhances concentration and imagination, and at the same time reduces stress. Blue gives a cozy and comfortable sensation when used in dark spaces with some lighting, and its contracting characteristic helps a room to look more spacious. The lower the saturation the more effective its results are especially in small spaces.

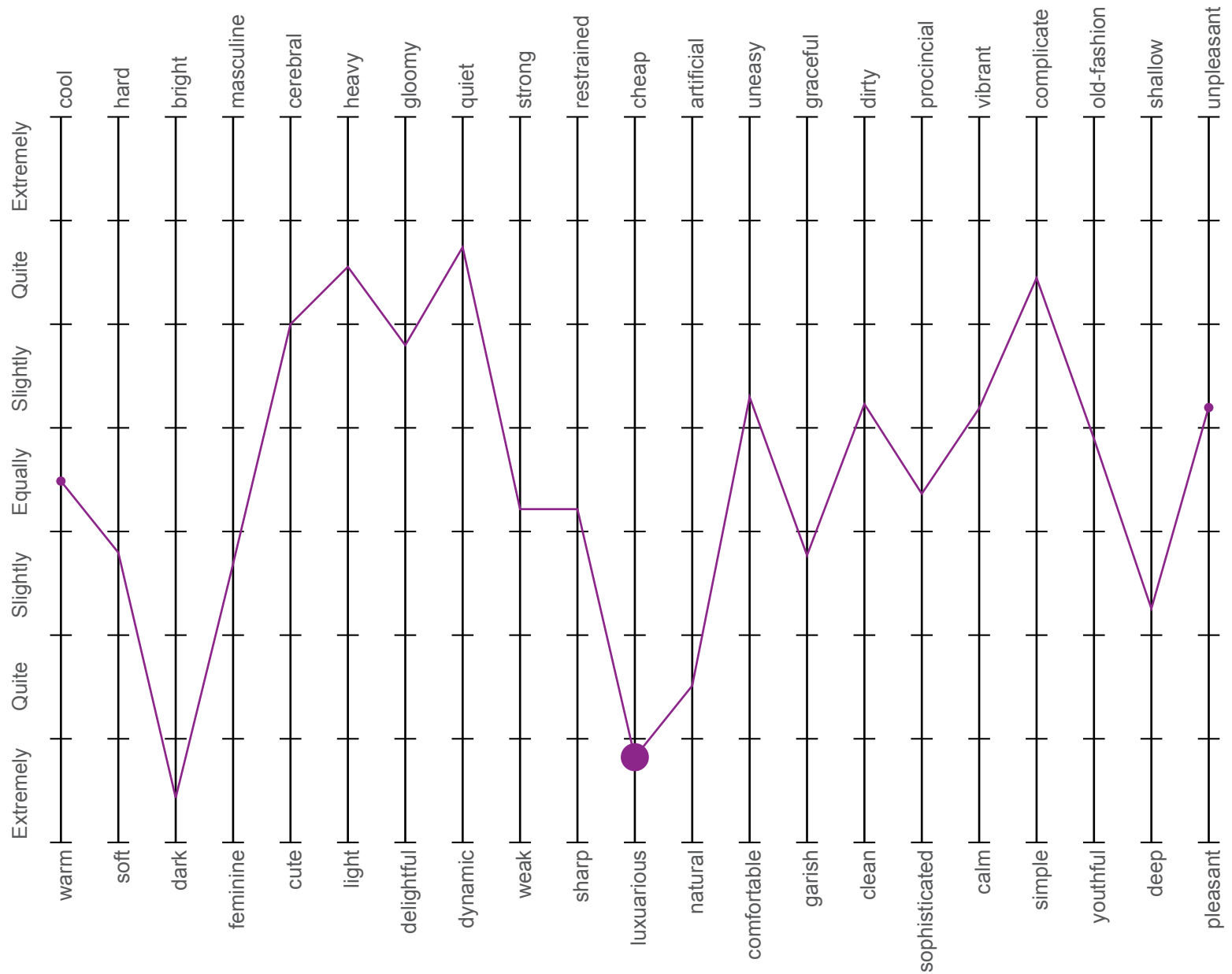
Bright blue assimilates with the vastness and freedom of the sky, evoking a calm feeling. Dark blue, on the other hand, goes beyond relaxation, sometimes causing lethargy, anxiety and depression.



Natural color system



Color cycle



SD Scale Measurement Results: Violet for PAD Evaluation

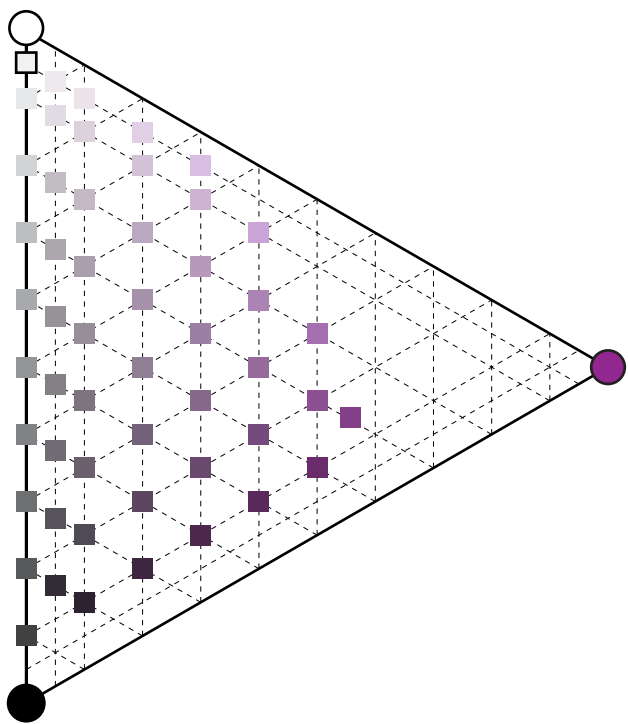
4.7.8. Violet _ Spiritual, elegance

Positive: Spiritual awareness, containment, vision, luxury, authenticity, truth, quality.

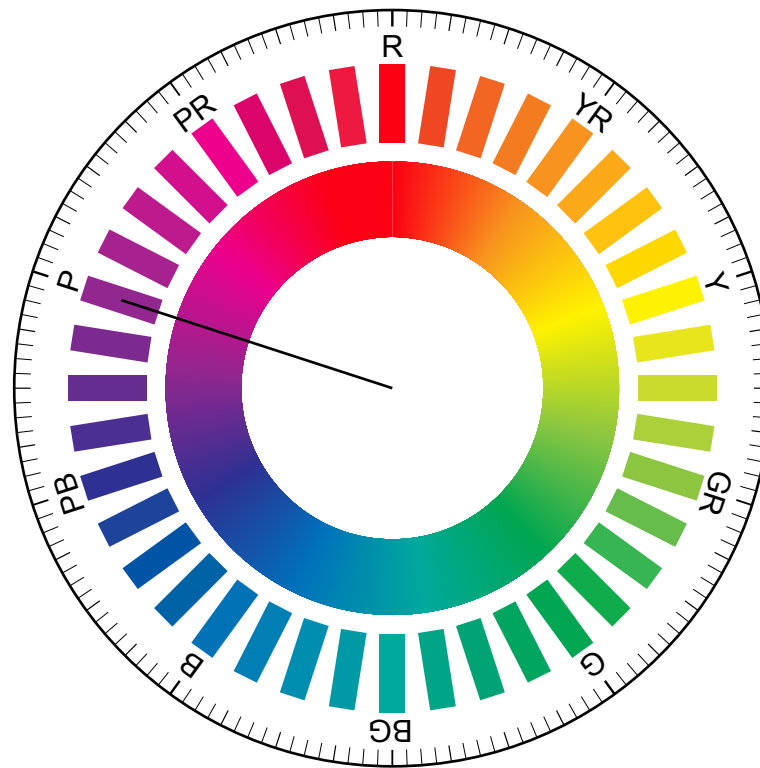
Negative: Introversión, decadence, suppression, inferiority.

For a long time, violet has been the symbol of wealth, elegance and spiritual revelation. It is an antique and ambiguous color, an image of complex worlds of exterior and interior; composed of blue and red, it reconciles the opposite meanings of masculine and feminine, earthly and heavenly. As a mix of complementary colors on the color wheel, violet is neutral. If the mixing ratio of blue is higher, it becomes indigo; when red is higher, it becomes magenta.

According to the color wheel, blue and red are complementary colors; they have opposite characteristics in relation to bodily and emotional functions and also to symbolic meanings. In ancient times, only the messengers of God who were considered sacred and spiritual had the authority to use this color because it was the mixture of blue and red, each representing the heavens and human blood. Moreover, being the symbol for grace and dignity, it was frequently used for the royal families. Violet is the perfect balance between logic and emotion, mind and body. Even in physiological reactions, it activates metabolism and stimulates the lymphatic system, due to its neutral property. Its combination of stimulation-relaxation is effectively used to control oversensitiveness and sensibility. Violet is a highly practical color especially in spaces that require a lot of mental activities; it stimulates intuition and imagination as it gets closer to red, and provides psychological stability when it has more blue in it.



Natural color system



Color cycle

- 5.1. Project introduction**
- 5.2. Functional characteristics of a cruise ship**
- 5.3. Main Flow line**
- 5.4. Target**
- 5.5. Plan programming**
- 5.6. Planning**
- 5.7. Project: Emotional colorful space**
 - 5.7.1. Space system**
 - 5.7.2. Corridor system**
 - 5.7.3. Cabin with balcony**
 - 5.7.4. Cabin without balcony**

5. Project : Emotional space

5.1. Project introduction

An architect is not someone who merely makes a beautiful looking interior space, but a person who plans how users can experience the designed space, allowing them to see what needs to be seen at the perfect time. Basically, the designer's intent of how the physical structures that make up a space should be perceived by the users is implied in the plan. This project intends to diversify the creation of images within spaces by giving the possibility of change in visual paths through motion and position. Rather than considering only the usability of space, it aims to design visual scenes that users can perceive as they move and keep transforming. These scenes first become informationized, perceived and emotionalized by the users. Then, when the users possessing these emotions move, the scenes obtain continuity and new pieces of information gets formed, affecting people's emotions. It is not simply making people use the space but to influence the user's sensibility and psychological changes through visual design.

5.1.1. Space story

5.1.1.1. Space creature-Space mind

The motive of this project lies in the importance of analyzing the human psychology in changing times. Being a change too difficult to recognize, it aims to provide a space in which the users can make the right judgment by themselves. Both the user's movement and change of feeling towards the space function as important factors that constitute an interior space. The modern world has forced people to be more focused on their own achievements than love or feelings; wasting time is considered as extremely negative, and the importance of self-authority and freedom has led to the tendency to create one's own special space. By enabling the users to create comfortable spaces for relaxation that allows them to change their behavior according to their mental state, the project tries to exhibit the correlation between structure and the change in human mentality on a floor plan.

5.1.1.2. A journey for unusual stimulations

One can escape from everyday life through travel; new experiences create an occasion for 'diversion' within certain selective environments. Although ordinary actions take place in these spaces, they are not the same as everyday behaviors because in this new environment, wisdoms of life and different ways to see the world become naturally connected to how the space will be

used and realized. During travel, private spaces that make us feel calm and relaxed coexists with public spaces, and users can go back and forth from a public space to a private space just by going through a simple door(transitional space). The utility of these spaces and temporal activities cause the interior to meet the exterior, and the continuity generated through this harmony allows the users to experience an interesting space by moving themselves.

5.1.1.3. A space where emotional events take place

People experience a space by looking, listening and feeling the area. Sensibility and possibility of change gets formed when we perceive a space and think about it. Assuming that the very first emotion felt when we enter a space is neutral, this state eventually changes even without any new stimulus since the amount of existing information gradually decreases as habituation takes place. Contrary to this, when the amount of new information increases, it activates physical and psychological responses. These kind of emotional changes take place differently depending on personal preference, but the fact that they generally react to behavior and stimulation remains unchanged. Therefore, it is important to create a place for the users and consider how it would be perceived and what behavior it can generate, before forming the actual space. Moreover, in addition to the physical and mental state of the user an internal variable that encourages the communication between objects and spatial structure and is needed. The complementary relationship between space, human and light changes the user's behavior, and the three dimensional effect of the space increases according to the visual changes on surfaces caused by these behaviors and also to the use of different colors. According to the movement of the users who experience a space that shows the potential of changes in sensitivity, the spatial transformations awaken the psychological changes of those who inhabit inside.

It is more important to instantly express the beauty of a space felt by our senses than merely emphasizing its function and structure. For the users of a space, beauty is the moment in which they experience the area. Being away from ordinary spaces consisting of walls and floors and the spatial changes that occur during every step of the way are important factor that stimulate human sensibility. And when the space exhibits its new meaning through colors and light, the users express their acceptance by movement. The visual perspective that changes according to these movements along with the usability of the space create a space that conveys beauty and gains vitality by changing itself. Spaces are not simple tools of survival but are the containers that hold our lives and the means to express ourselves.

5.1.1.4. Color harmonic program

The transitional space that lingers between public and private, will exhibit a color effect that ranges from tension to relaxation in order to intensify the soothing effect of the private area. The overall space configuration is: corridor (slightly dark to generate a low level of tension) > transitional space (the low ceiling gradually becomes higher, and users move from the dark space to a brighter one, creating high level of tension) > private space (a bright area where physical and mental relaxation occurs. Users experience plenty of emotional impressions.)

The public space is a closed area with no natural light, a space in which natural relaxation through natural light does not take place, and its path is determined according to the user's purpose. It generates low tension because it uses indirect light in a dark space where only color tension (bright: relaxation, advancing effect <-> dark: tension, receding effect) is present.

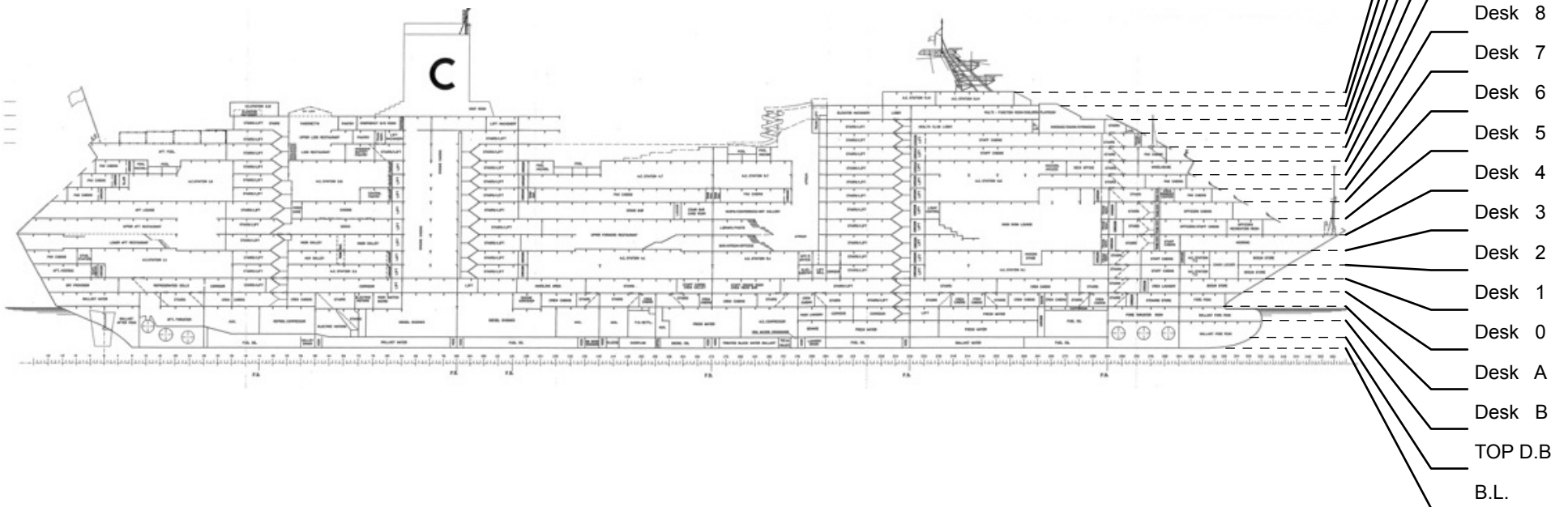
When the users move from the public space (low tension) to the private space (high tension), they pass through a transitional space with contrasting properties in order to intensify the relaxing effect. In order to give it some tension, the ceiling starts from low and gradually becomes higher, and as the users pass through this narrow corridor, they suddenly meet with a large and bright space.

There are 3 different situations happening in the private space: work, rest and play. Activities such as packing, unpacking, dressing up and washing takes place in the work area because it contains the wardrobe and bathroom, and in the resting area the users regain energy and relax their body through sleep. As the characteristic area of this trip, the playing zone contains a place to get a tan or enjoy the outside panorama; it is closely related to the outdoors and has different functions according to time. Having a low ceiling due to the structural characteristics of the space, a gradation effect of colors and light generates a sense of expansion into this private space, especially on the ceiling of the resting area. As the users view the ceiling from their beds being physically relaxed, the ceiling will remind them of a colorful sky that helps elevate their level of tranquility. In addition, the vast ocean from the outside panorama will add to it an elevated kind of impression to the space.

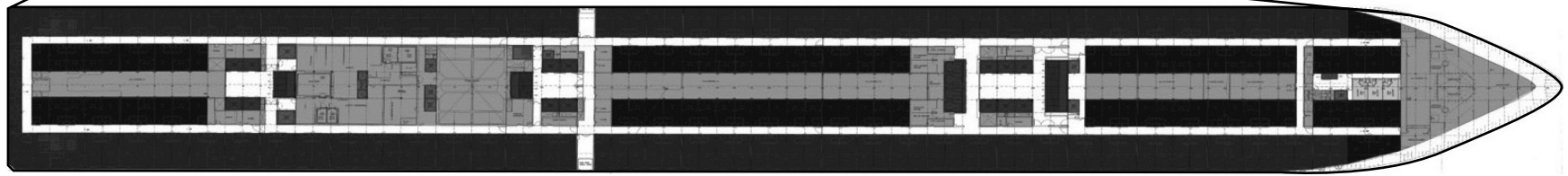
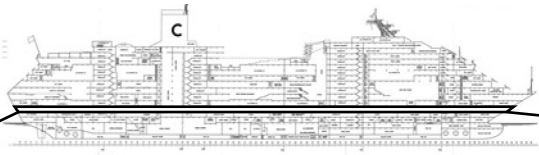
The overall color composition of this space is made up of solid colors that might seem monotonous. However, the morning light wakes up the users, the intense afternoon light brightens the room, and by night, the space gets tinted by the delicate lights of the evening. Drawing the natural light in and reflecting it through the angled surfaces of interior walls not only enrich the color gradation effect but also adjusts the life cycle of the users that might otherwise get disturbed by the unusual circumstance of travelling. In addition, by using a color composition that is perceived differently depending on the reflected

color of the wall and change in the user's perspective or movement, it aims to increase perceptual utility and influence sensibility.

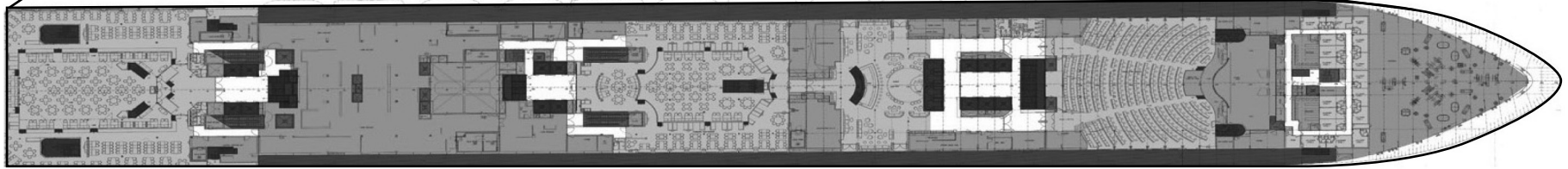
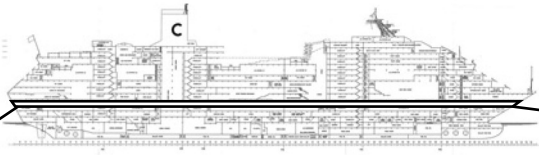
5. 2. Functional characteristics of a cruise ship



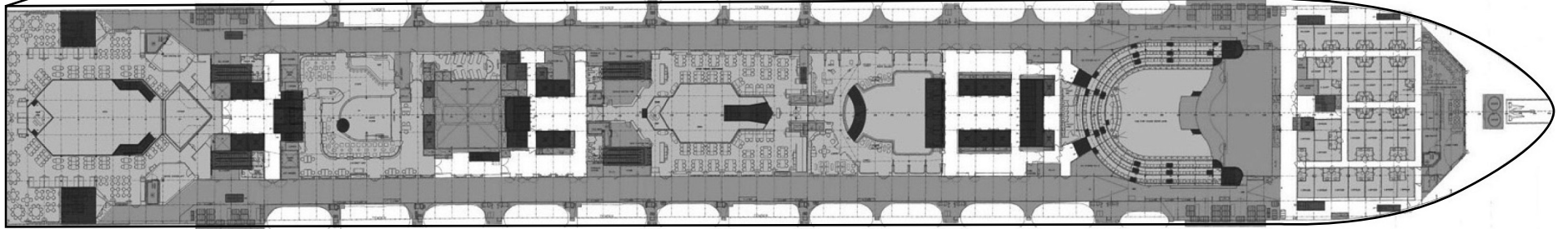
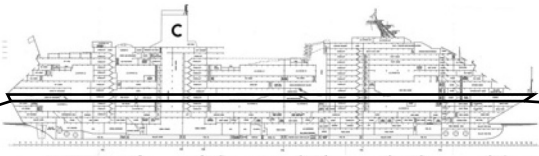
DESK 2



