

Temporal and spatial designing in architecture

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With regard to the two cerebral hemispheres, it has been indicated that the left hemisphere controls language, logic, calculation, and time-series processing, while the right hemisphere governs nonverbal cognition and pattern processing. According to recent findings (Ando, McGraw-Hill Yearbook of Science and Technology, New York 2009, p. 384-389), the general characterization of the left hemisphere as “the brain for temporal perception” and the right hemisphere as “the brain for spatial perception” contributes to better understanding people’s relationships with the environment in terms of psychological reactions. However, a spatial perspective only still tends to dominate in the planning and designing of architectures and the urban environment. In fact, a planning or designing methodology that successfully employs a temporal perspective has not been established, yet. Temporal design approach is basically regarded as associated with three concepts: the development of the body as the first stage in human life, the development of the mind as the second stage, and the development of individuality as the third stage. This paper presents a temporal design methodology that addresses the third stage of development in human life (creation based on personality). There are prevailing scales of time used in temporal planning design, which is attempted to summarize in this paper.

key-word : temporal design, architectural design, architectural planning

1. INTRODUCTION

Our environment consists of space and time. Therefore, when an architect designs houses and other architectures, his thinking tends to dominate only spatial designing. This manner in the planning and designing

is partiality and imperfection. It is known that when our brain perceives the surrounding environment, both the right and left cerebral hemispheres are stimulated. It has been indicated that the left cerebral hemisphere controls language, logic, calculation, and time-series processing,

while the right cerebral hemisphere governs nonverbal cognition and pattern processing. Moreover, according to recent findings, the categorization of the left cerebral hemisphere as “the brain for temporal perception” and the right hemisphere as “the brain for spatial perception,” contributes to a clearer understanding of a person’s relationships with the environment in terms of psychological reactions. (Fig. 1; Ando and Hosaka,1983) .

For a person to perceive “preference,” it is necessary that both cerebral hemispheres are simultaneously provided with effective stimuli (Ando, 1983, Chen and Ando, 1996a, 1996b, Ando and Singh, 1997). In addition to the dominant spatial design approach, associated with the perceptions of the right hemisphere, a temporal design approach, related to the left cerebral hemisphere, is vital in the planning and designing of architectures and urban environments in order to achieve not only “functionality” but also “preference.”

And the other, temporal design is generally regarded as being associated with the three stages of human development: the first development (body), the second development (mind), and the third development (creation due to unique personality which is oriented by DNA). The realization of one’s individuality requires an awareness of one’s differences from others in terms of DNA. This is achievable by vitalizing one’s brain to a degree that renders even subtle differences perceivable. Since the brain achieves maximum vitalization when both cerebral hemispheres are effectively stimulated, equal weight shall be given to the temporal and spatial design (Ando, 1998, 2009a, 2009b, Ando and Ando, 2010). As well as the designing spatial factor, the designing temporal factor is certainly needed. This paper presents a hypothesis related to a temporal design methodology that addresses this third stage of development.

2. PREDOMINANT PERIODS IN HUMAN LIFE

In spatial design, subjects for planning and designing are addressed by differing scales, including original size, 1/5–1/10, 1/30–1/50, 1/100–1/300, 1/500–1/1000 and scales below 1/1000 (Table1, Takatsu, A.). Similarly, in temporal designing, different time domains are considered, ranging from milliseconds to 1000 years, which are particularly significant time periods for human life. Such time domains will be referred to as the “predominant periods.” Clarifying the predominant period will contribute to a clearer definition of the subjects in the temporal designing and planning, as well as spatial designing and planning. The stimulation to brain in each predominant period is important, but the direct stimulation to brain decreases so that

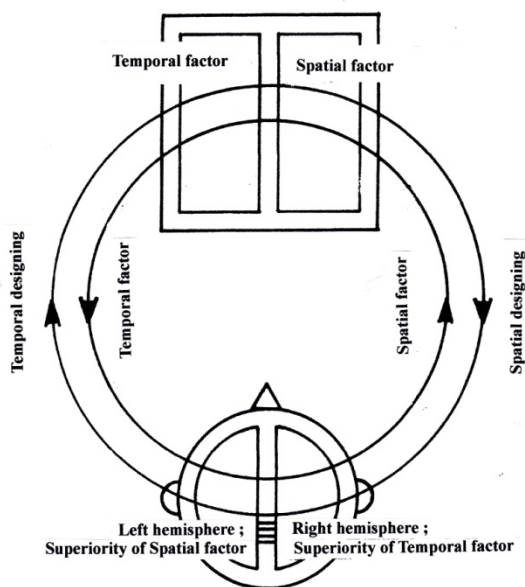


Fig. 1 Specialization in cerebral hemisphere and theory of temporal and spatial designing in environment