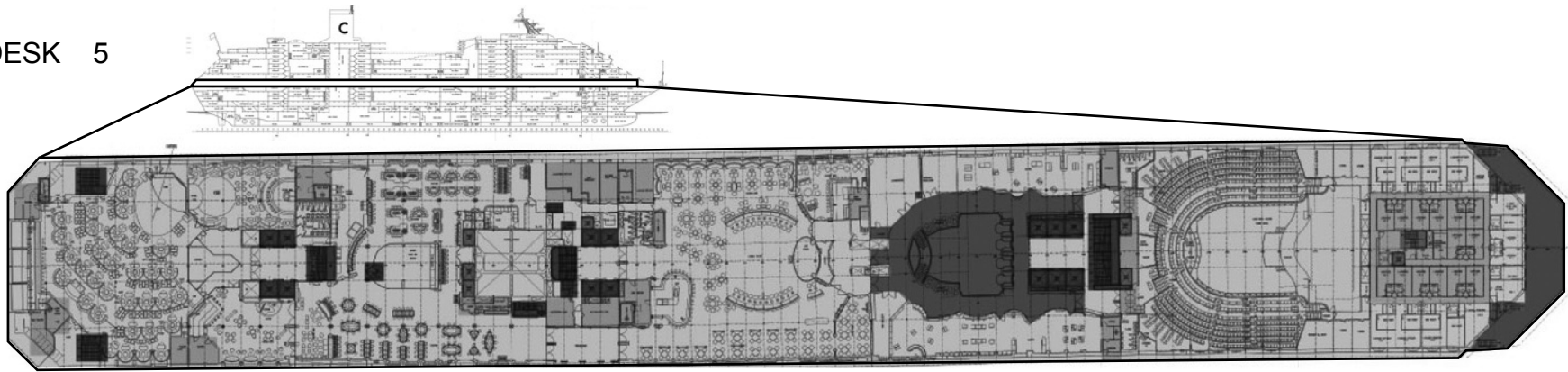
DESK 3



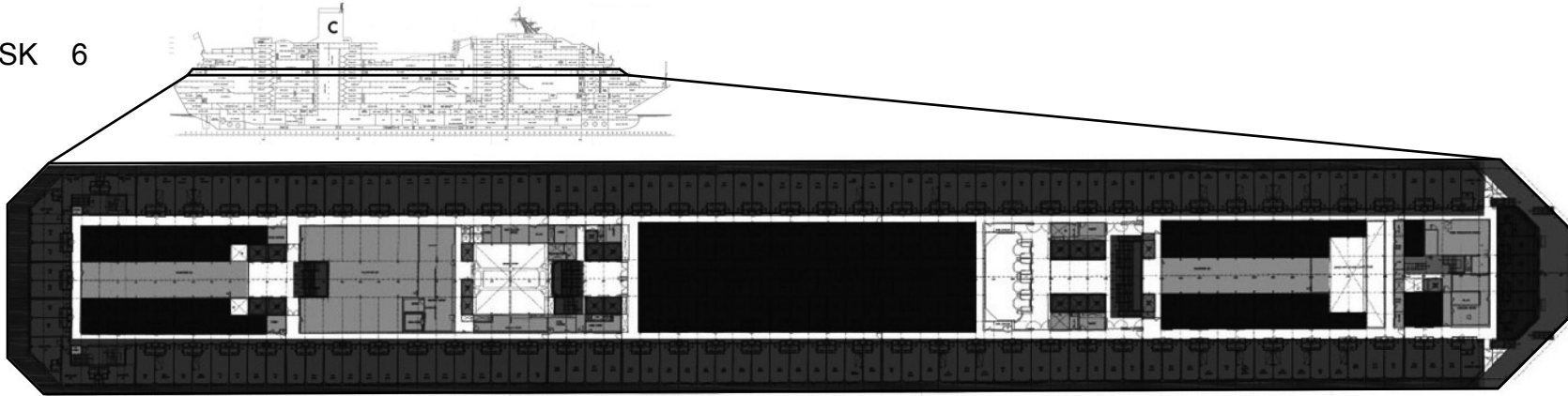
DESK 4



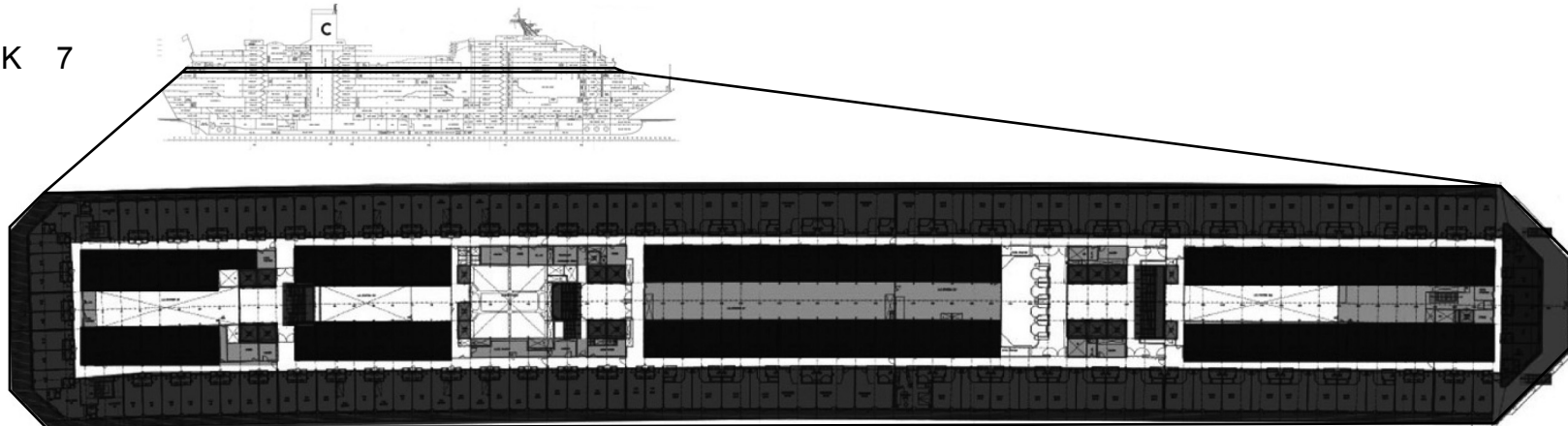
DESK 5



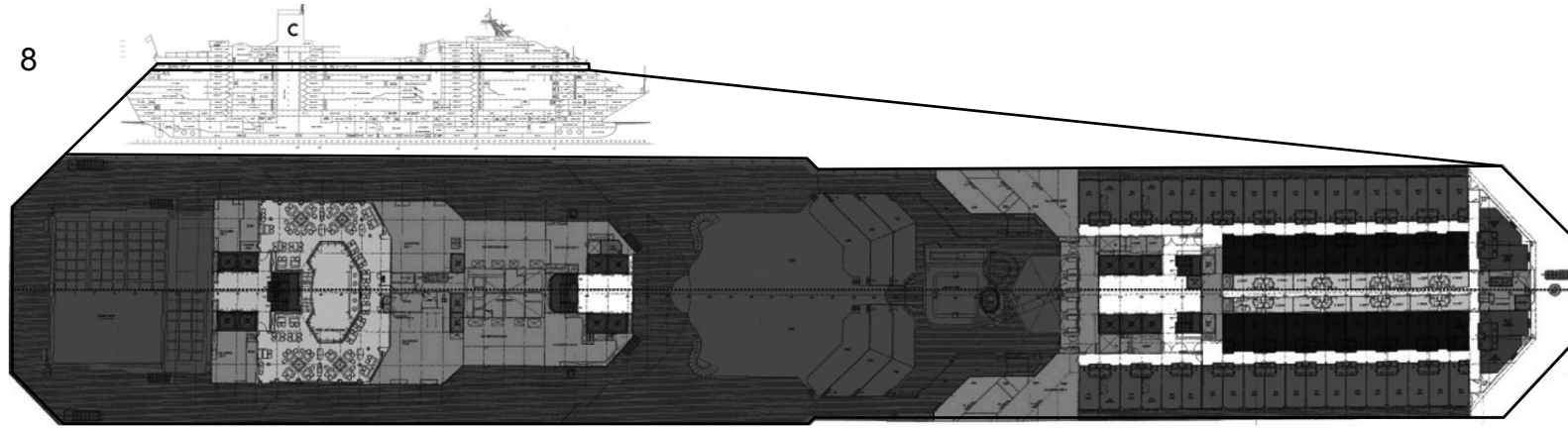
DESK 6



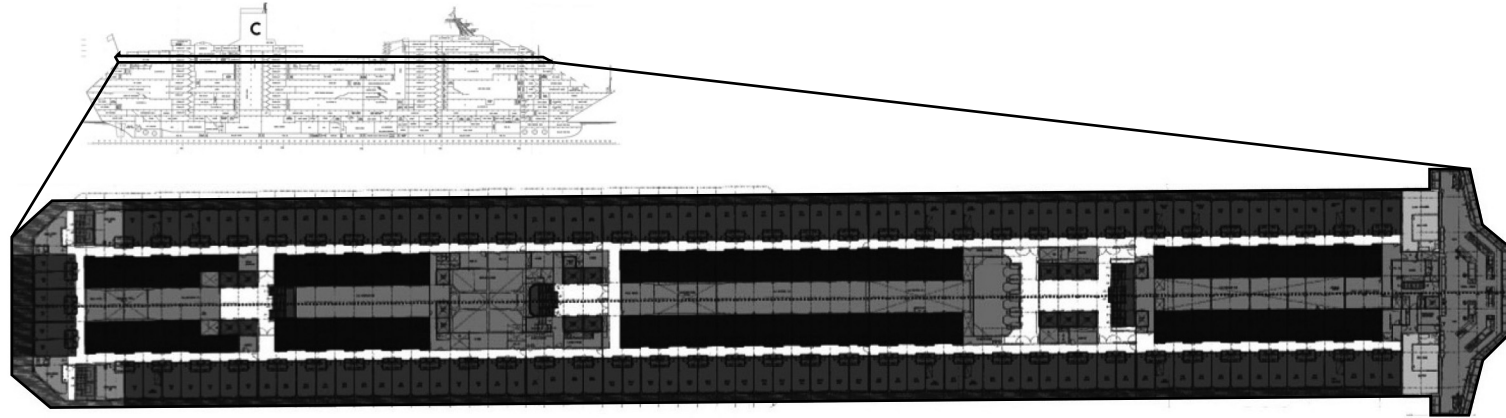
DESK 7



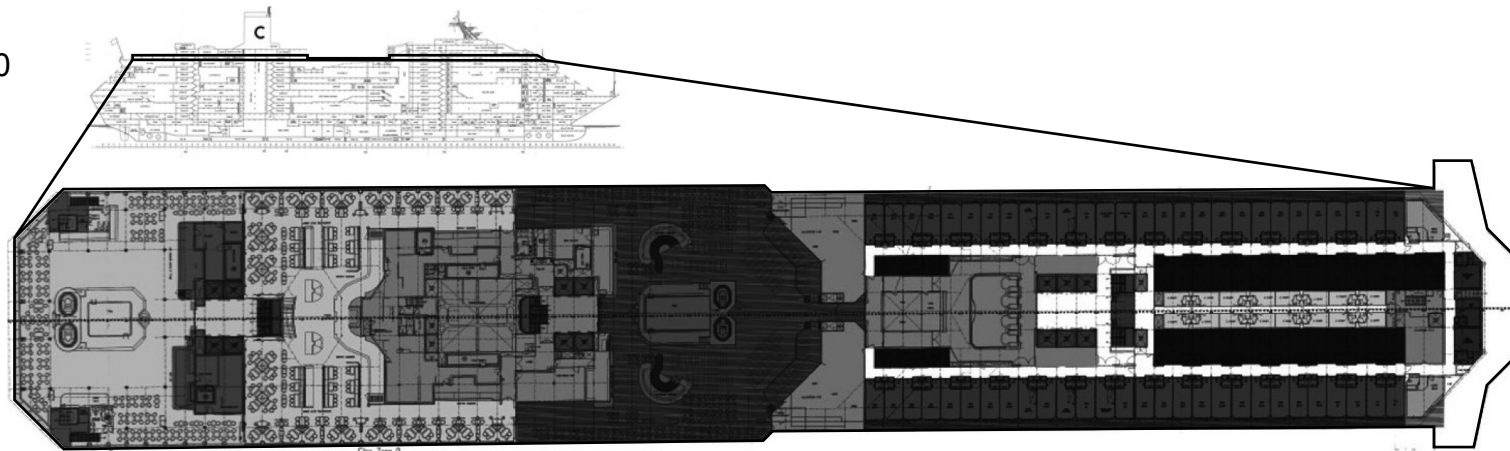
DESK 8



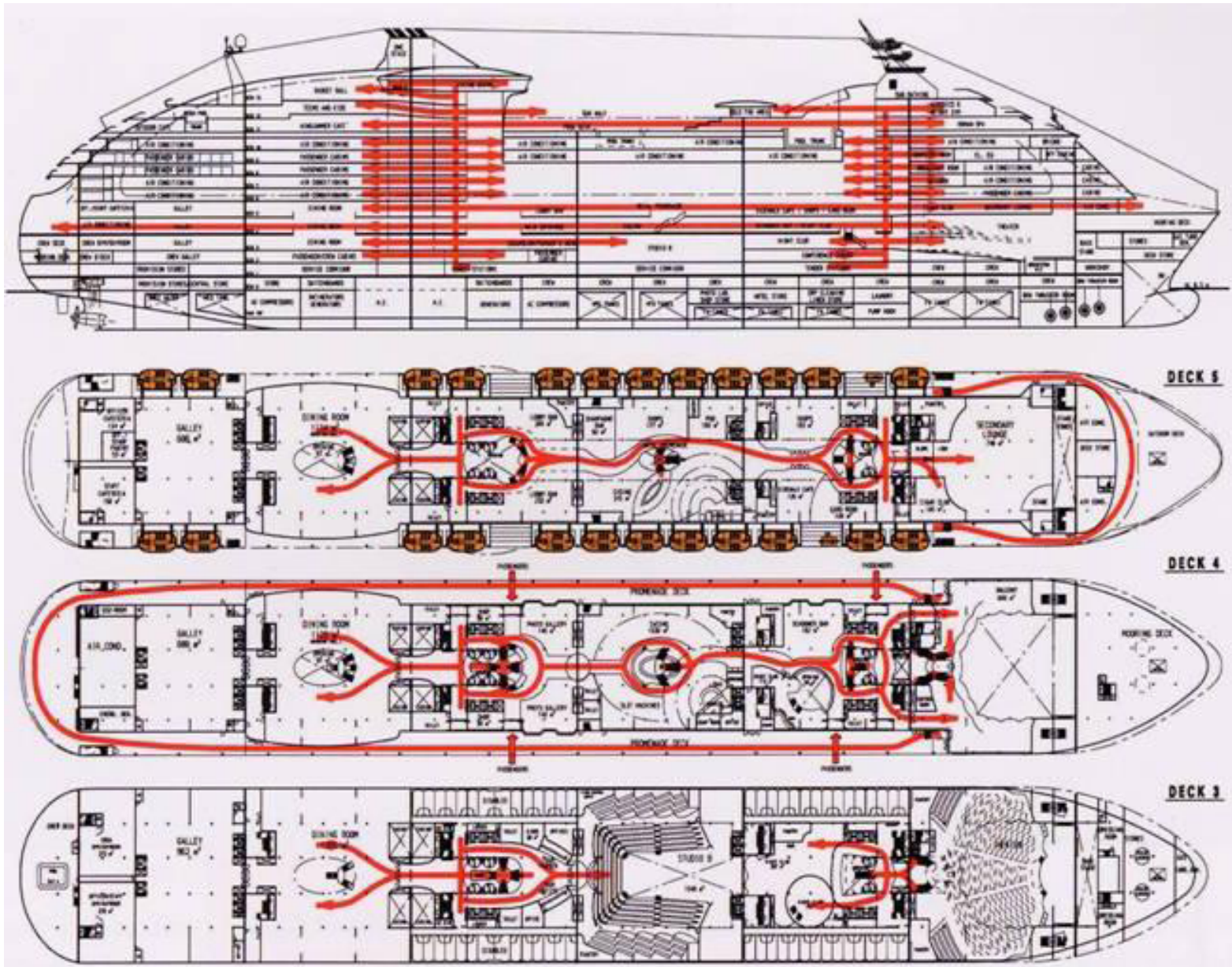
DESK 9

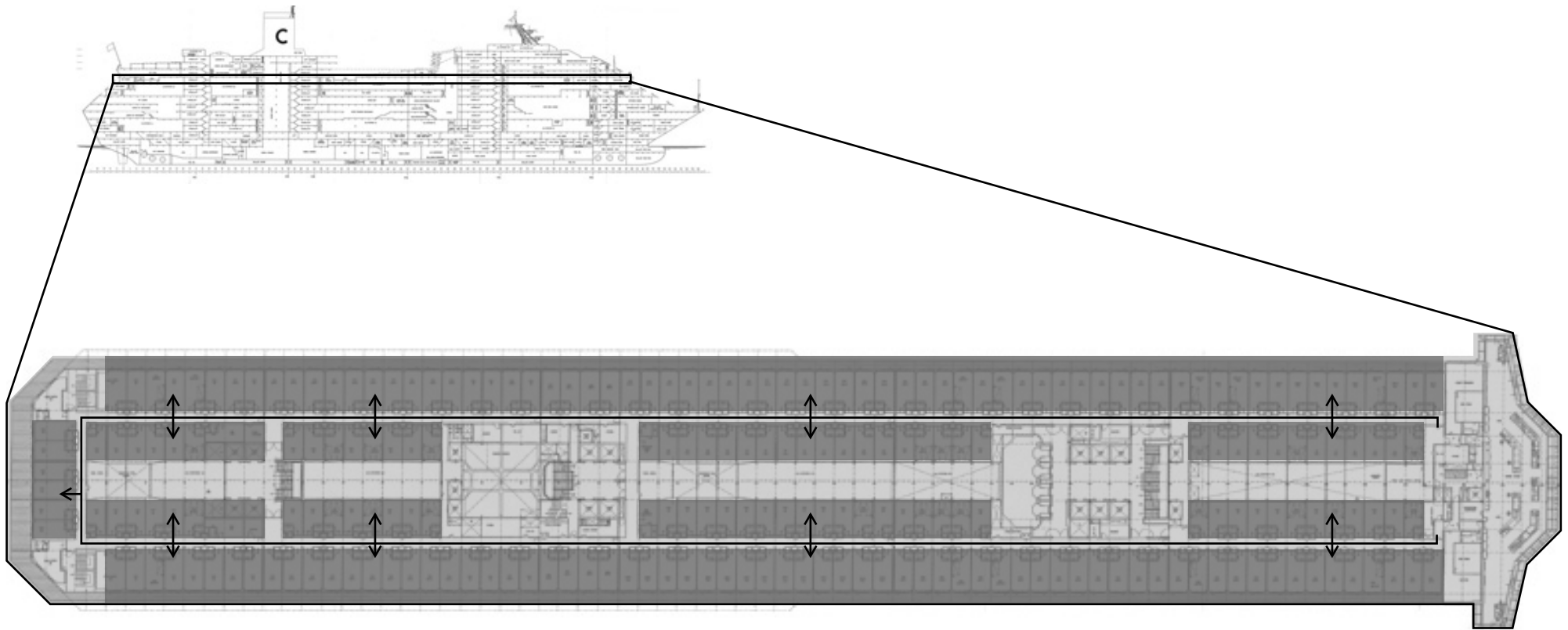


DESK 10



5.3. Main Flow line





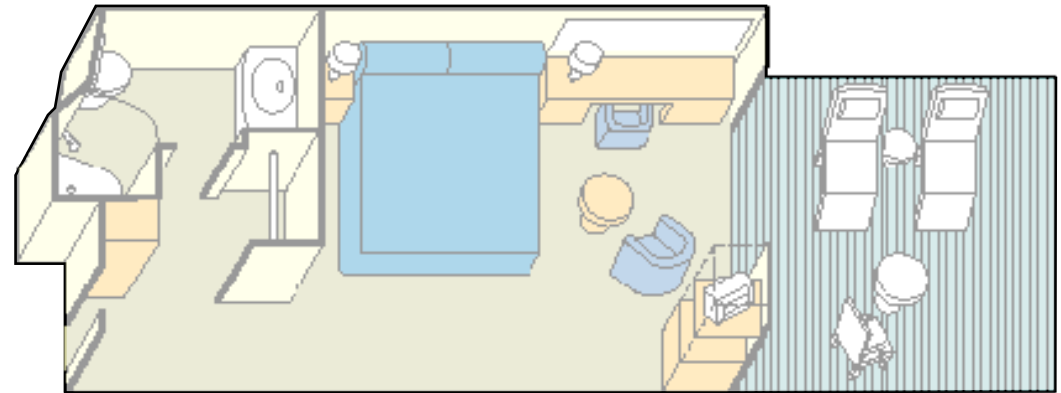
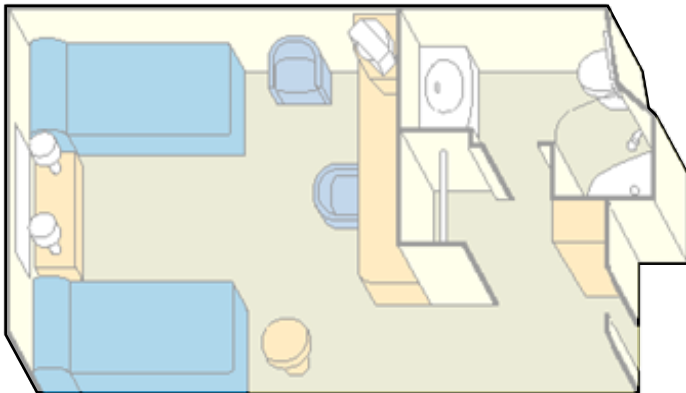
- Privat space
- Public space

5.4. Target

5.4.1. Passenger cabins

5.4.1.1 Type of cabin

- 10 -15 m² The minimum
- 15 -20 m² Normal
- 20 - 30 m² The luxury
- Maximize the number of cabins
 - _ Single (one person: One)
 - Couple (two persons: One +One)
 - Family (two persons + children : One + One + Kid +Kid)
 - 4X4 (One + One +One + One +One+ One +One+One)
- **Cabins with balcony**
- **Cabins without balcony**



5.4.2. Passenger's day life experience

People's daily life can be fragmented into morning, afternoon and evening. We wake up, clean ourselves, eat breakfast, dress up and get ready to go out in the morning; during the day our level of activity gets very high by working and organizing our social lives; in the evening, we get home, wash up, relax a little and go to sleep.

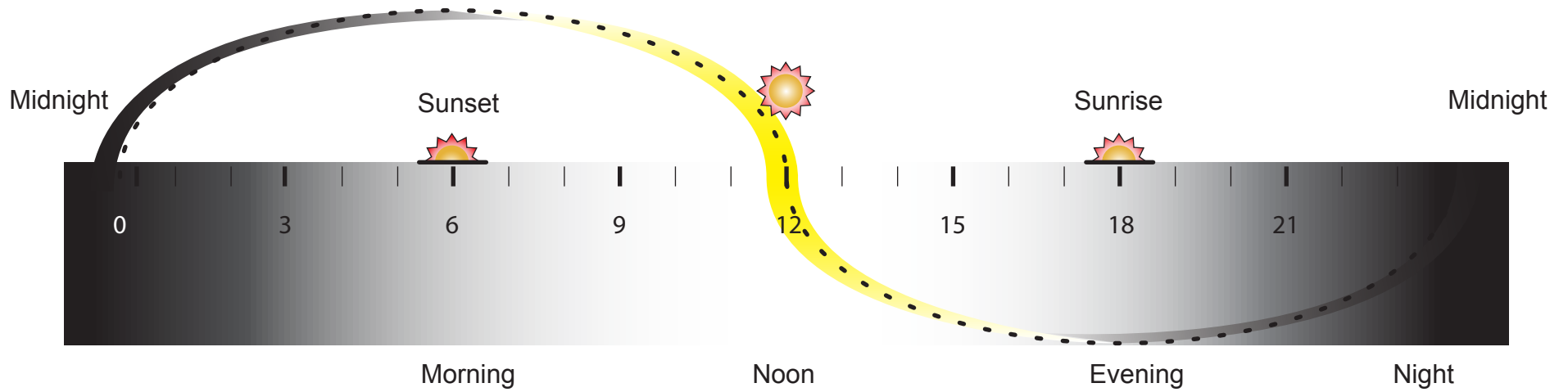
Customer experience

Awake (bed) > Clean (bathroom) > Dress (clothes chest) > Breakfast (Restaurant)

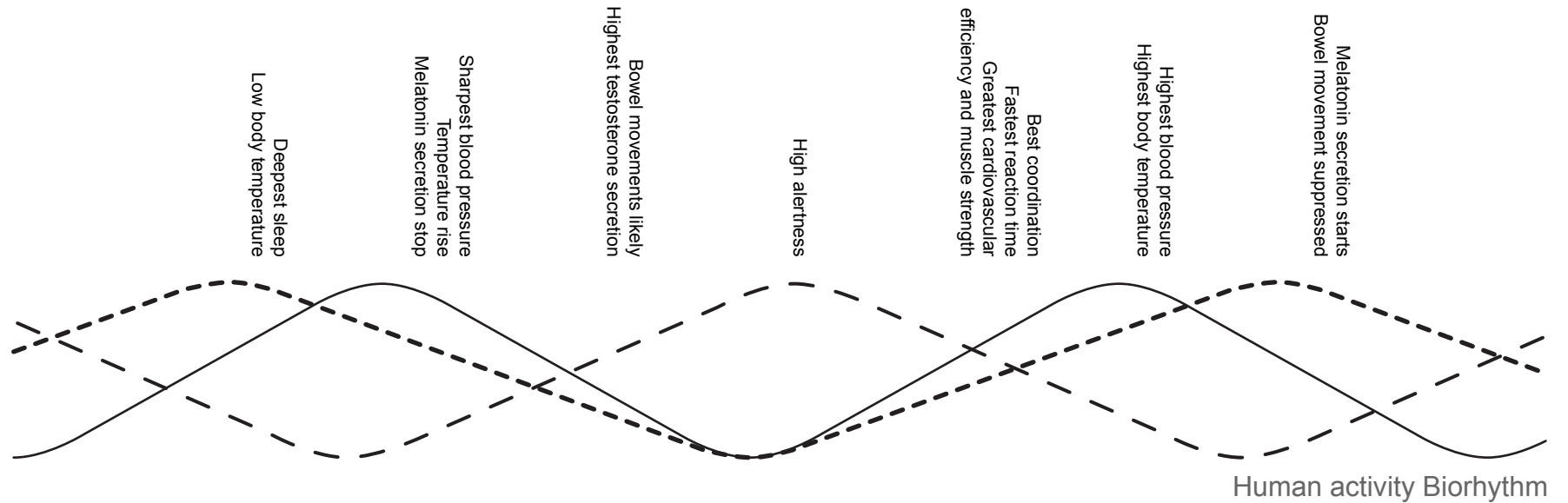
Return > Change dress (clothes chest) > Clean (bathroom) > Relax (sofa, watch) > Sleep (bed)



5.4.3. Natural light cycle

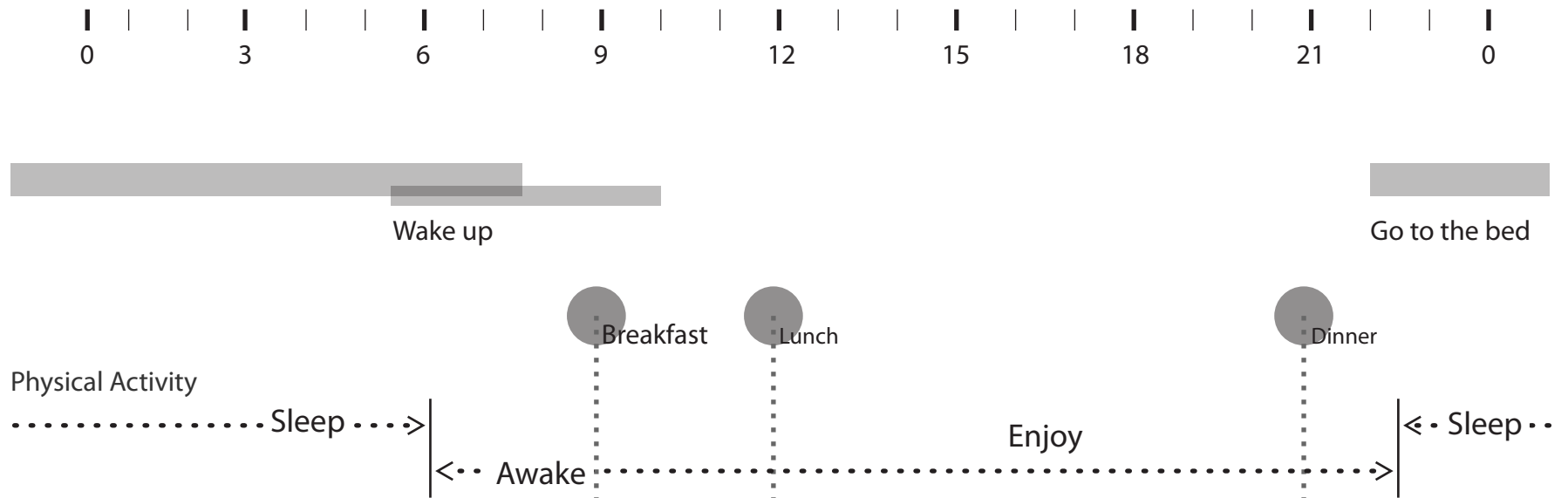


5.4.4. Natural body cycle

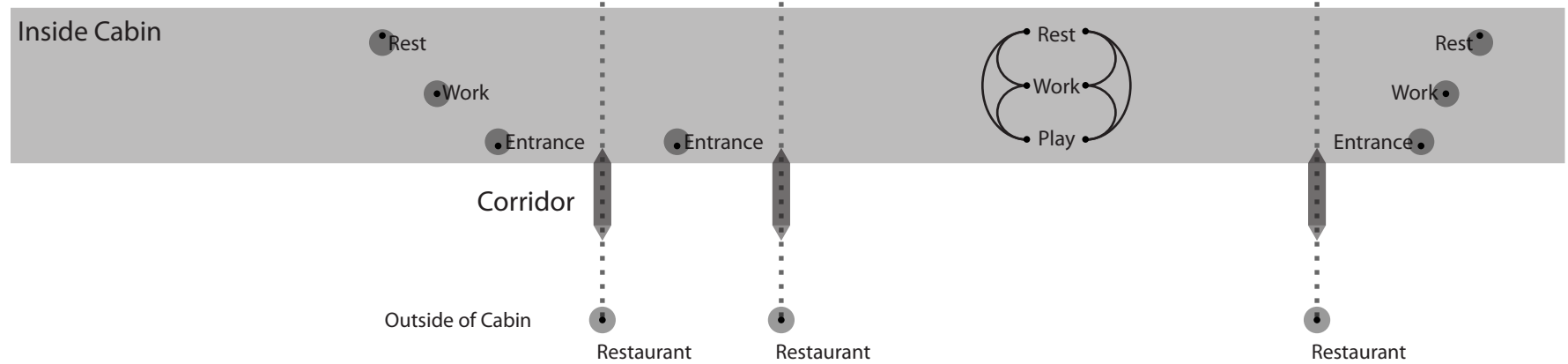


5.4.5. Day Life cycle

Day life cycle



5.4.6. Space Activity



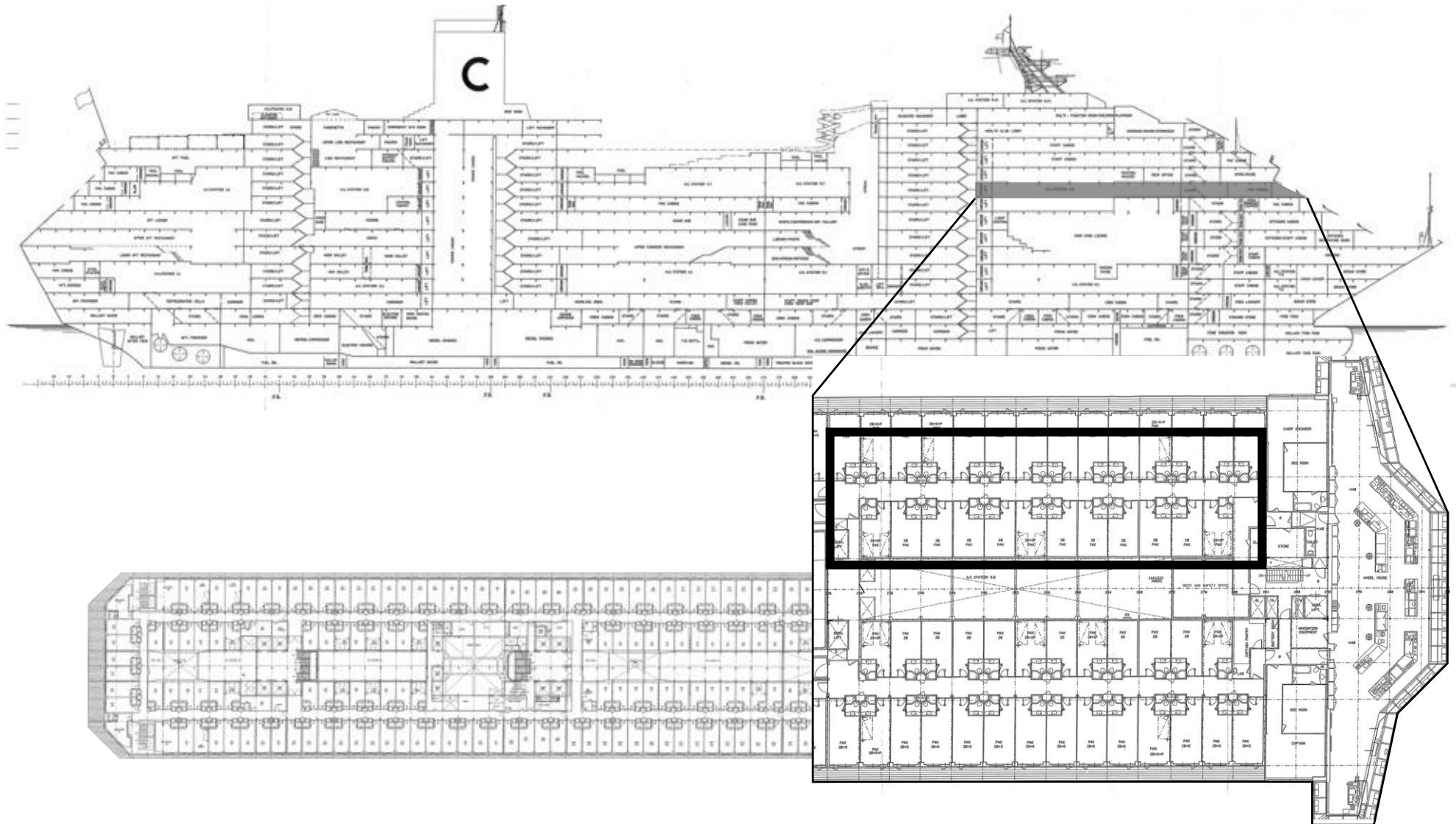
5.5. Plan programming

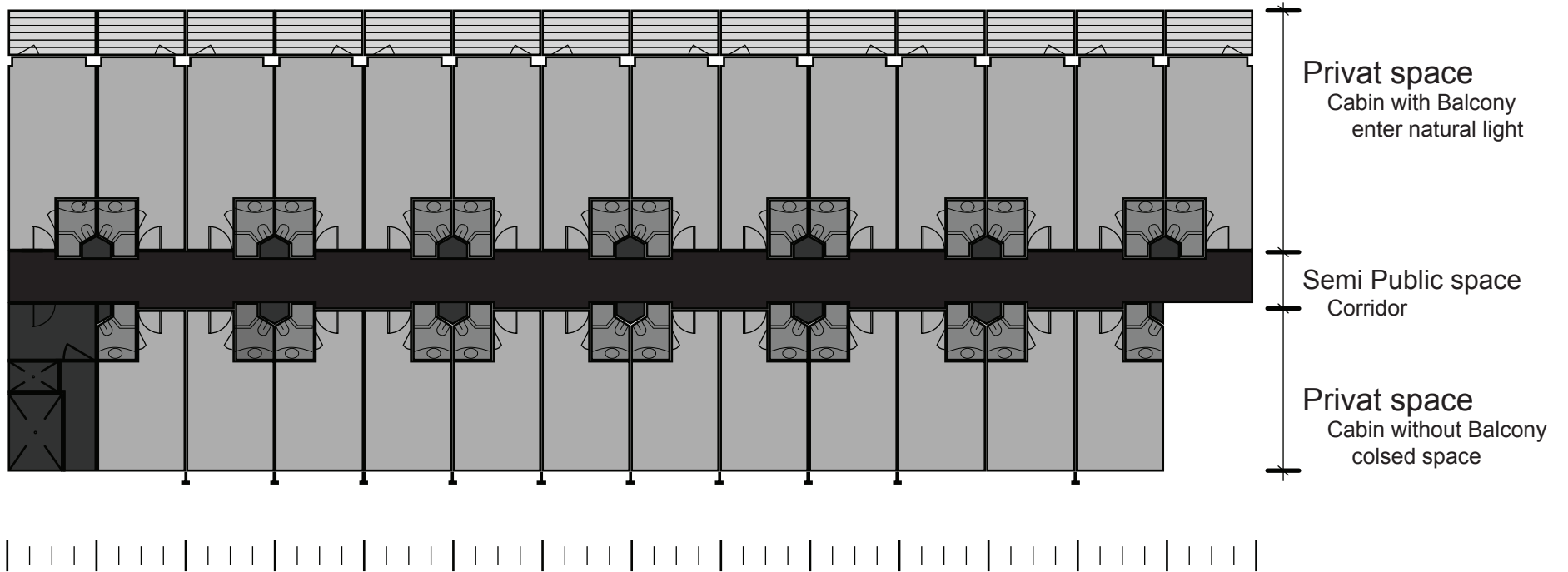
5.1 Spatial program

Environment	Emotional responses	Behavior responses								
Independent variable	Parameter	dependent variable								
Element of space	Scene Image	Physical user motion								
<p>Subspace Object - Furniture</p> <p>Primary space Structure - Volum, Wall, Color, Light</p> <p>Secondary space Structure + Object</p>	<ul style="list-style-type: none"> ● Pleasure ● Arousal ● Dominance 	<p>Movement Path</p> <p>Position</p> <p>Change of the view field</p> <p>Height of visual field</p> <table> <tr> <td>on Stand</td> <td>1700mm</td> </tr> <tr> <td>on Sit</td> <td>1300mm</td> </tr> <tr> <td>Sit on floor</td> <td>800mm</td> </tr> <tr> <td>Lie down</td> <td>Ceiling</td> </tr> </table>	on Stand	1700mm	on Sit	1300mm	Sit on floor	800mm	Lie down	Ceiling
on Stand	1700mm									
on Sit	1300mm									
Sit on floor	800mm									
Lie down	Ceiling									