(Ando, 2009b, 2009a)

a period of the time becomes long. In other words, the stimulation to brain in predominant period determined by milliseconds, seconds and minutes is direct, but the one determined by the time over hour, day, week and so on, become logical grasp. This means that the stimulation to cerebral hemispheres is more important in

predominant periods determined by milliseconds, seconds and minutes. With regard to the predominant periods in human life, the following summarizes the findings related to acoustics which demonstrate the activities of the cerebral hemispheres while experiencing “preference”, and psychology chronobiology, historical and cultural studies.

scale	Area	Target	Drawings Documents, Specifications
1/1		Material Settlement	Full-size drawing
1/10		Detail Settlement	Partial detailed draeing View and section detailed drawing, Se
1/100		architecture planning	Site plan Floor plan, Cross section, Elevation
1/1000		Urban planning, Tawn-scape planning neighborhood district planning	Location map Toen-scape master plan
1/10000		City planning	City masterplan& planning map, Land use zone map
1/100000		regional planning	Regional master plan
1/1000000		National spatial strategies,	White paper in national strategies

Table 1. Sense of space (Right hemisphere of the brain) and spatial designing

2.1 Predominant periods determined by brain structure

i) Neural spike time: approximately 1 ms

One millisecond is the duration of the shortest electrical pulse that can excite nerve cells and cause a physiological reaction in human beings. It is the period in which external stimuli transmitted from sensory organs, such as the auditory and visual organs, are converted to electrical pulses. It is associated with the life-sustaining reactions such as experiencing pain, sound levels, and temperature differences. In relation to this predominant period, architecture must satisfy basic performance requirements, such as safety and comfort, which concern the first stage of human development. These requirements are met by enforcing laws such as the Building Standards Act, and through the professional ability of the architects.

ii) The psychological present: from 30 ms to several seconds

A process in time can be perceived as an “instantaneous” event by human beings. This instantaneous moment is referred to as the “psychological present” in psychology, a brief time period ranging from 30 ms to several seconds. The temporal factors in acoustic experiment, “time delay of reflected sound (ΔT_1)” and “subsequent reverberations (T_{sub}),” belong to this time domain.

The ORBIS Hall is designed as a medium-size (400-seats) multi-purpose round shaped event-hall in KOBE Fashion Plaza. This hall was designed with temporal designing in this periods as well as special designing. The final scheme for this hall was designed to maximize the scale values of both the spatial factors and temporal factors. To avoid acoustical

problems produced by round shaped walls, and maximize the total scale value of the subjective preference at each seat, various acoustical features were carefully designed. In order to maximize the scale value of ΔT_1 and IACC, various diffusion and reflection panels was installed. In accordance with its multi-functional role, this hall has four types floor plan with moving-floor system. In order to correspond to all kinds of program sources, hybrid system for additional subsequent reverberation consisting of small reverberation chamber and an erector-acoustic system was designed. The measurement results of original T_{sub} at 500Hz in this hall was from 0.8 to 0.7 s. The measurement results of T_{sub} at 500 Hz with this system was 1.9 s for a design target of 2.0 s, similarly 1.5s for a design target of 1.5s and 0.9 s for a design target of 1.0s. Then, the results shows that this hall with this hybrid reverberation-control-system has been able to correspond to all kinds of events. In particular, To eliminate the SPL dip at low frequencies, this hall was designed in such a way that sound path, which is considered one of the temporal factors controlled by space designing, can be changed using the under-floor space. In order to link the above-floor space with the below-floor space, the floors in area close to the stage were perforated with 5-mm holes at the ratio of about 9%. In the seating areas on the sides and in the back of the hall, holes of a 25% ratio have been drilled into the steel panels of the movable chairs that can be lowered into the floor convenient storage. The SPL-dips around 400Hz on the perforated floor were improved more than 10 Db, compared to the results for the normal floor. The measurement results show that there were none acoustical problems associated with circular forms. It is thought that the acoustic designing of this round-shaped hall was succeeded by that the