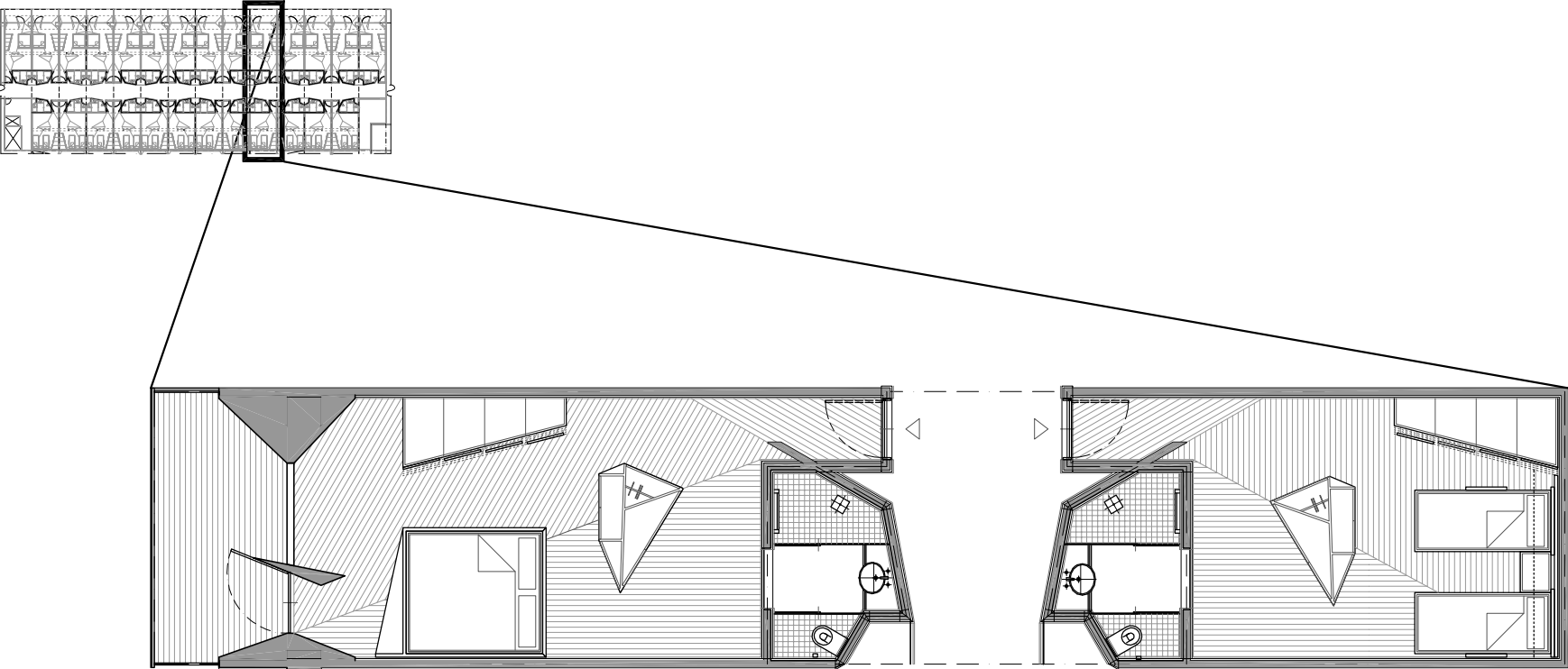
5.6. Planning

5.6.1. Standard Cabin





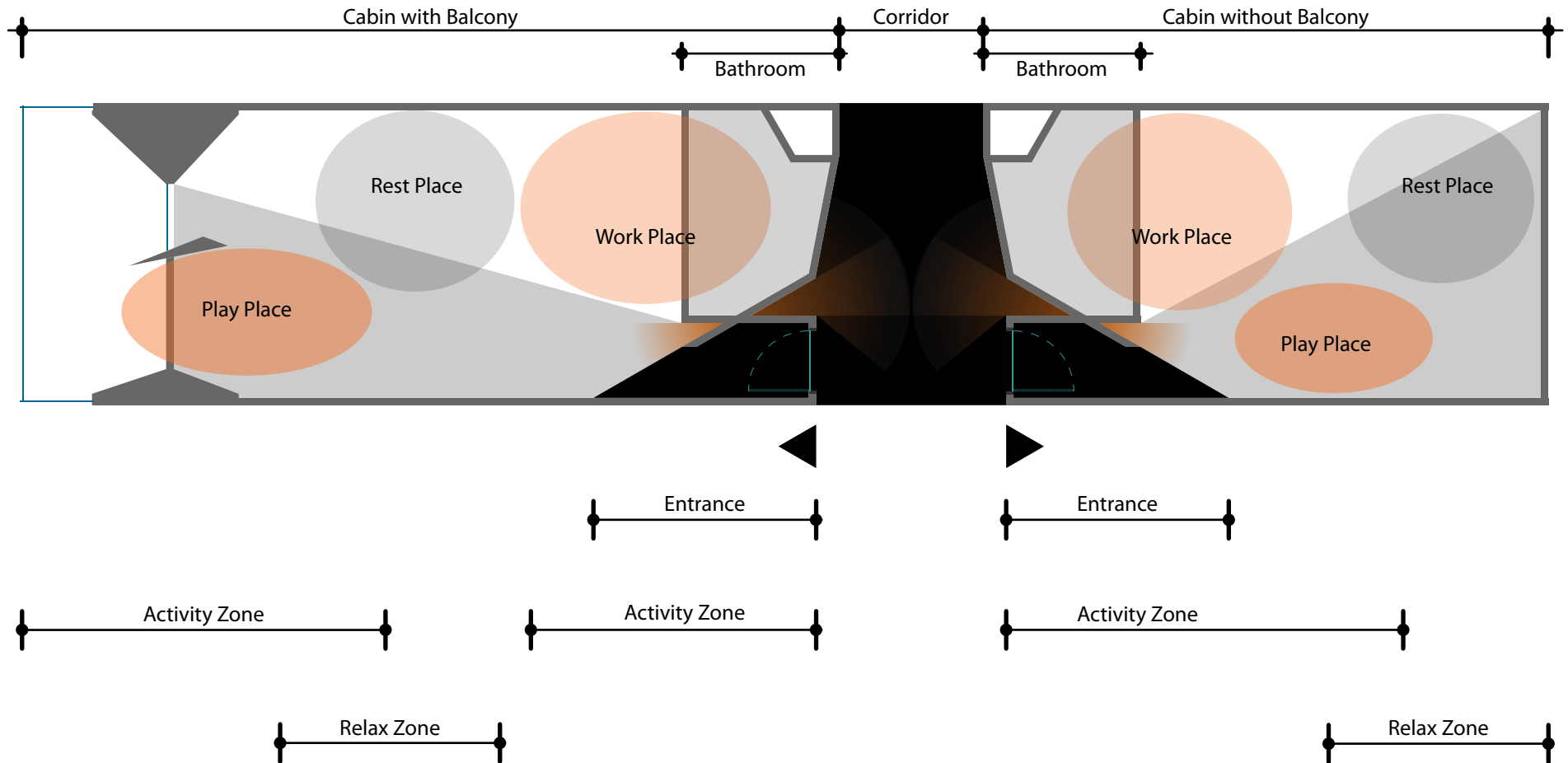
5.7. Project: Emotional colorful space



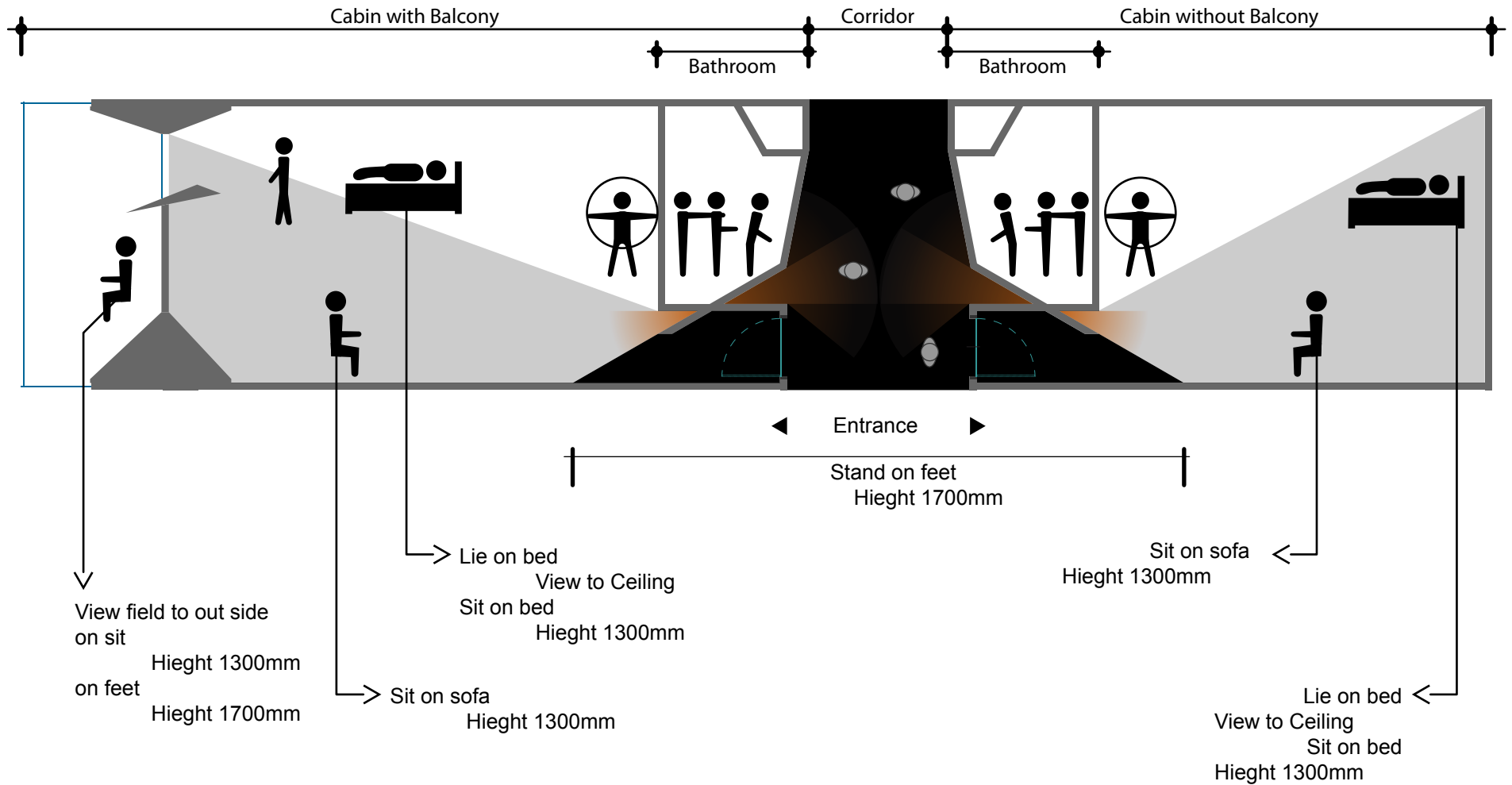
Scale 1 : 100

5.7.1. Space system

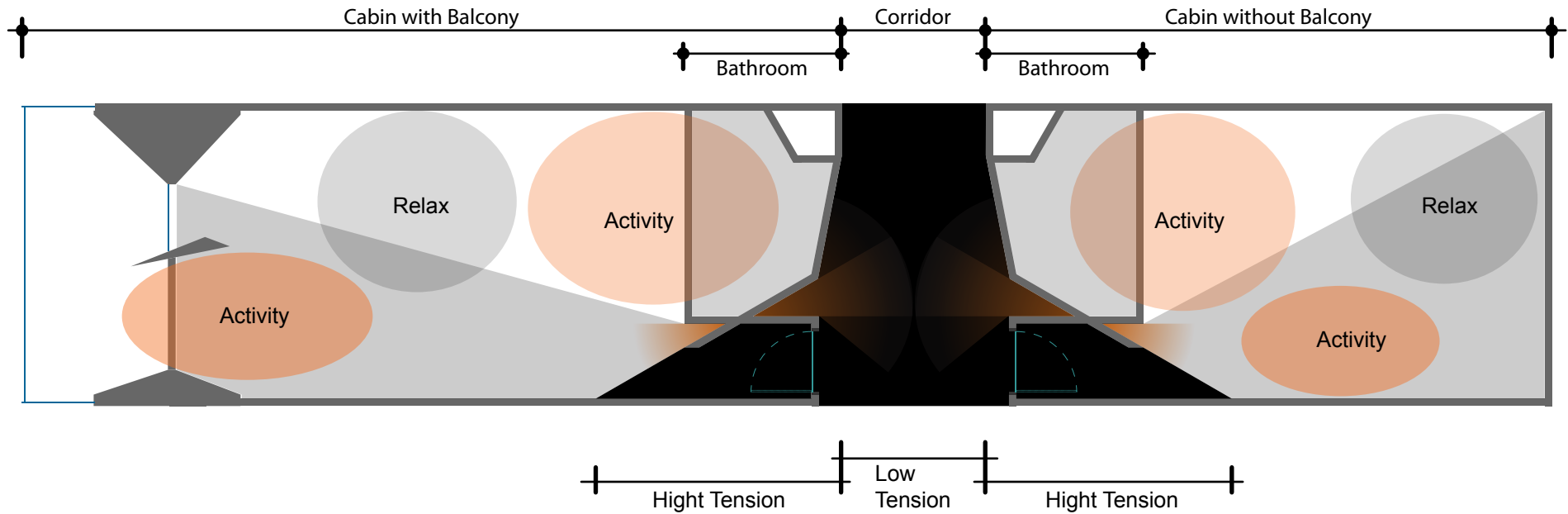
5.7.1.1. Space function



5.7.1.2. Height of Visual field



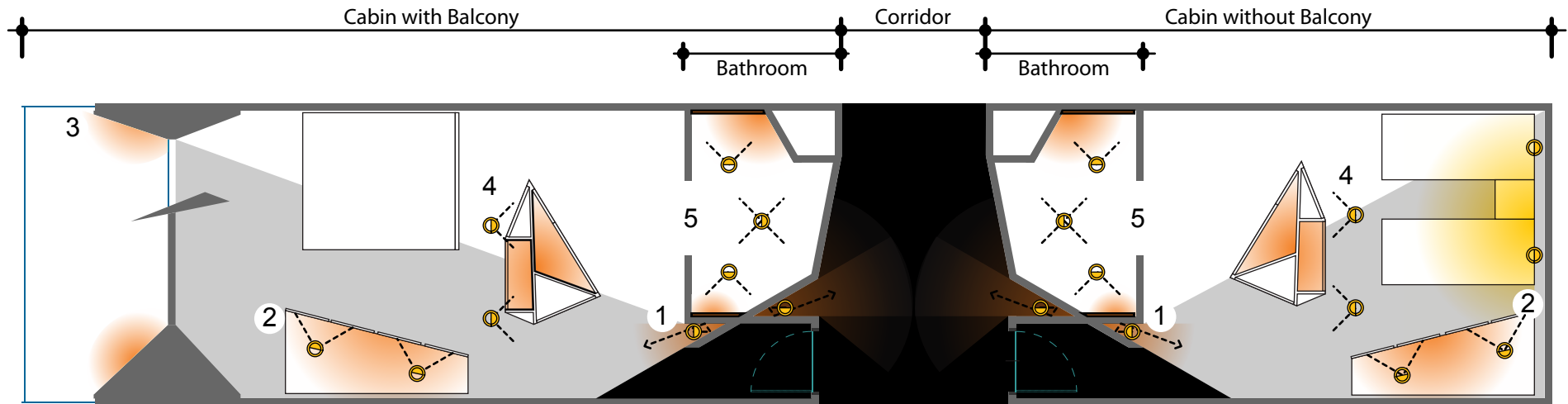
5.7.1.3. Emotional Effect : Affective image



Factor of space activity

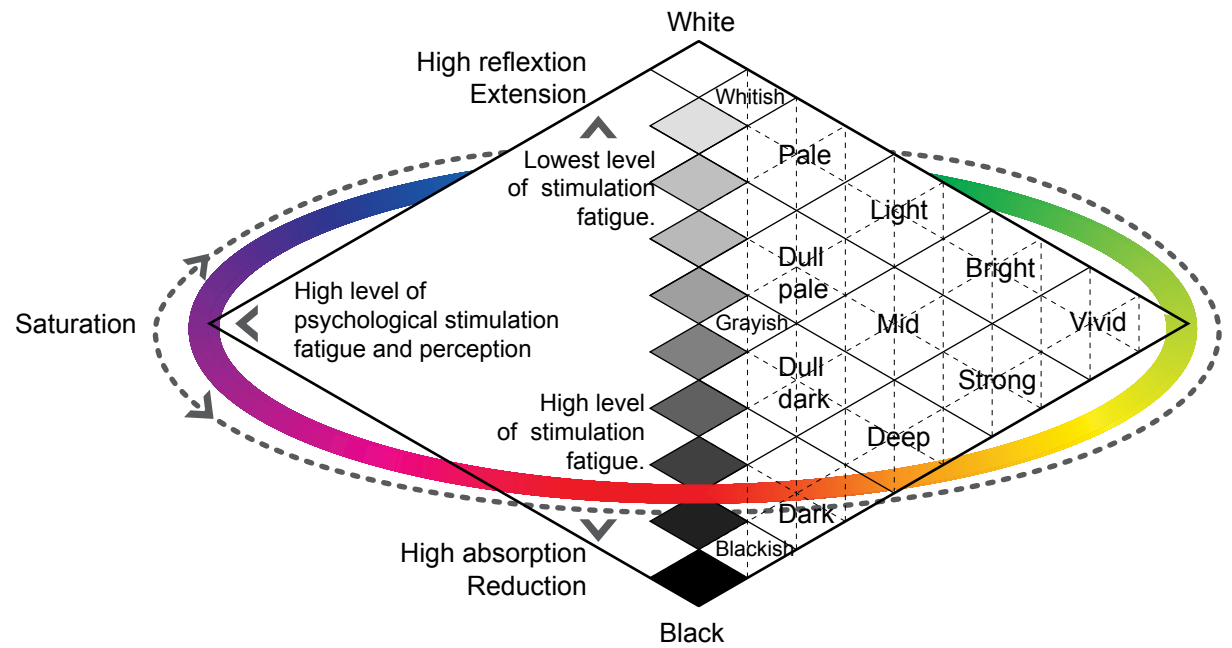
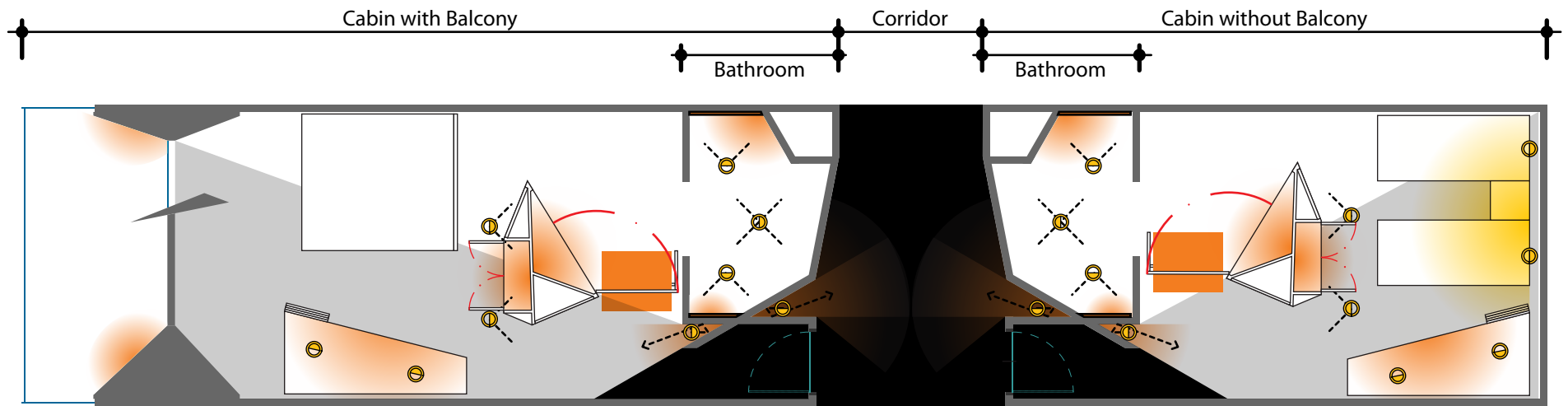
- Low tension — High and low light plan > Not show directly to eye > Low tension
Black > Color effect make high tension
Colorful effect > Emotional activity
- High tension — Fretum and low ceiling > High tension
Black > Color effect make high tension
- Activity emotion — Color effect > Activity physical, biochemical
- Relax emotion — Color effect > Bright color > Relax

5.7.1.3. Emotional Effect : Color system

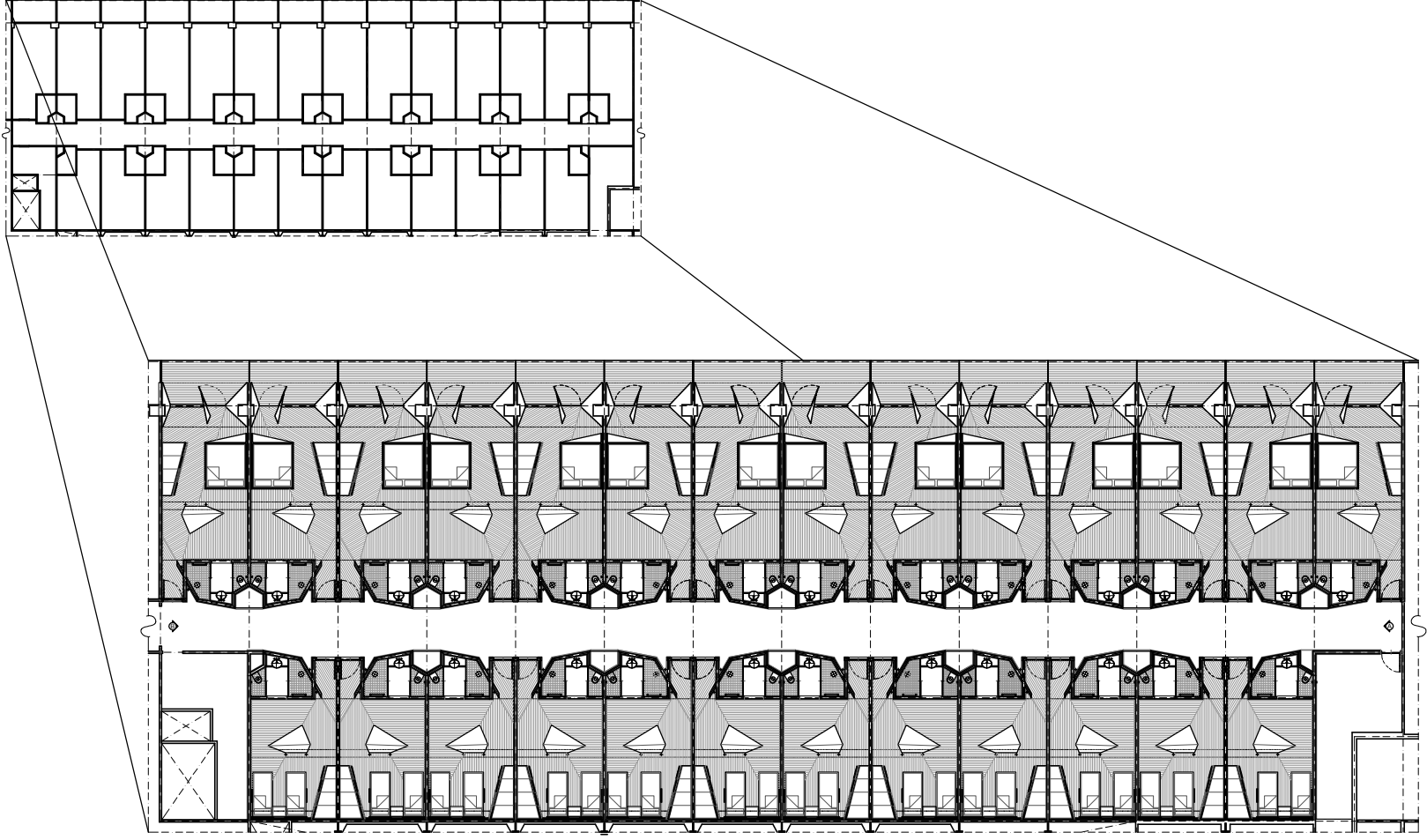


The light setting makes reflection by color wall is dyed the inside space one saturation color

1. The reflection of light by angle of wall is dyed the color
2. One partition plate has two different color by the direction.
toward the bed : White
toward the wall : Color
3. Colorful facets are dyed reflection by the natural light.
4. Inside system furniture has coloring surface.
5. Selected walls of bathroom are dyed the color by reflection of light

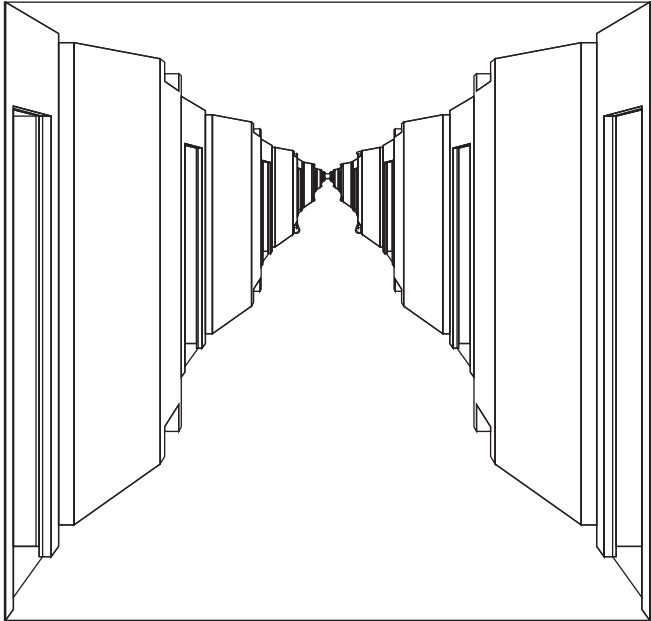
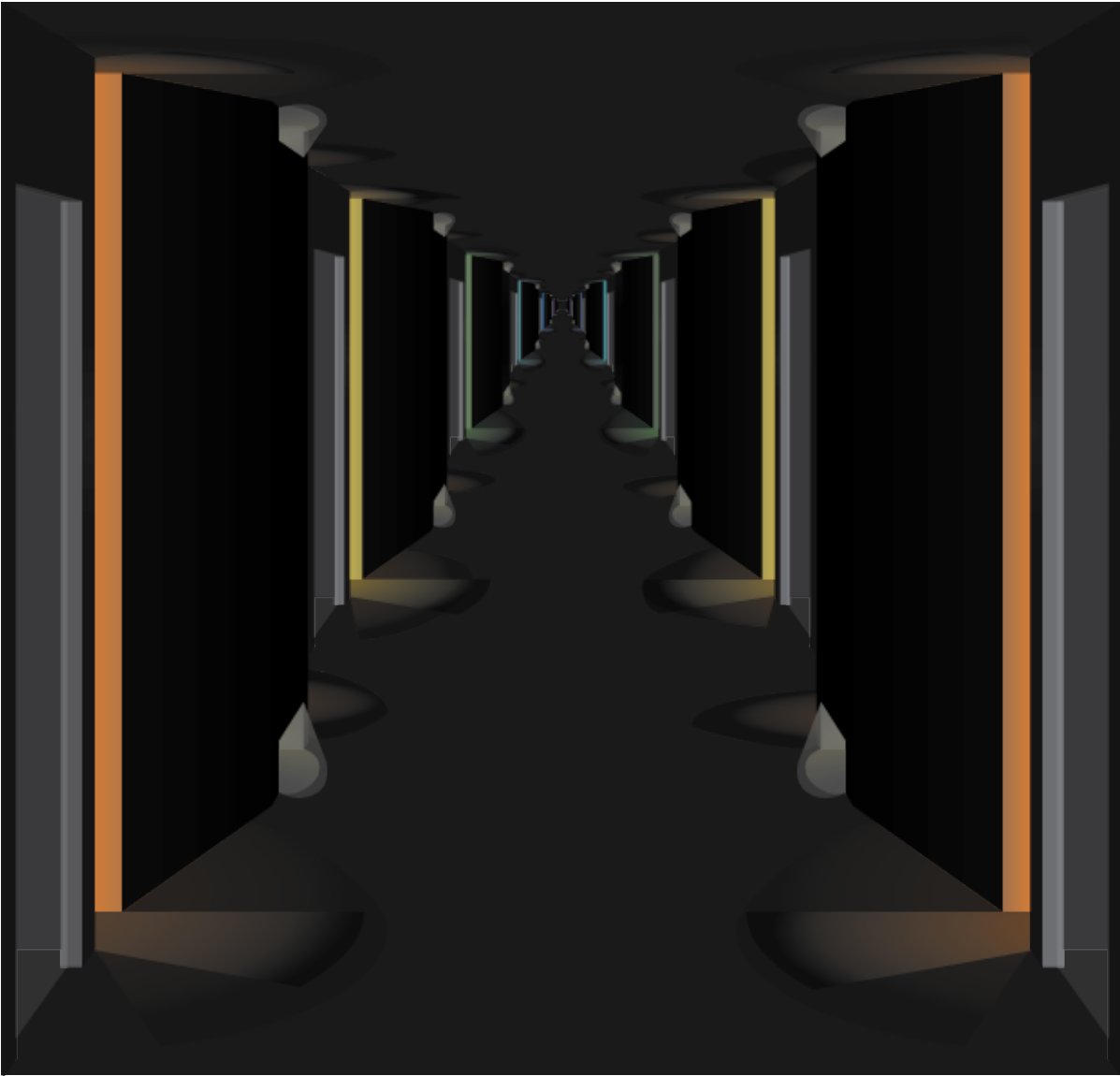