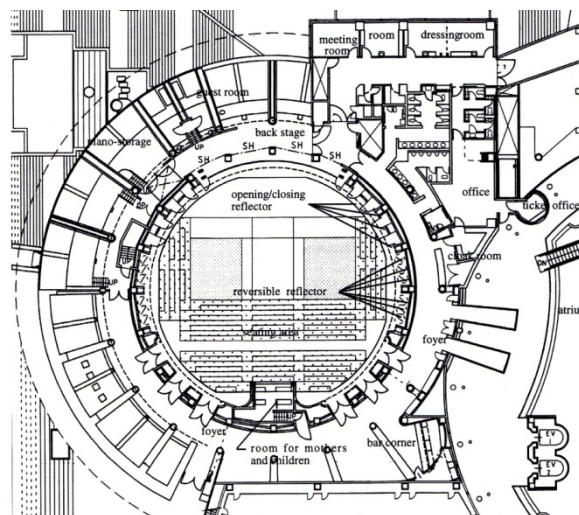


Fig. 2-1 Plan of ORBIS Hall

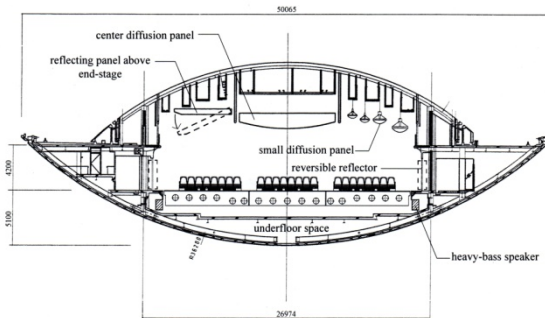


Fig. 2-2 Cross section of ORBIS Hall

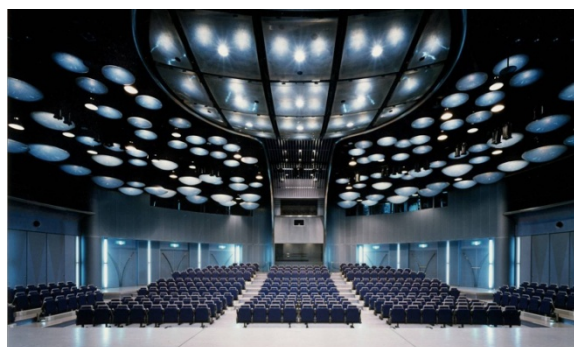


Photo.2-1 Interior of ORBIS Hall

temporal designing as well as spatial designing were considered enough for the purpose maximizing the scale values of both the spatial factors and temporal factors.(Takatsu, A., Y. Mori and Ando, Y. 1997. A. Takatsu, Sakai H. and Ando Y., 2000. Takatsu, A. Sakai, H. and Ando, Y. 2000. Takatsu, A. Sakai, H. and Ando, Y., 2002.)

The changes a person perceives within this psychological present may include those in nature, such as the flow of the wind, the sound of a brook or waves, changes in the shape of clouds, the singing of insects, or the sound of rain. Other examples include the swaying of leaves and the flickering sunlight on the surface of the water, and pattern of reflecting sunlight in the water surface.

Japanese traditional architecture contains examples of “environment” design practices that focus on this predominant period. Imperial architectures such the Katsura Imperial Villa and Shugakuin Imperial Villa employ a design integrating the interior and exterior space that combines the Shoin-style (traditional Japanese residential architecture) and Kaiyu-style (stroll garden with a central pond), enabling the appreciation of nature even from indoors. The same practice can be noticed in the temple architecture, such as those at Ryoan-ji and Nanzen-ji Temples, in which the Hojo Garden (rock garden) is integrated with the temple architectures.

2.2 Predominant periods determined by circa-rhythms

i) Sleep cycle: approximately 90 min.

There are a variety of changes in nature that a person may become aware of within this predominant period. These include variations in solar and lunar altitudes, shadow lengths, and weather. Physiologically, it is known that REM and non-REM sleep consists of cycles of approximately 90 min., generally also considered the maximum length of time for which a person can sustain his or her concentration on work or study.