5.7.2. Corridor system

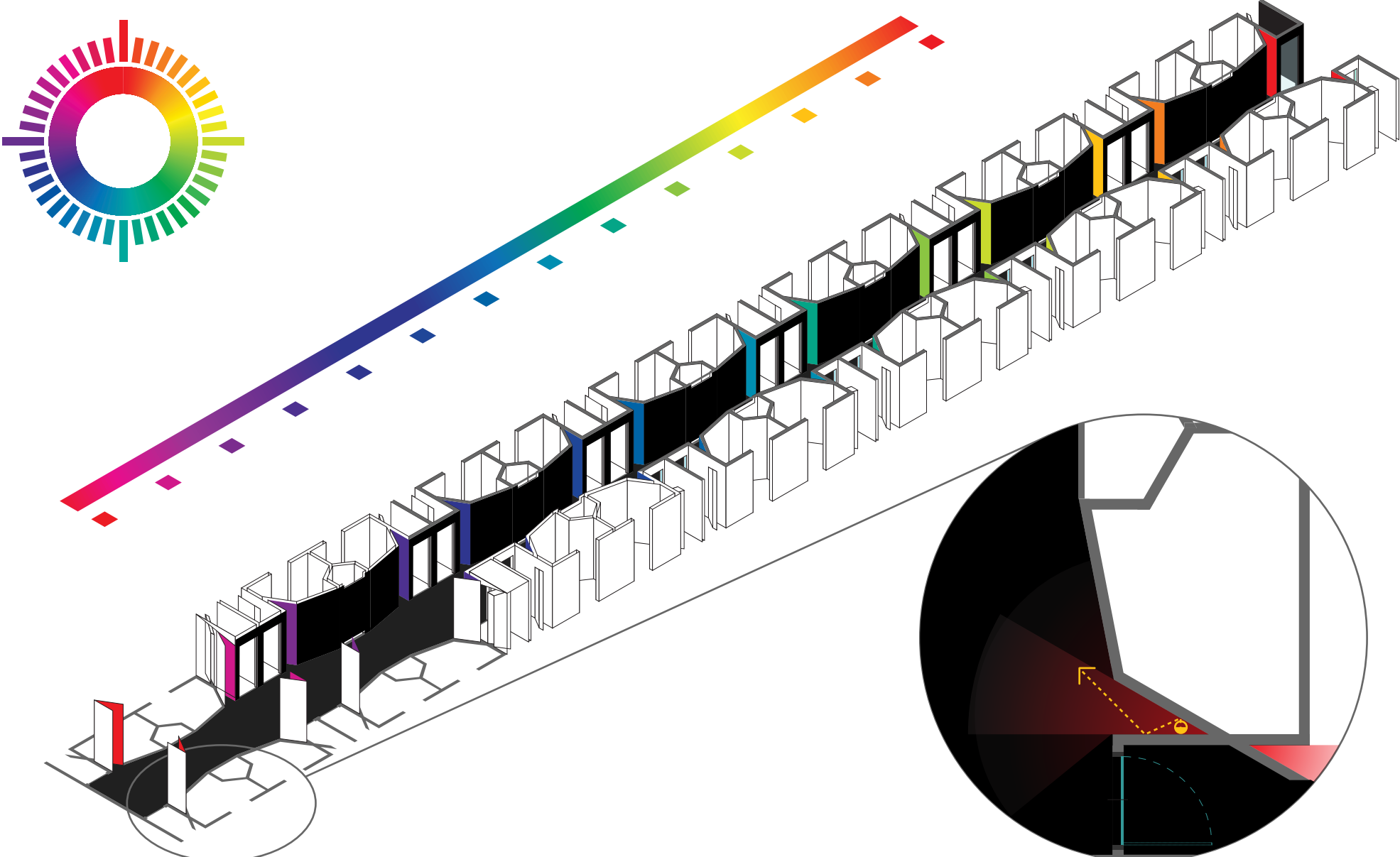


Scale 1 : 300

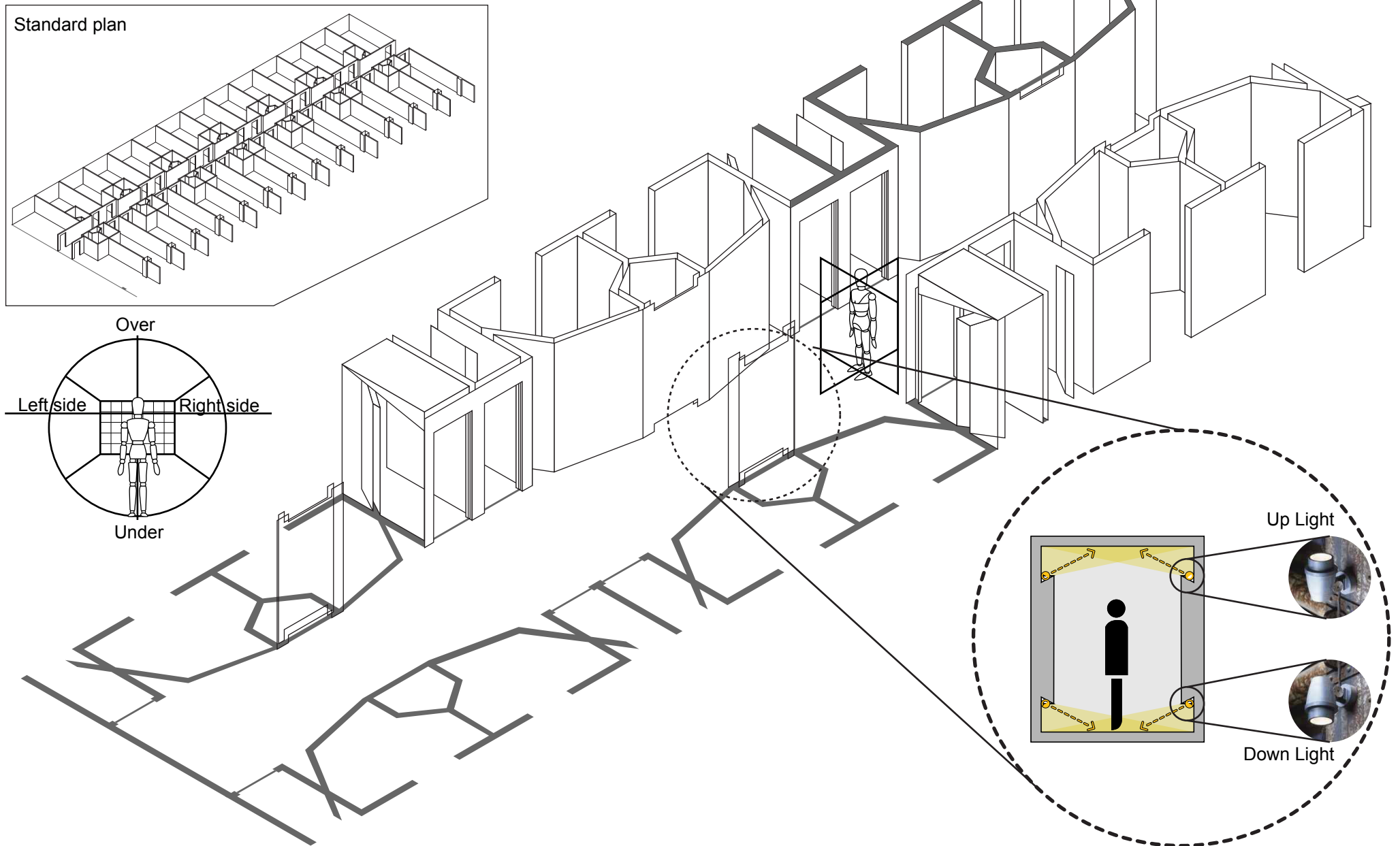
5.7.2.1. Prospect View



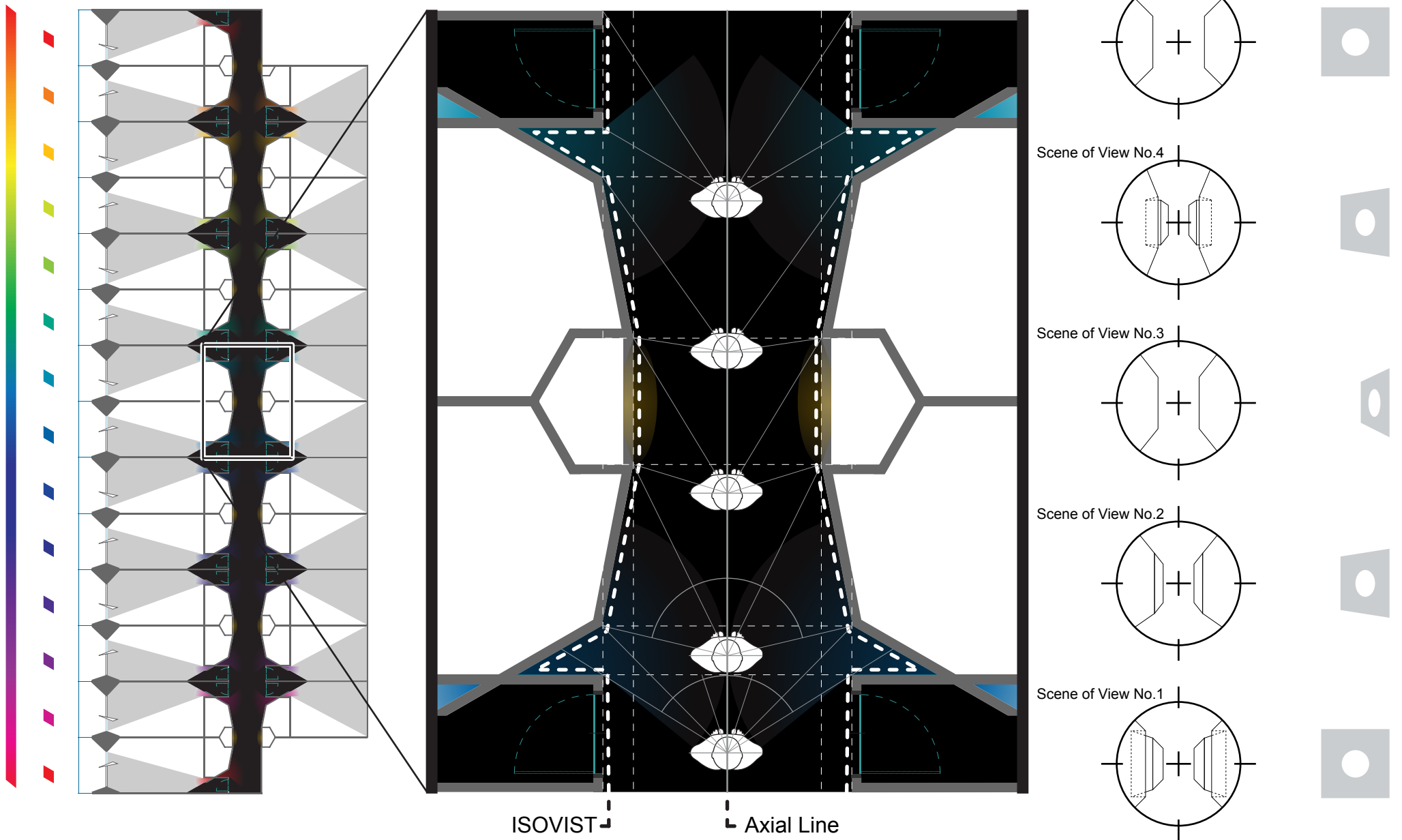
5.7.2.2. Rainbow color light



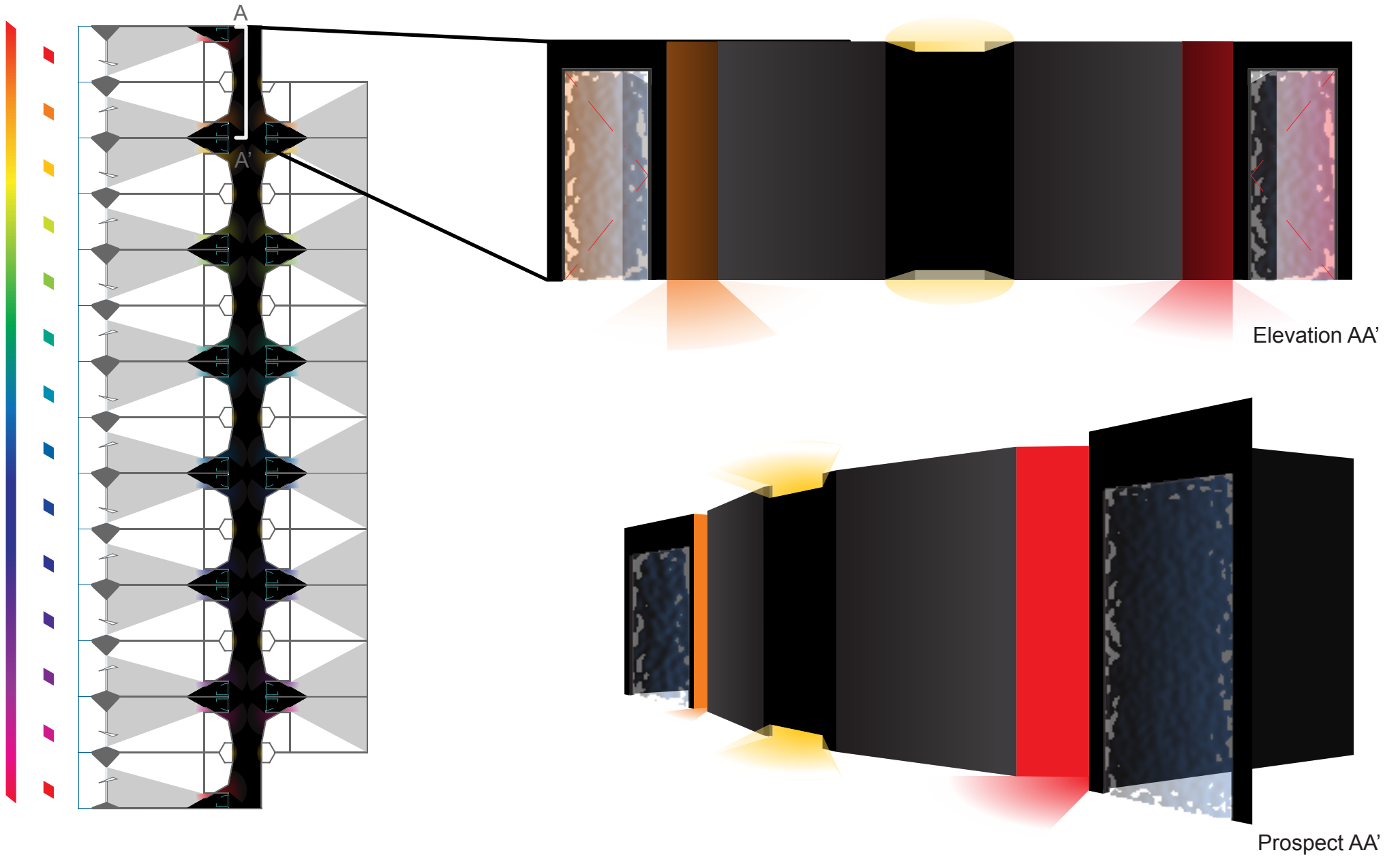
5.7.2.3. Light system



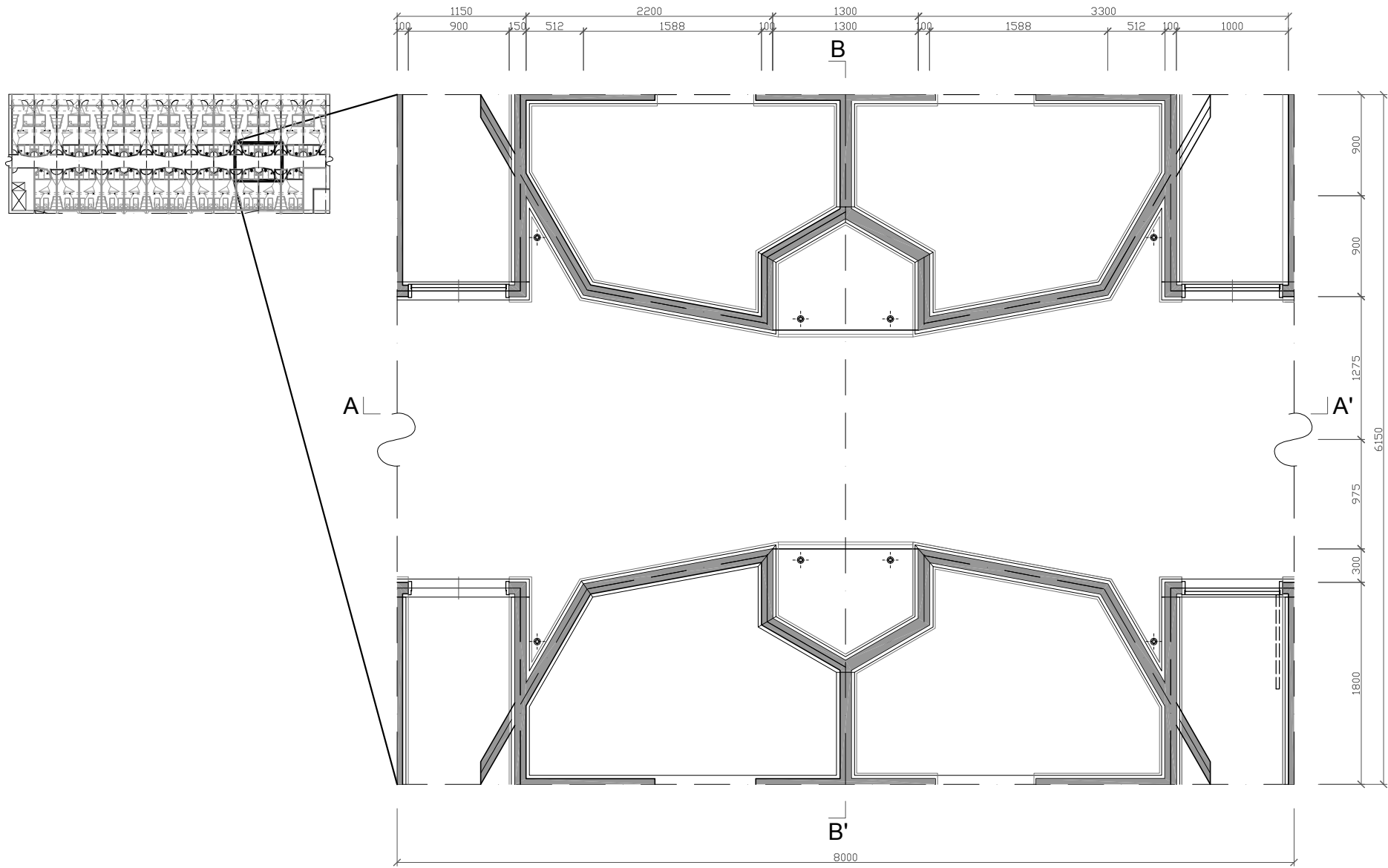
5.7.2.4. Visual Access field



5.7.2.5. Detail : Section A-A'

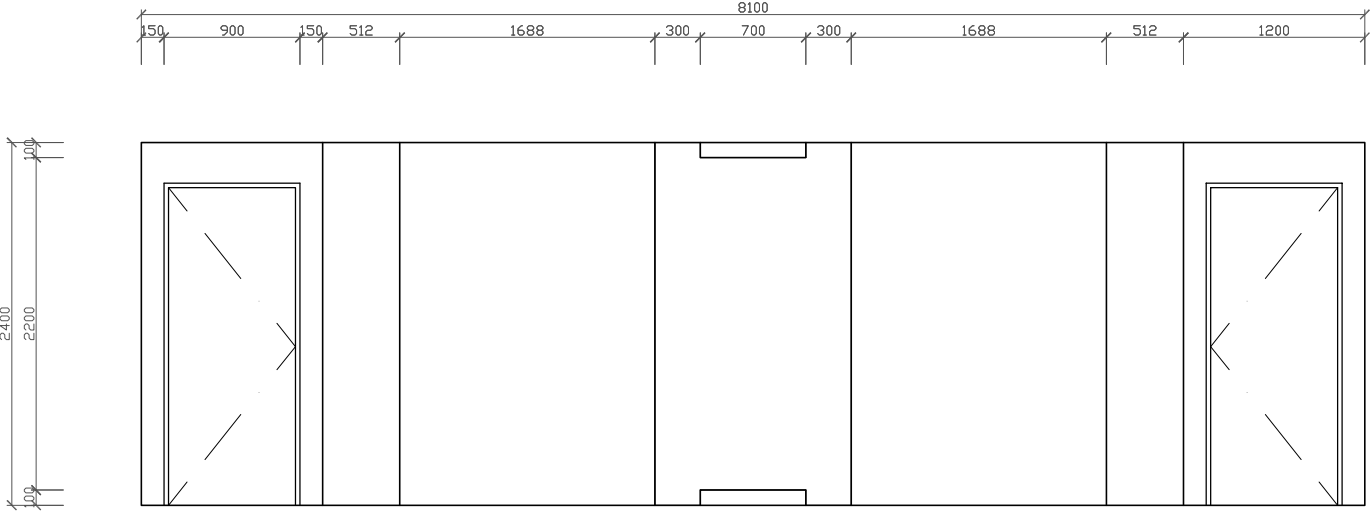


5.7.2.2. Floor Plan

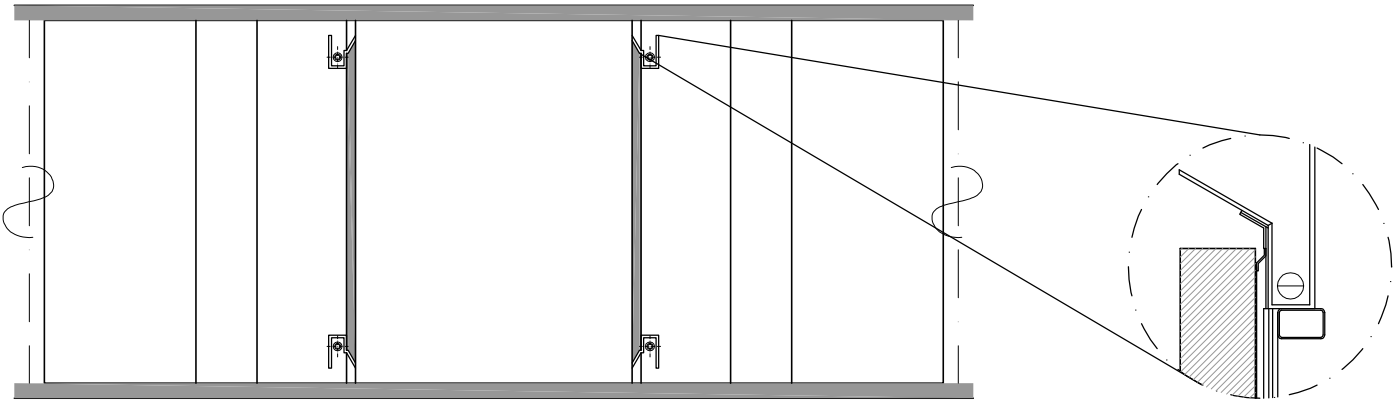


Scale 1: 50

5.7.2.3. Section



Elevation A A'



Elevation B B'

Scale 1: 50


5.7.3. Cabin with terrace


5.7.3.1. Space function

Space function

View height of position

①  on Feet 1700mm

②  on Sit 1300mm

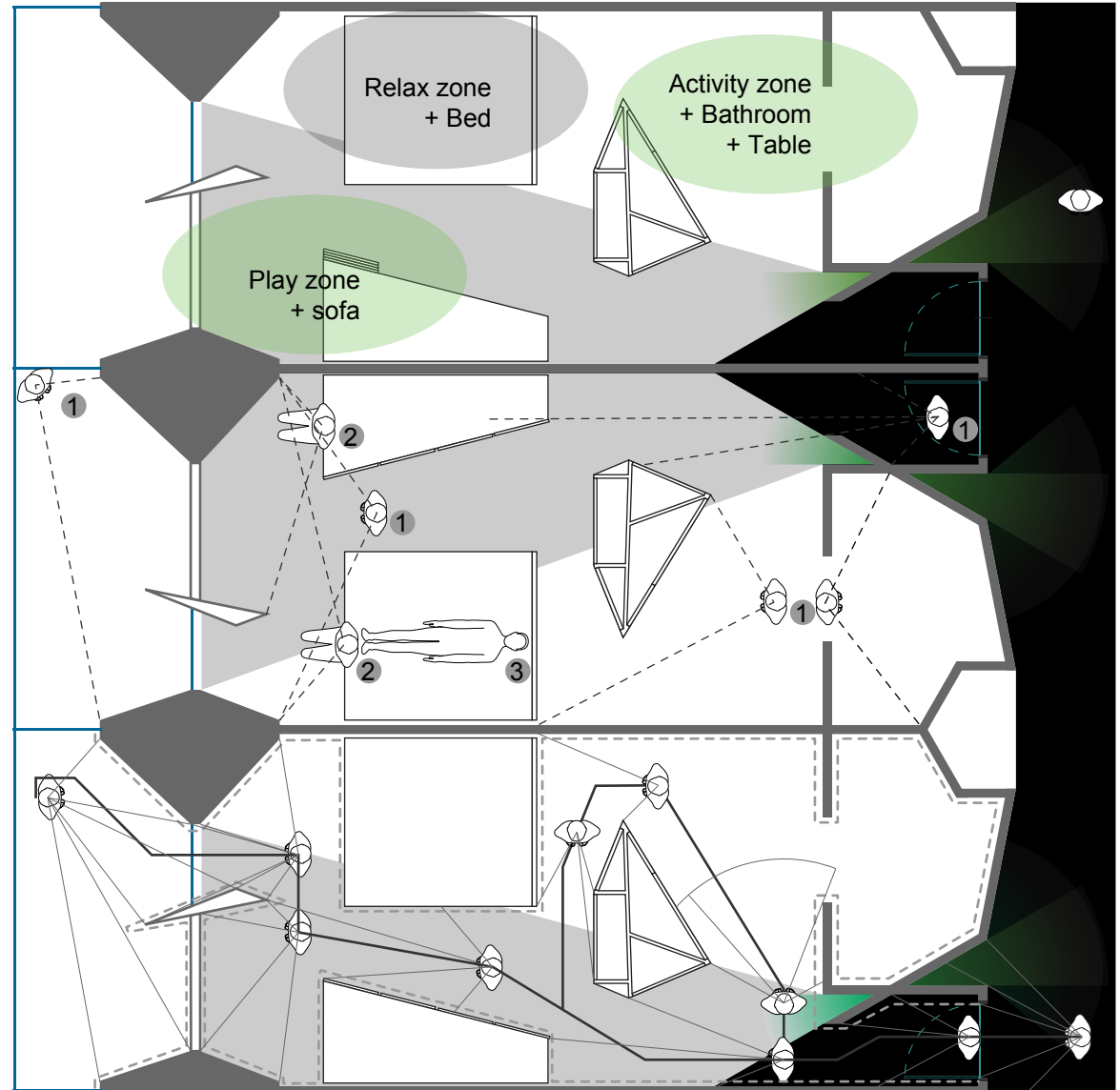
③ 
Lie down view Ceiling

Space flow line

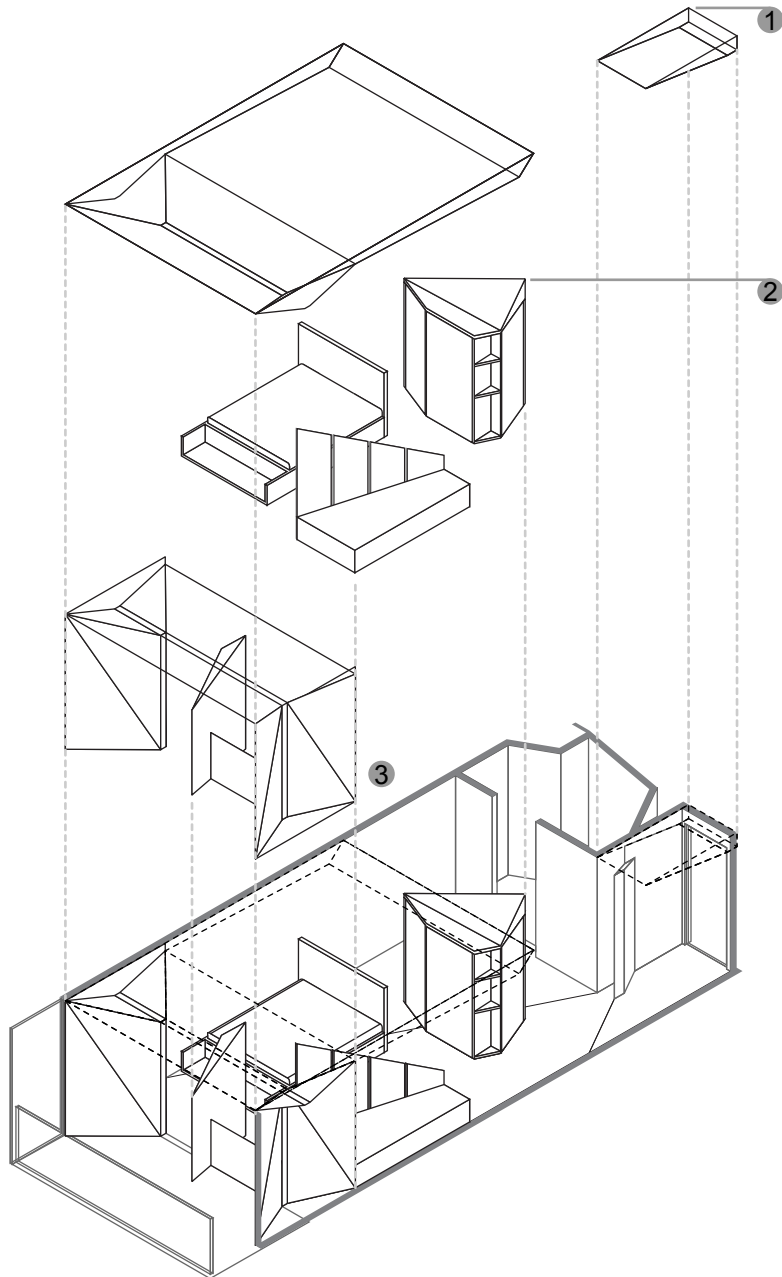
— ISOVIST

— Axial Line

— Visual Line



5.7.3.2. Space system



1 Ceiling system

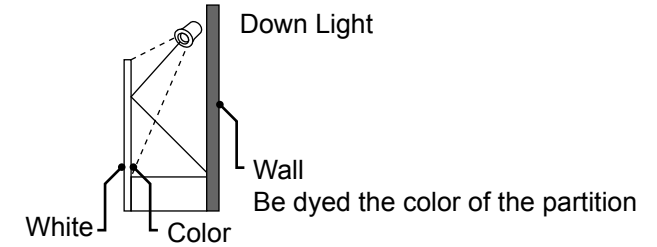
Inclination of the surface induce the light
bumpy surface make smooth reflection

2 Furniture system

Bed : Double bed

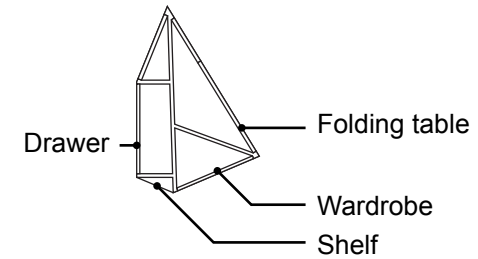
dimension 2000 x 1800 x 450

Sofa with partition plate



System furniture

Varial angle of pentagon make diversity angle of view

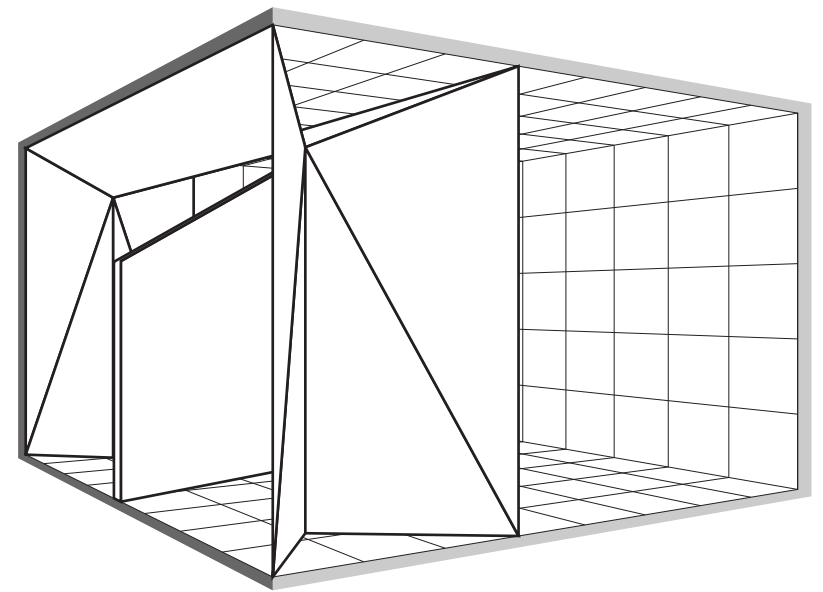
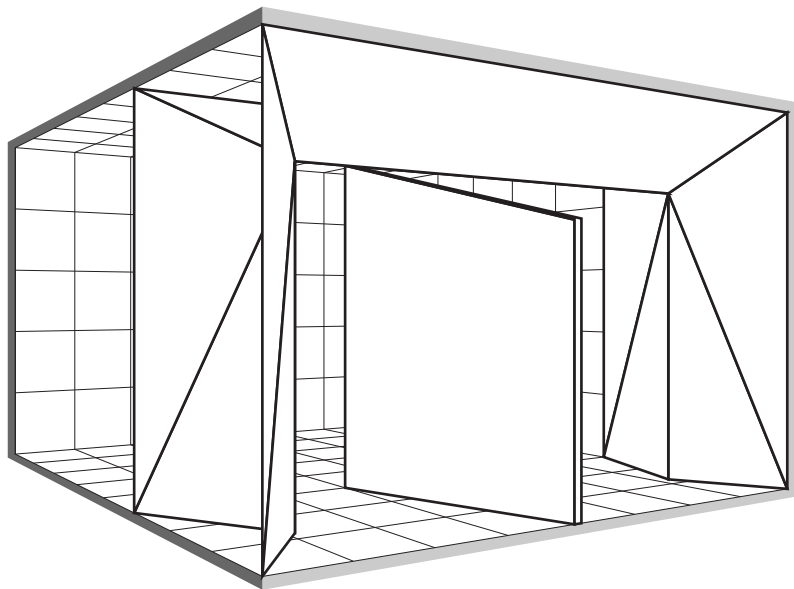
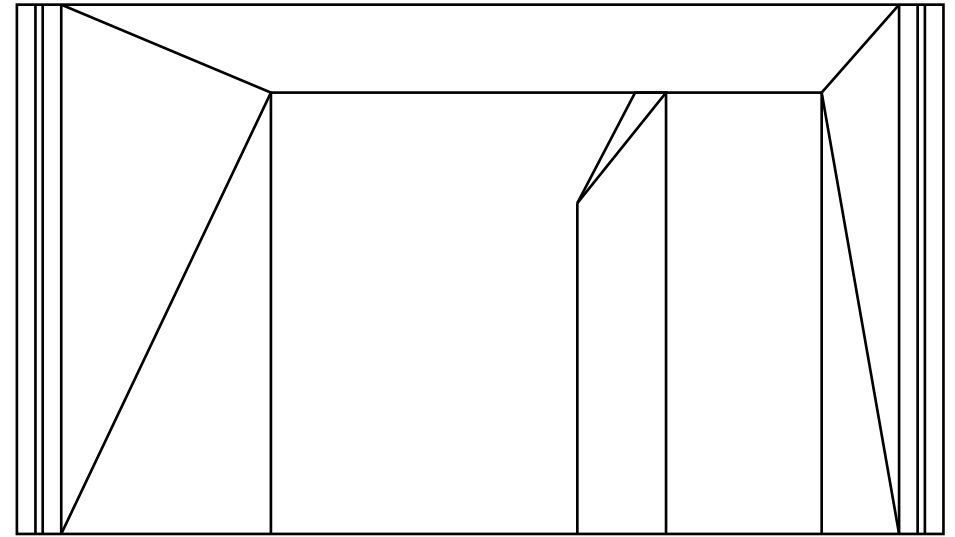


3 Screen system

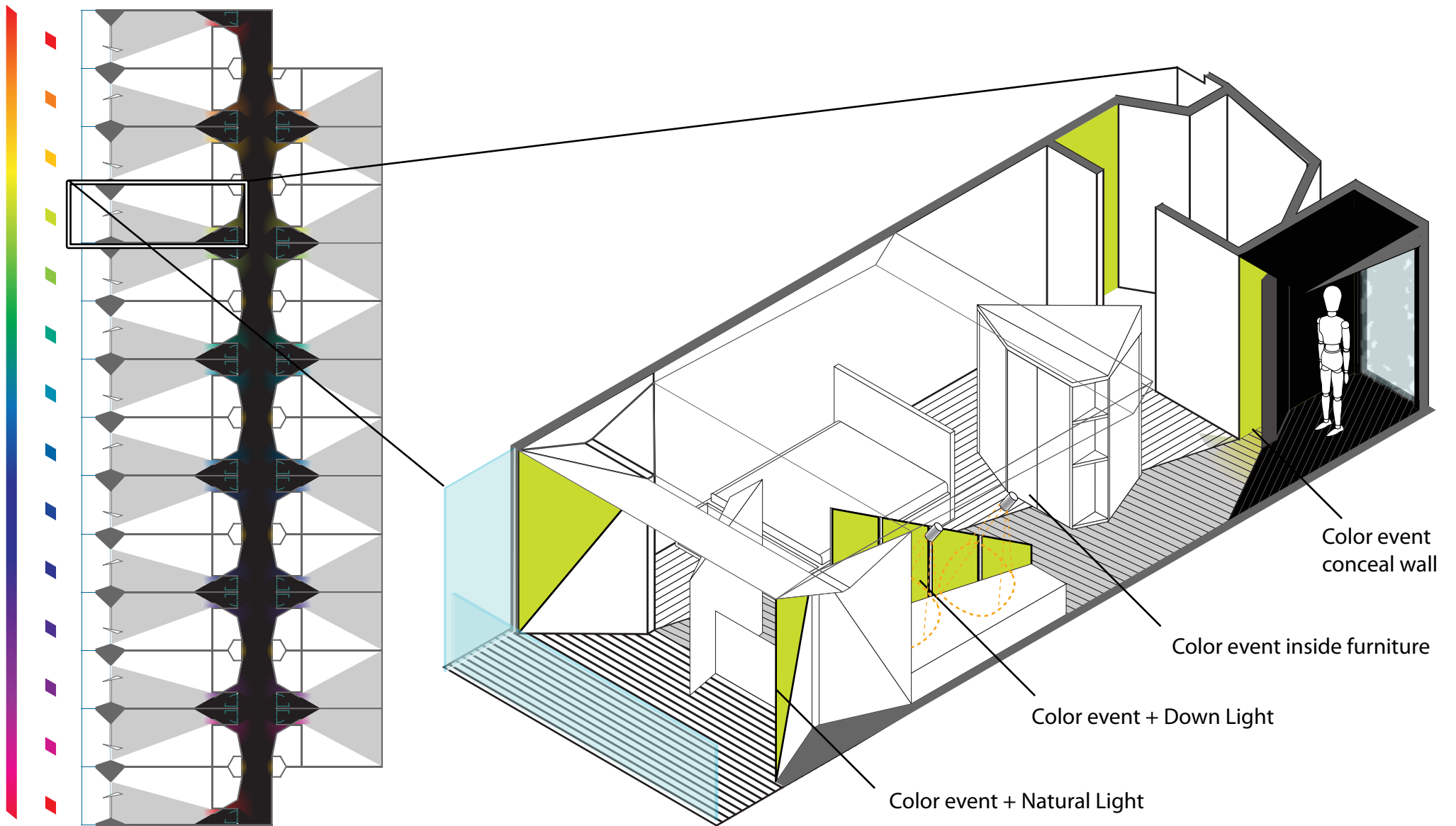
The facets of the surface induce the natural light

5.7.3.3. Screen system

The facets of surface have different angle make different reflection to guide the light inside space