There are many examples of architectural design that are conscious of changes in sunlight, such as The Row House in Sumiyoshi by Tadao Ando. It is a masterpiece that was rewarded by the



Photo. 2-2 Katsura Imperial Villa (primary color Art of Japan no.15, Katsura Imperial Villa and Chashitsu ; SHOGAKUKAN)



Photo. 2-3 Ryoan-ji Temple (primary color Art of Japan no.10 , Zen temple and Rock garden; SHOGAKUKAN)

Architectural Institute of Japan, and is a good example of modernist architecture that incorporates such design. The architect daringly included a courtyard, in spite of the narrow dimensions of the site, to create the life with the changes in nature, in this predominant periods. Among traditional Japanese architecture, the approach to the Konpira Shrine is a good example of temporal design concerned with this predominant period. It is designed to evoke an uplifting feeling as pilgrims approach the main pavilion, using various techniques such as the strategic placement of eye-stop focuses, the slight shifting or large right-angle redirection of the axis, the expansion and narrowing of spaces, and the

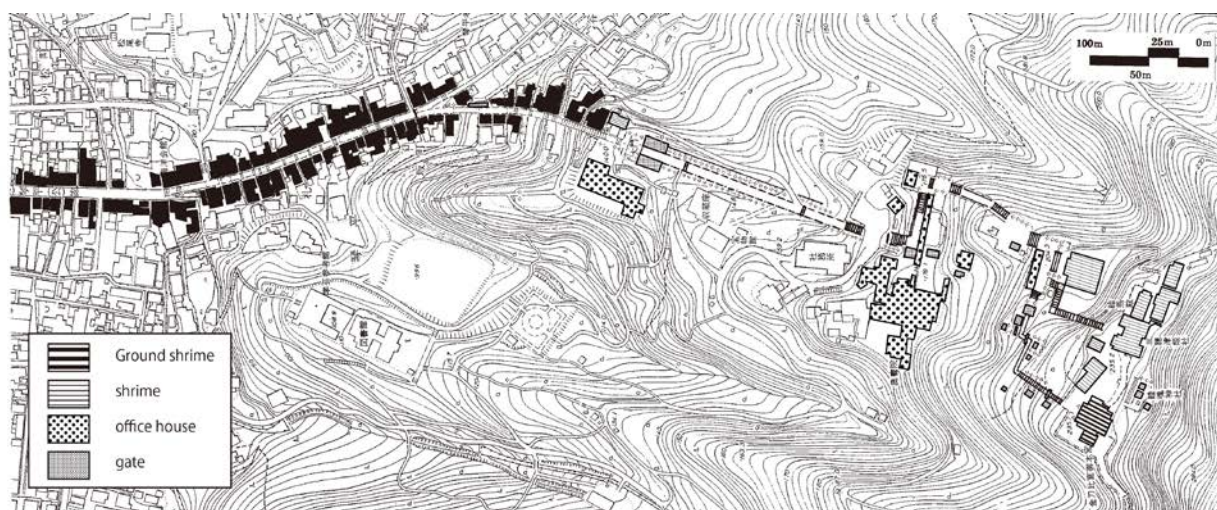


Fig. 2-3 Site map of Konpira Shrine

skillful positioning of staircases and bridges.

ii) Circadian-rhythm: a day

The greatest natural change that occurs within a day is the alternation between day and night caused by the rotation of the Earth. The rise and fall of the tide can also be perceived within a day. Predominant rhythms in life that are shared by most people include events and activities such as waking up, eating a few meals, excretory, working (or study), and sleeping. The duration of a circadian cycle is generally considered to be 25 hours.

Apart from the natural flow of time experienced through such rhythms, people, in their daily life, deliberately engage in a variety of activities throughout the day based on “schedules” and “programs.” However, even if activities change by the “hour,” a daily program tends to be repeated. Therefore, people have created facilities, such as theaters, concert halls, theme parks, and global merchandise centers (GMCs), to engage in experiences that nourish “life” in terms of experiencing the sense of being alive.

In the Jodo-do of the Jodo-ji temple, the statues of the Amitabha Triad stand facing east on the pedestal of the lotus above the

cloud. Each day, during sundown, a ray of sunlight penetrates the hall from an opening in the west, illuminating it in red. This is an example of a temporal design that conforms to the circadian rhythm, and it produces a scene representing the arrival of the Amitabha Buddha from the Pure Land. This architectural masterpiece is designed for the third stage of human development to provide people a sense of being alive by experiencing an extraordinary space.