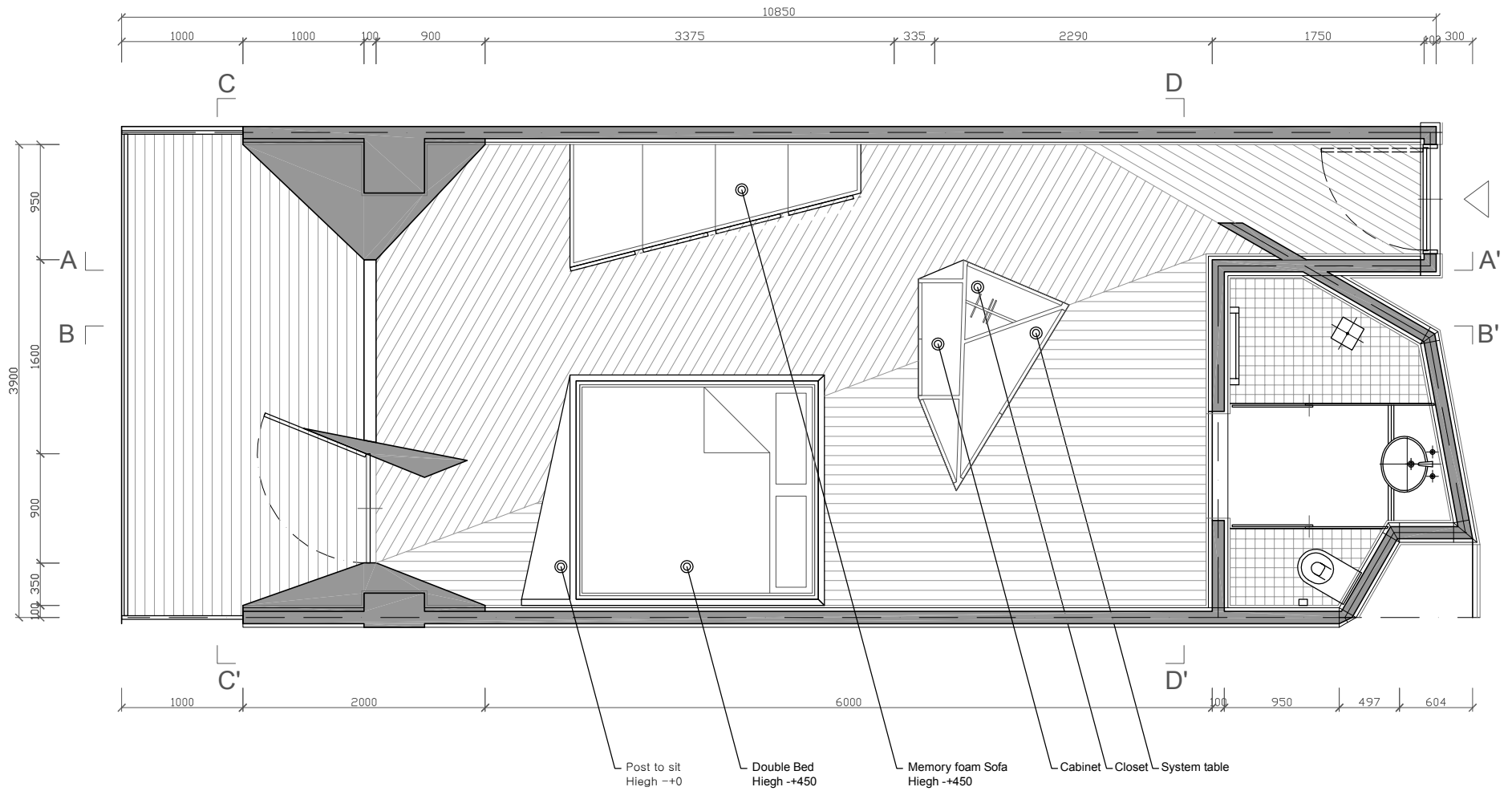


5.7.3.4. Color event system



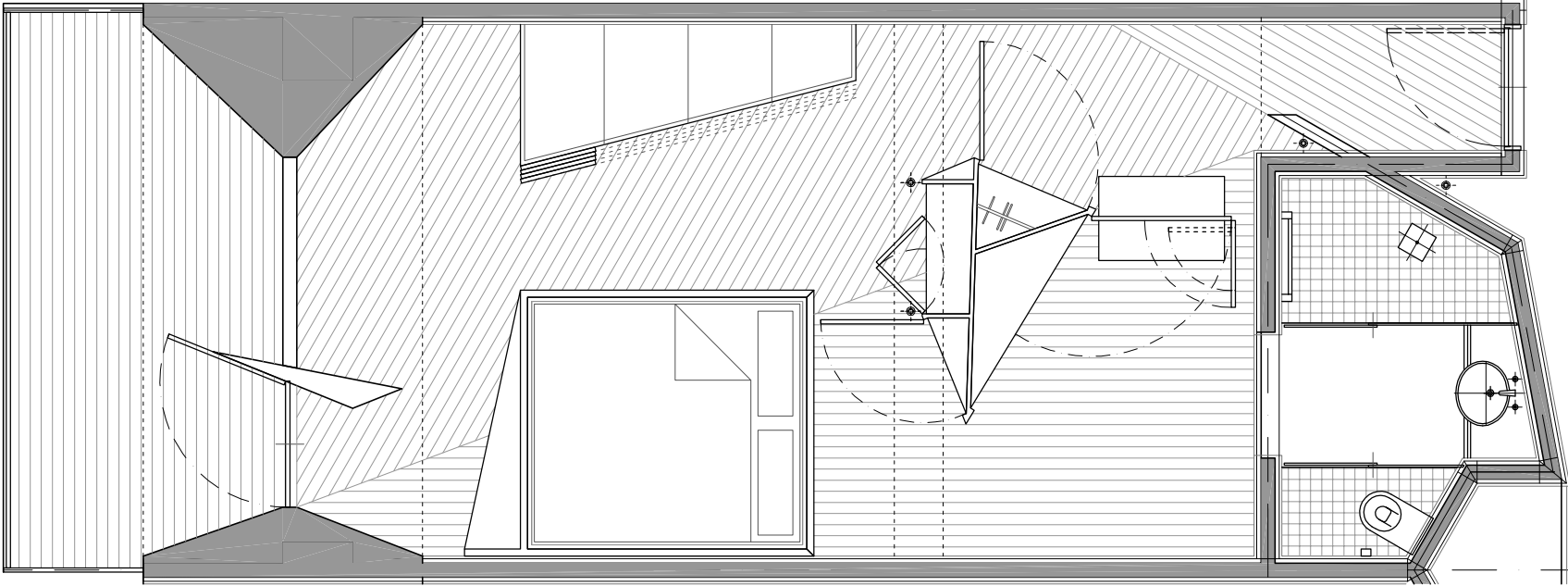
5.7.4. Floor plan

5.7.4.1. First Impression



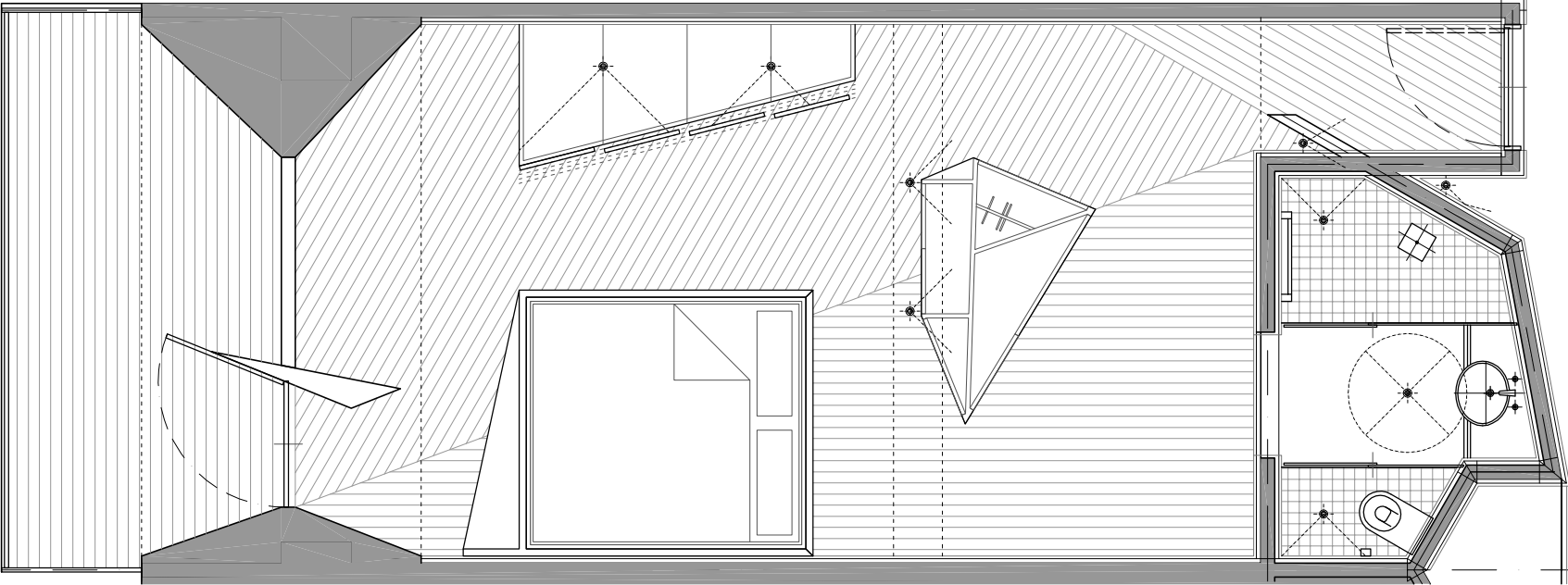
Scale 1: 50

5.7.4.2. Space Activity



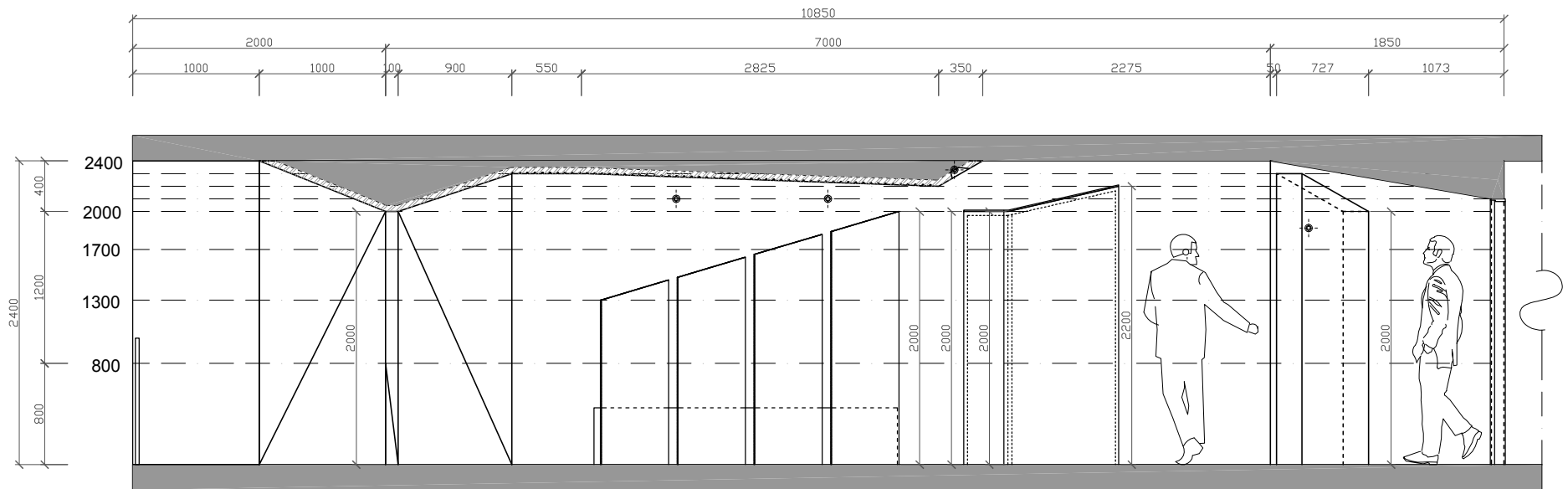
Scale 1: 50

5.7.4.3. Color & Light system

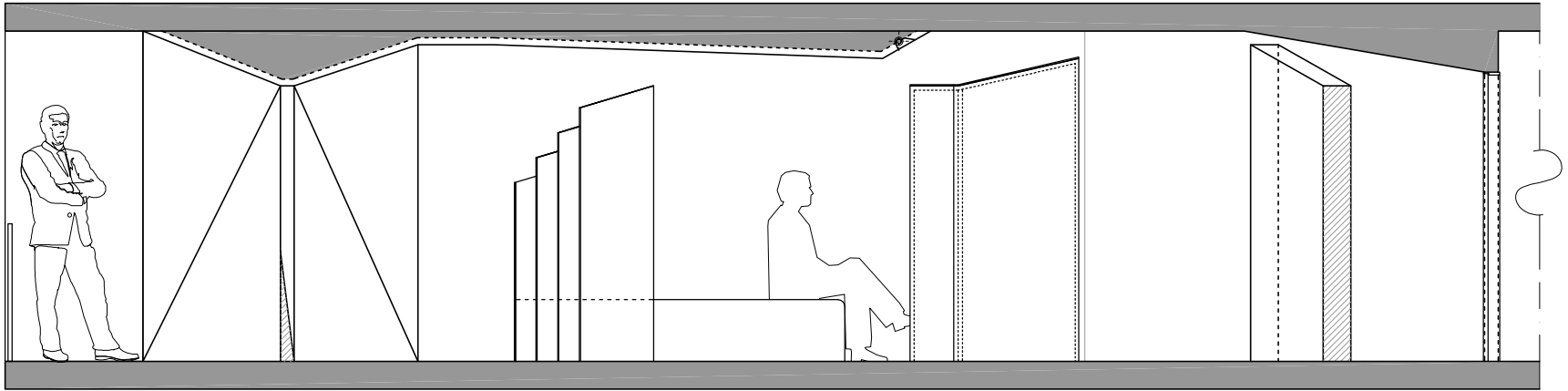


Scale 1: 50

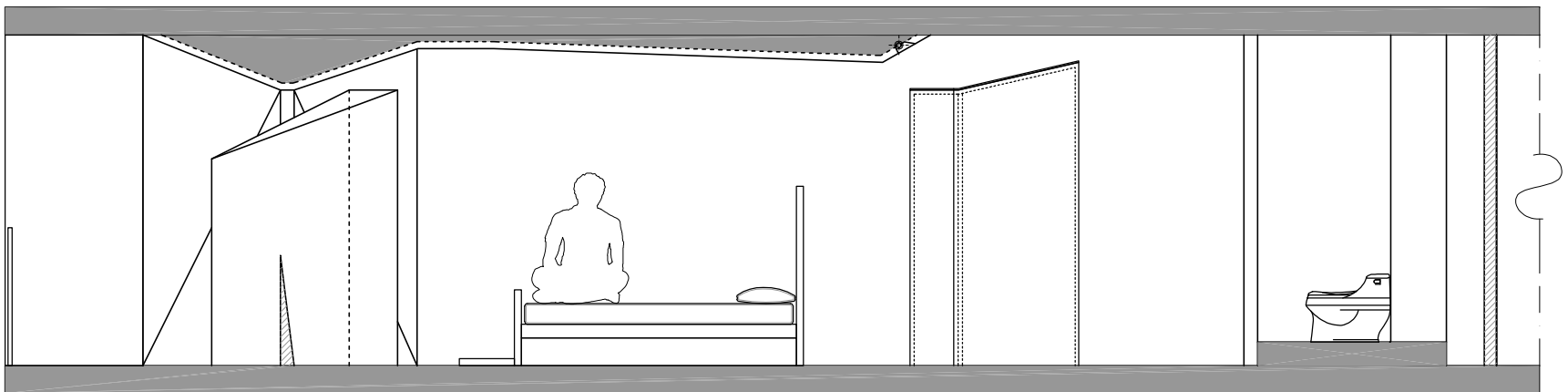
5.7.4.4. Section



Scale 1: 50

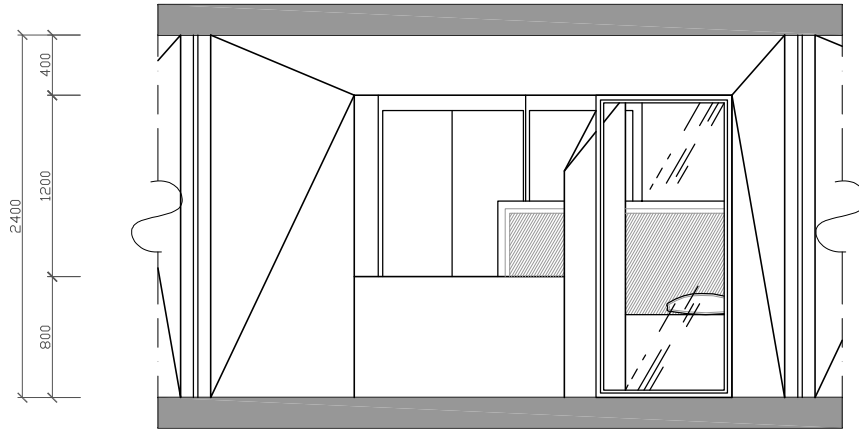


Elevation A A'

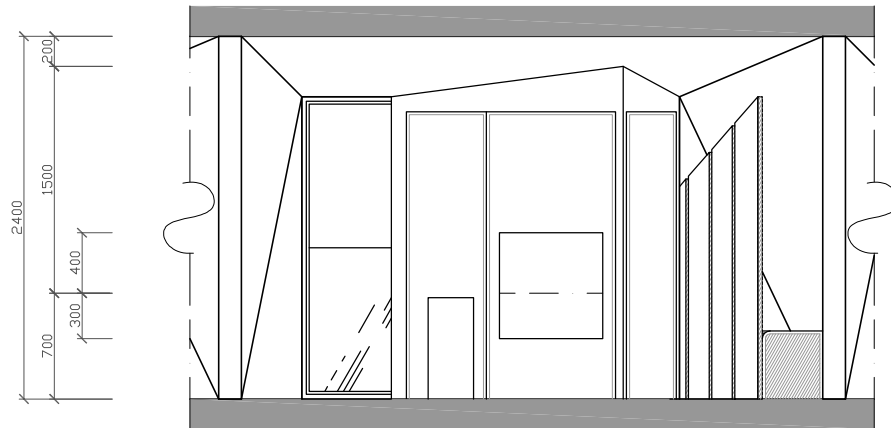


Elevation B B'

Scale 1: 50



Elevation A A'



Elevation B B'

Scale 1: 50

5.7.3. Cabin without Balcony


5.7.3.1. Space function

Space function

View height of position

①  on Feet 1700mm

②  on Sit 1300mm

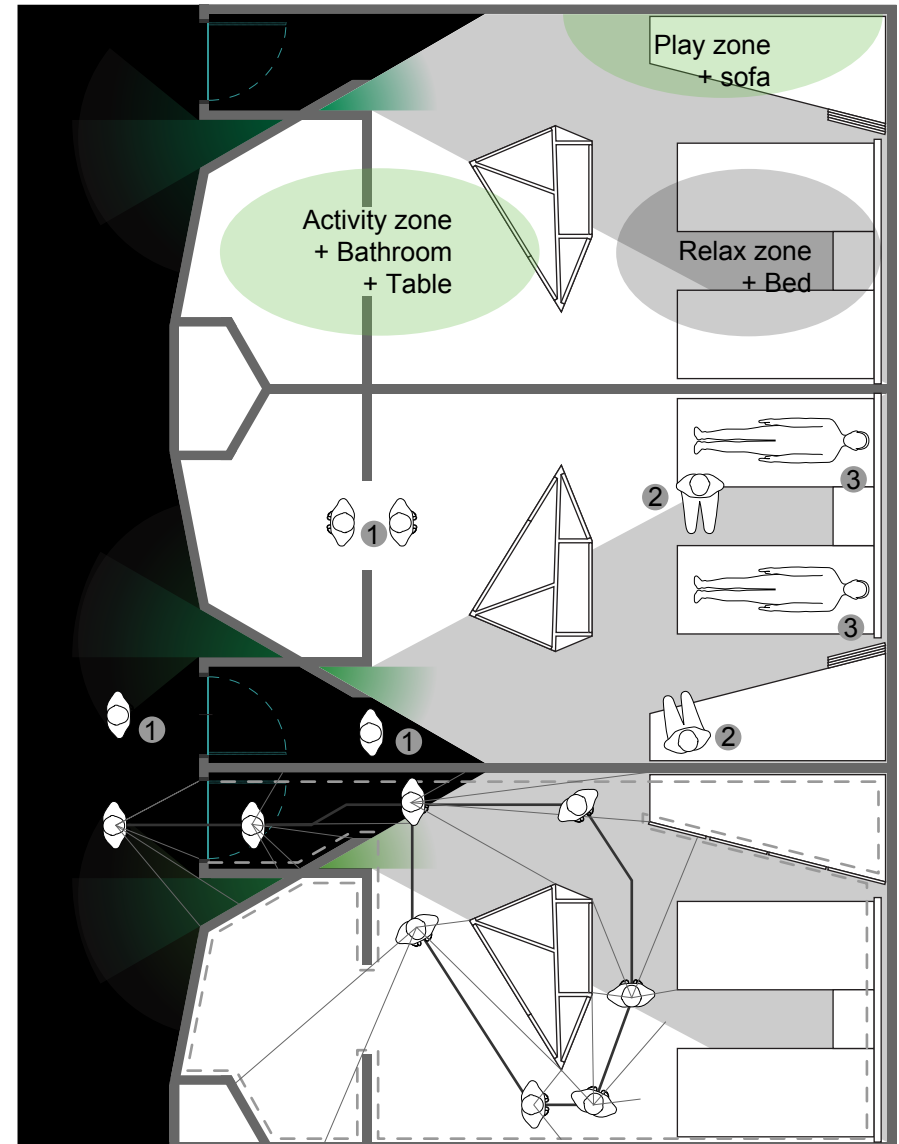
③  Lie down view Ceiling

Space flow line

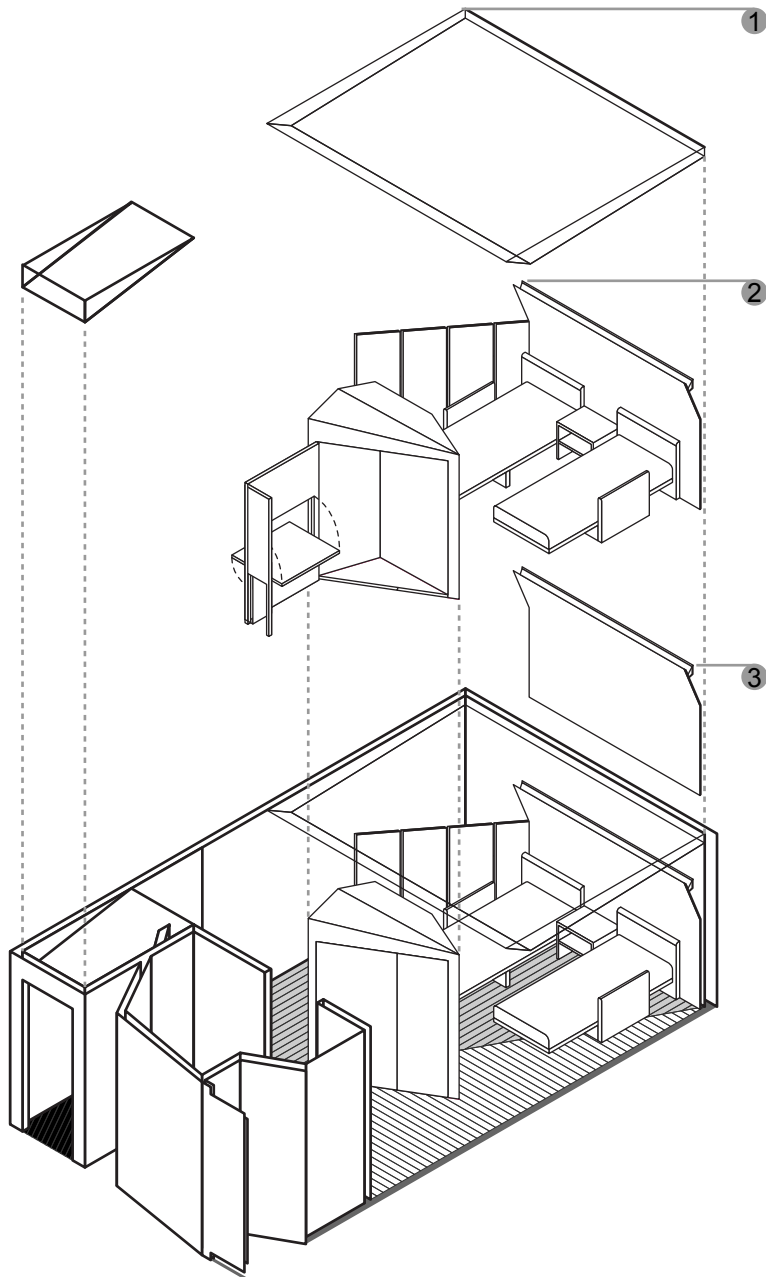
— — ISOVIST

— Axial Line

— Visual Line



5.7.3.2. Space system



1 Ceiling system

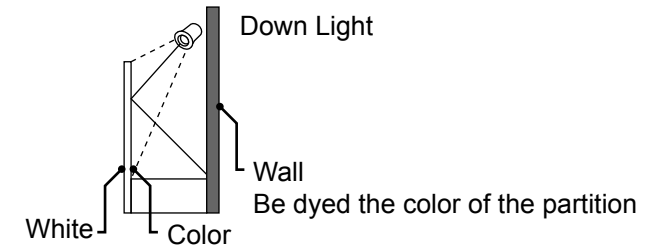
Inclination of the surface induce the light
bumpy surface make smooth reflection