2.3 Predominant periods determined by infradian-rhythms

i) Weekly cycle

A week is an entirely artificial time domain created by mankind. While changes occur between each “day” of the week, a variety of “weekly” programs are repeated and routinized, such as school curriculums and television programs. Seeking freedom from weekly repetitions and routines, people take vacations seeking extraordinary experiences, including traveling to the sea or the mountains to explore nature, and traveling to historic cities. Through such activities, people experience the sense of being alive in the third stage of human development.

The Kobe Fashion Plaza is a building complex that holds the Kobe Fashion Museum at its core. The architecture consists of a hotel, cinema complex, retail stores, restaurants, and a large atrium that connects every institutions in this large architecture. The exterior is designed to ask the question, “What is fashion?” Based on a story, the question is expressed through a design that depicts a UFO crashing into the building. Partially because this complex was built on a newly-developed artificial island, it was provided functions and designs with a strong awareness of the extraordinary to attract customers.

ii) Monthly cycle (circalunar-rhythm)

The lunar cycle is the basis on which calendars and the time axes were created. Since antiquity, the Japanese have enjoyed “life” in the third stage of human development. They placed themselves in an eternal flow of time, as they watched the full and chip of the moon from “Tsukimi-Dai”, moon-watching terrace, or its reflection on the surface of a pond. Many examples of architecture that can provide such experiences are found among old Japanese imperial villas and Zen temples. The Katsura Imperial Villa can be justifiably described as dedicated to enjoying the moon. Most notably, the moon-watching terrace, which projects into a pond, offers a view of the moon in the sky as well as the view of its reflection on the surface of the pond.

iii) Yearly cycle (circannual-rhythm)

In the natural world, the seasons; times of sunrise and sunset; culmination altitude of the sun; growth of plants; and behaviors of migratory birds, insects, and so on, change daily within the circannual cycle. Since antiquity, the Japanese have devised various ways to cherish and enjoy such changes. This is represented by the



Photo. 2-4 Kobe Fashion Plaza



Photo. 2-5 Tsukimi-Dai in Katsura Imperial Villa (primary color Art of Japan no.15 ,Katsura Imperial Villa and Chashitsu ;SHOGAKUKAN)

integration of exterior and interior spaces in spatial design, which enhanced people’s interactions with nature and the changes of seasons. Annual events, such as the new year celebration, Setsubun (start of Spring), Momo no Sekku (girl’s festival), Hanami (cherry blossom viewing), Tango no Sekku (boy’s festival), Tanabata (star festival), Bon festival (custom of ancestral worship),

autumn festival (harvest festival), and the new year's eve celebration, serve as opportunities to vitalize life by deviating from the mundane pattern of life. Those events facilitate an awareness of seasonal changes and the passage of time as well as enable one to delight in the changes in nature. These are temporal design practices created by the Japanese because of their close relationship with nature, dedicated to "life" in the third stage of human development.

2.4 Predominant Periods of Human Life-Stages

Several predominant periods under mentioned are empirically derived and have not been confirmed by firm evidence. Even though they are hypothetical, the following predominant periods as largely concerned with temporal design is proposed.

i) Three-year cycle

Furthermore, we are empirically aware that the mental and physical development of a person is governed by an approximate three-year cycle. This includes the first phase of childhood (infancy), during which a newborn child gradually becomes capable of basic communication and conscious behaviors; the second phase of childhood (post-infancy), during which a child gradually becomes capable of communication with persons other than his or her parents; the first half of elementary school education, during which children establish the foundation for social living; and so on.

An elementary school constructed with consideration of these three-year cycles is the Utase Elementary School in Chiba City. It is renowned for its "open school" policy. Each lower-grade classroom is accompanied by a space in the courtyard, which could be

described as an outdoor classroom space. In the case of higher-grade classrooms, a group of classrooms share a large indoor workspace. For intermediate grade classrooms, each one is assigned an individual indoor work space. Thus, the school provides the children with a spatial environment that considers their stages of development and facilitates their transition from the initial three years to the later three years of elementary school education.

ii) 10-year cycle

Especially mentioned term in human-life, which concerns with physical and mental development, is 10-year cycle. This is a longer cycle that governs physical and mental development. This includes the duration from childhood to graduation from elementary school, during which children require the care and protection of their parents; adolescence, during which children prepare themselves to become independent from their parents; and the period of time in which a person becomes financially and mentally independent from their parents. And then, stages of life continue to change as a separator for about 10 years.