2 Furniture system

Bed : Double bed

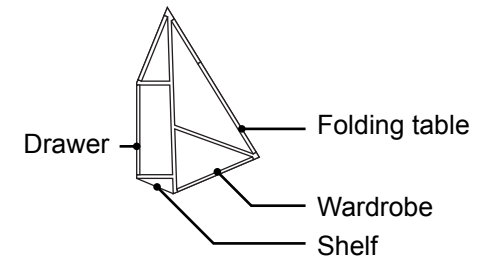
dimension 2000 x 1800 x 450

Sofa with partition plate



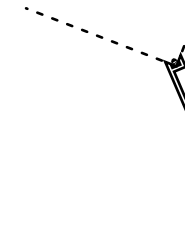
System furniture

Varial angle of pentagon make diversity angle of view

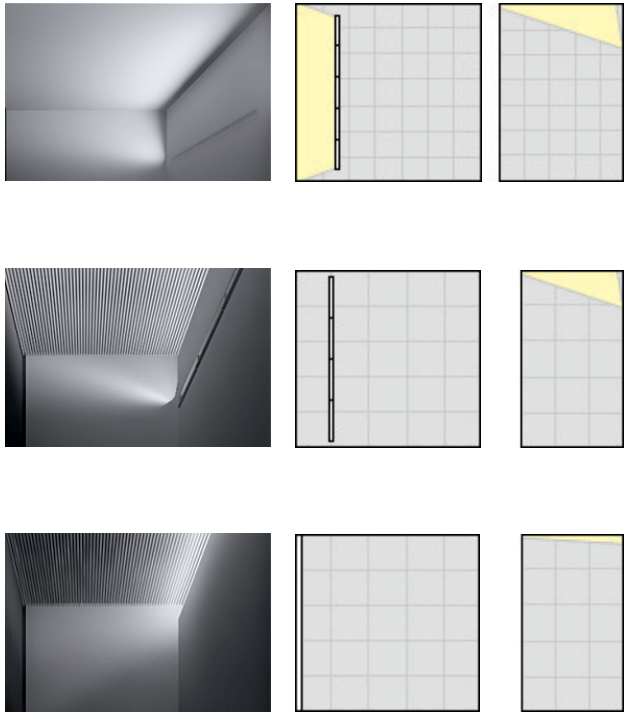
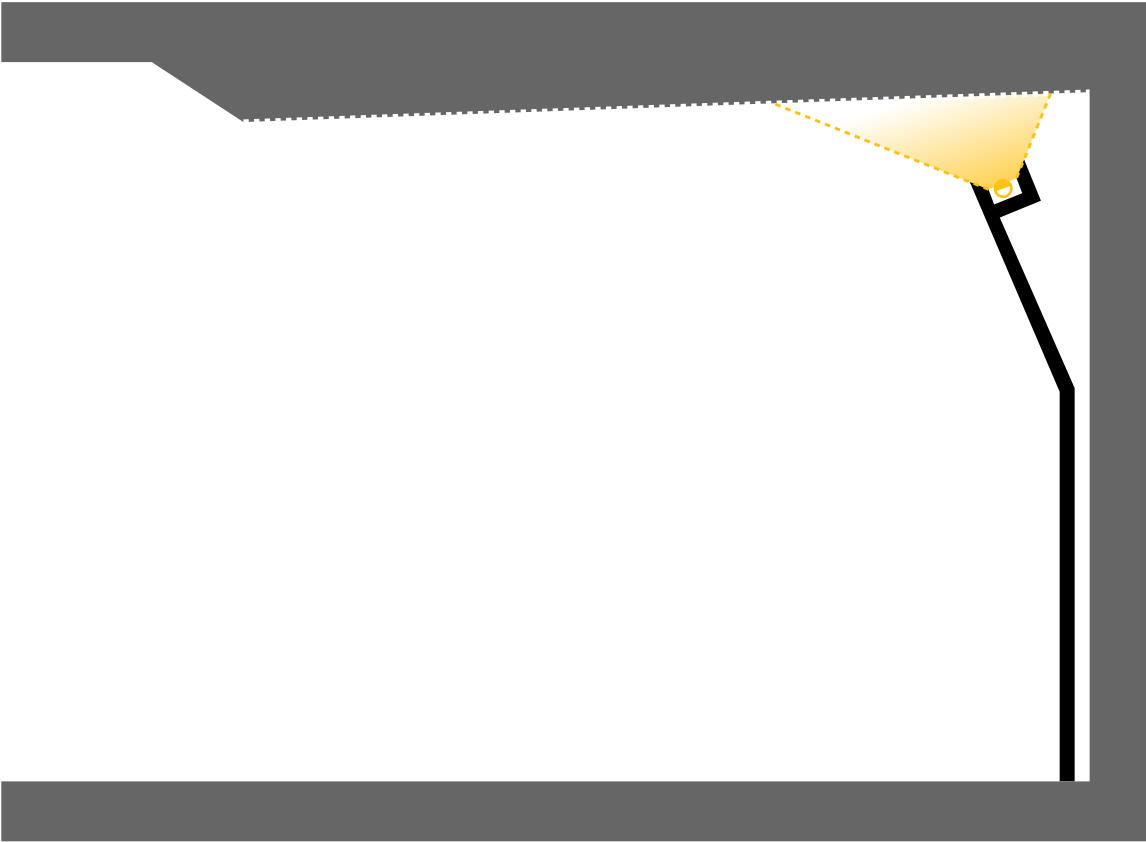


3 Indirect Light

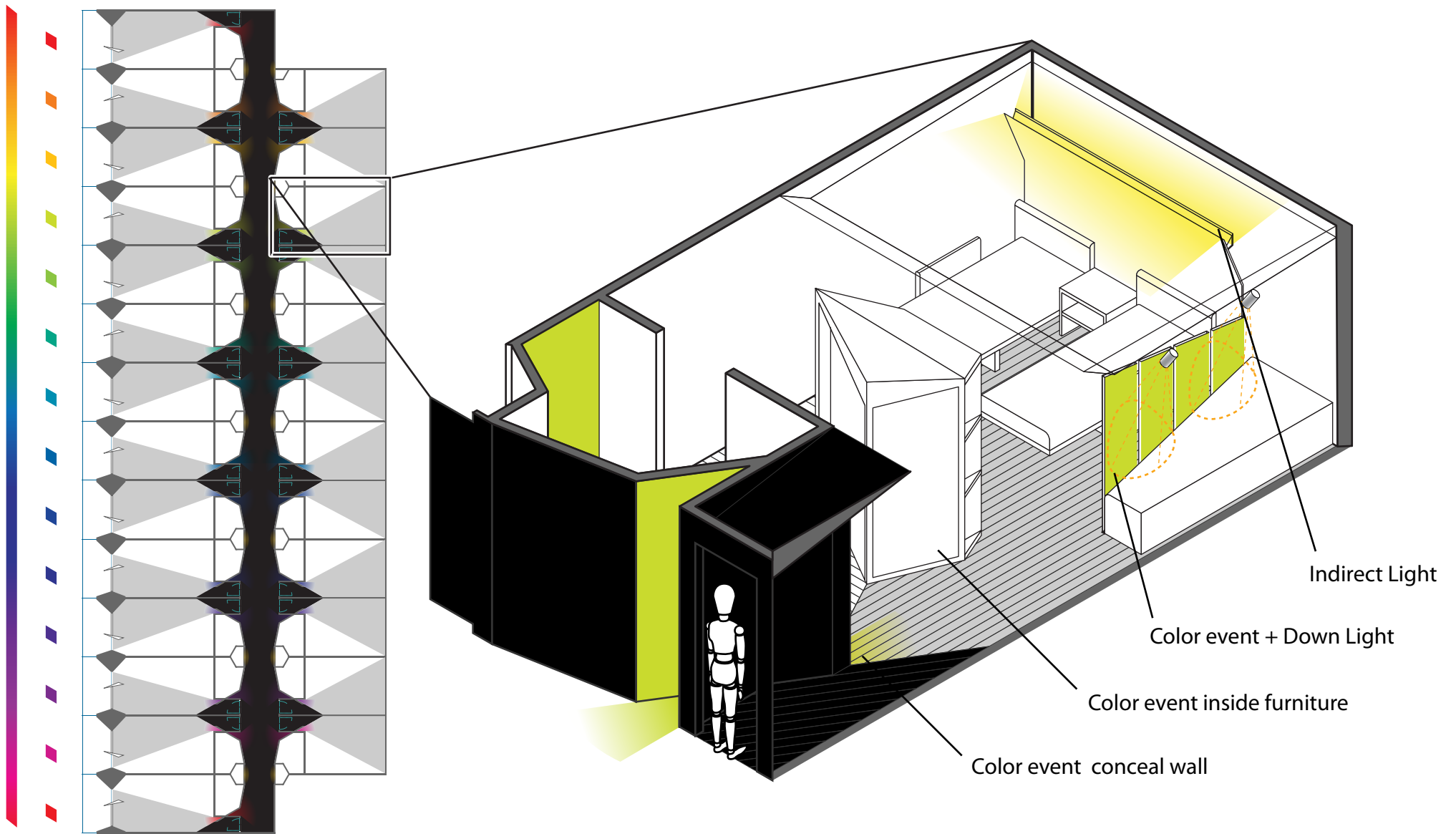
The indirect light bright from back of space fallow in ceiling surface



5.7.3.3. Indirect light system

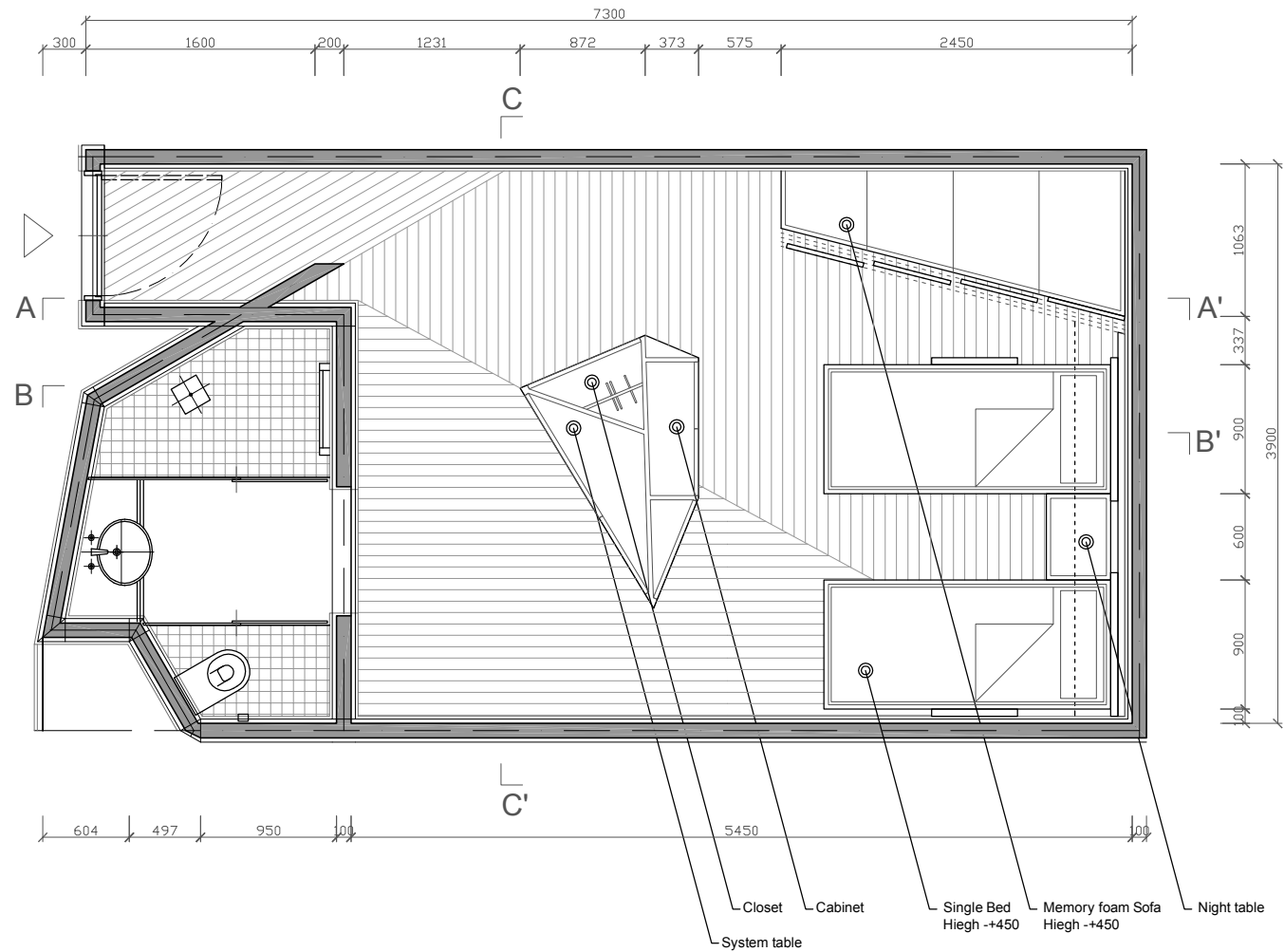


5.7.3.4. Color event system



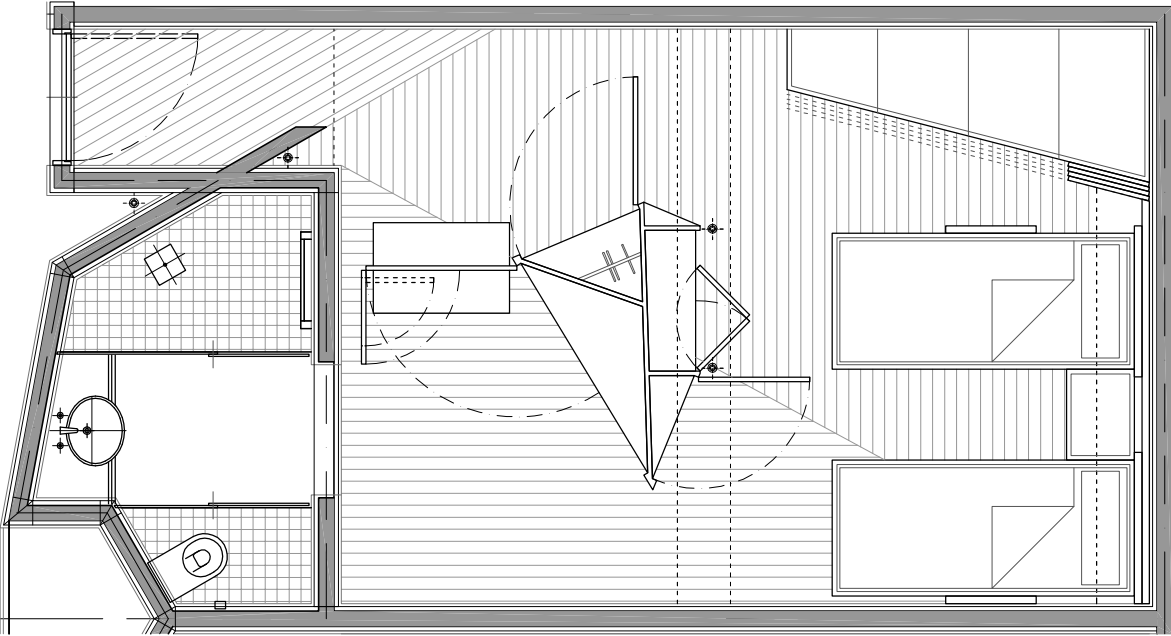
5.7.4. Floor plan

5.7.4.1. First Impression



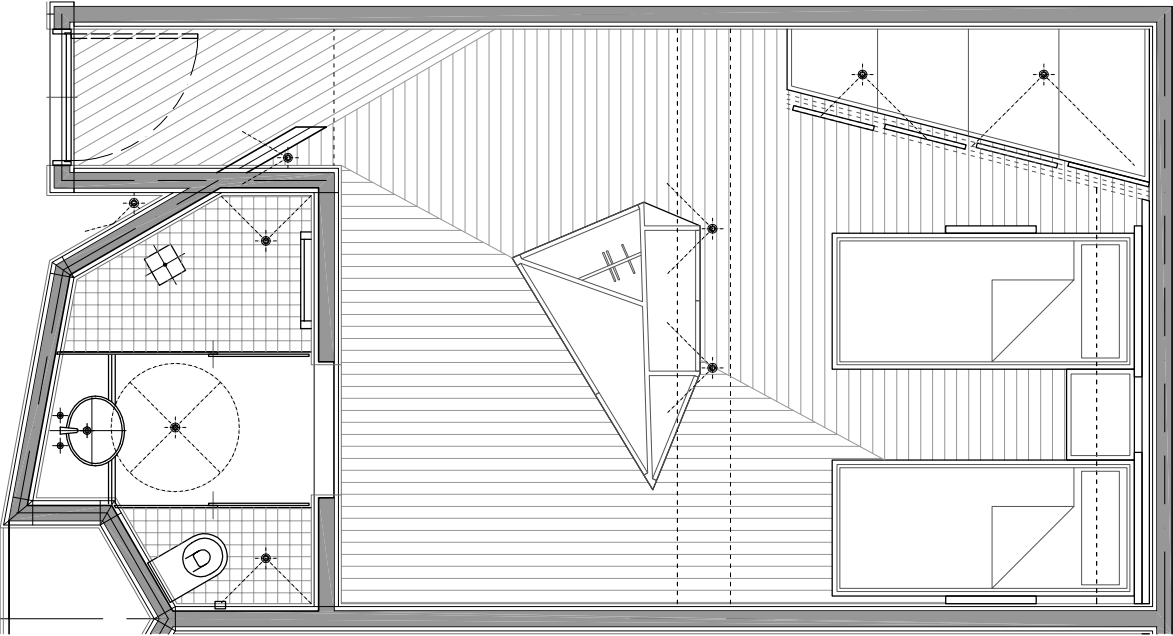
Scale 1: 50

5.7.4.2. Space Activity



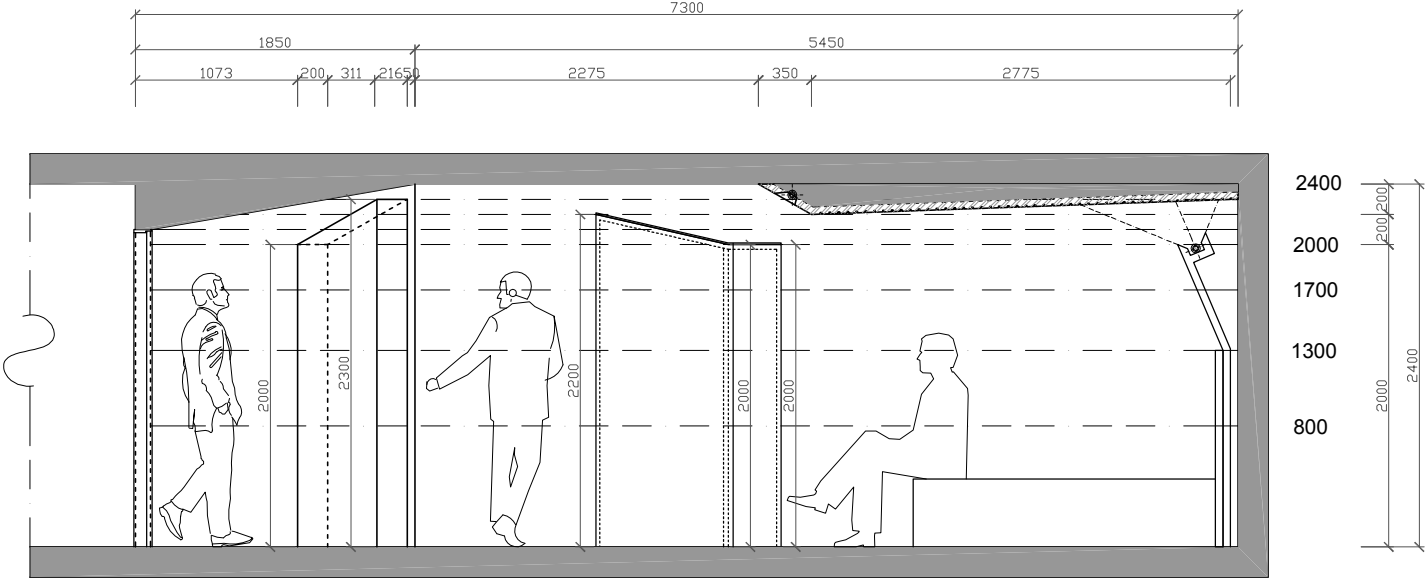
Scale 1: 50

5.7.4.3. Color & Light system: Style A

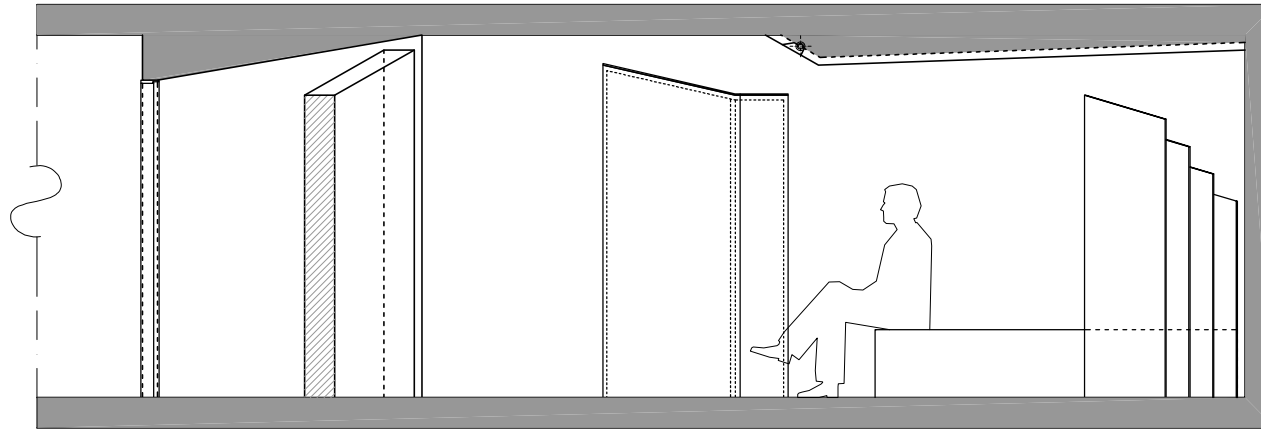


Scale 1: 50

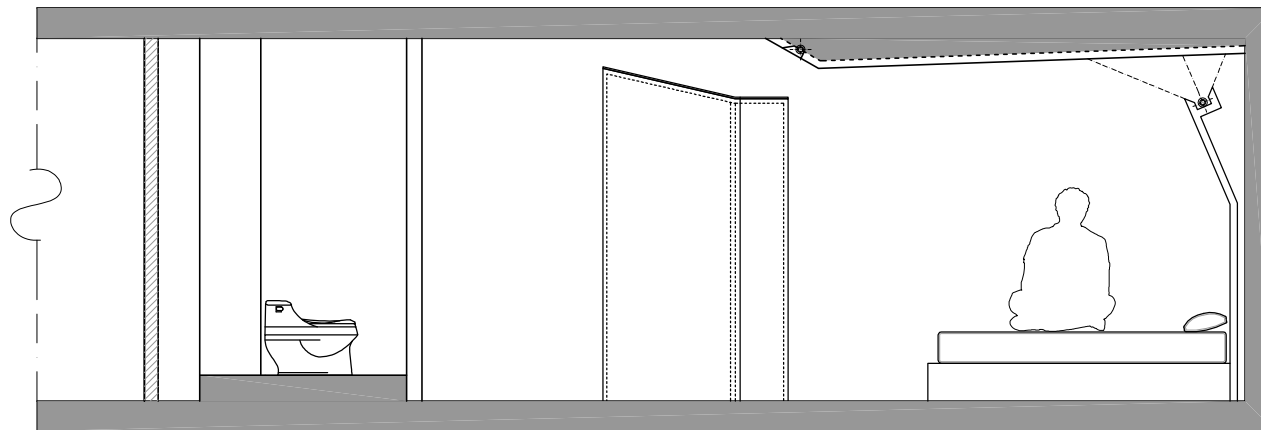
5.7.4.4. Section : Style A



Scale 1: 50

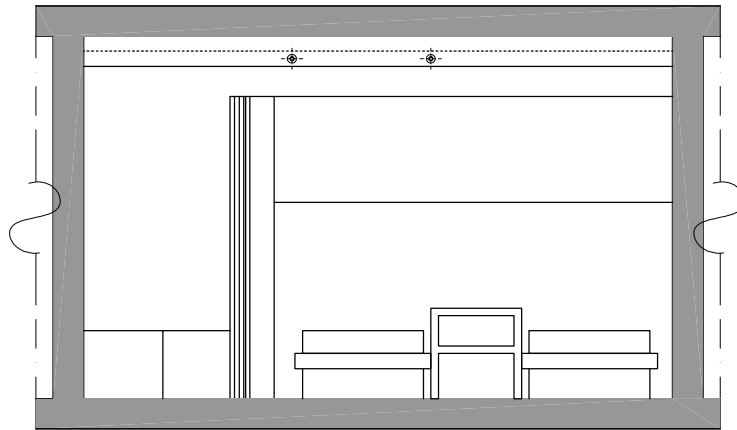


Elevation A A'



Elevation B B'

Scale 1: 50



Scale 1: 50