It is necessary to modify spaces taking into account the ten-year cycles governing a person's mental development. Infants and lower-grade students in elementary schools could share a large room with other children and substitute a study desk with a large dining table. However, in the second ten-year period, children should preferably be afforded a private room or at least a space in which their privacy may be respected. During the third ten-year period, individual daily schedules differ greatly, making it necessary to devise designs that provide for such independent lifestyles, such as those that consider the paths between the bedroom, bathroom, and toilet, etc. In the fourth ten-year period, children may leave home,

allowing parents to enjoy the second half life with greater freedom from financial burdens and various obligations. Therefore, it is necessary to thoroughly consider what one would like to do and in what type of dwelling one wishes to live during this period of life. Once people become old, they require handrails along hallways and staircases and may also need to consider eliminating differences in floor levels. One may eventually require a wheelchair or become bedridden. It is possible to count the number of years, but impossible to foresee the future. Life is replete with uncertainties. Therefore, a long-term perspective that considers the ten-year cycles should not be ignored in planning a home, which is part of the basic infrastructure that supports life.

Separating the skeleton (building frame and energy/water/drainage infrastructures) and the infill (interior structures) is a design approach that can be applied to such structures, which effectively fulfills the needs of the ten-year cycle. Such construction enables the modification of only the infill, without touching the skeleton, in accordance to the changes in the different periods of life. Since houses can be renovated without deconstructing the skeleton, the method is eco-friendly and contributes to resource conservation.

iii) 30-year cycle

In Japan, which has become an aged society, the 30-year cycle signifies the alternation of generations. That is, the developmental years from birth to independence; the period of family building and child rearing; and finally the period that follows the children's independence. Therefore, houses would ideally be designed to endure across generations and in a manner that enables the utilization of temporal design.

The formalized rebuilding of the Ise Grand Shrine occurs every 20 years. One of supposed reasons for the 20-year interval is that it corresponds to the duration required to transfer construction techniques to a new generation. Considering that human life-spans were shorter in ancient times, this parallels the 30-year cycles of the modern era. This is a remarkable example of temporal design that ensured the eternal perpetuation of the sacred shrine.

Another example is the Disaster Reduction and Human Renovation Institution in Hyogo Prefecture. Dedicated to commemorating the Great Hanshin–Awaji Earthquake, this building was established as a center for hosting informative exhibitions about the earthquake, displaying materials related to the Earthquake, conducting research about urban disasters, and disseminating corresponding information. For these



Photo 2-6 Disaster Reduction and Human Renovation Institution in Hyogo Prefecture

purposes, a large column-less space and an under-floor air conditioning system was employed to enable flexible arrangements for exhibitions. This building is an urban example of temporal design that is prepared against disasters expected to occur according to mid- to long-term perspectives.

2.5 Stages of Cultures

Culture arises by a long-term accumulation of each individual's creativity. At the same time, each individual's creativity, the third stage of human life, glows by culture and civilization. It is necessary to hear in mind about what should or should not be allowed to change for human in 100 or 1000 years later.

i) 100-year cycle

In Japan and other advanced countries, people now reach the age of approximately 100 years old. Human development has been accelerating since the dawn of history. Even though we may lose track due o rapid changes in the business world, it is important to remain aware of such 100-year cycles in relation to the enrichment of culture and landscape which are the basement for the third stage of human life glowing, when considering urban environments, architecture, and houses.

The Hyogo Prefectural Museum of Archeology inside the Onaka Archeological Park, holds pit-type dwellings from the Jomon Period that have been discovered and reconstructed. One of the functions of this building is the preservation of the original atmosphere and landscape of the archeological park. Therefore, the building was constructed within a new artificial hill inside the park. When visitors enter the museum, which represents an ancient world, they walk along a walkway surrounded by huge walls designed based on the motif of



Photo. 2-7

Hyogo Prefectural Museum of Archeology



Photo. 2-8 Site of Hyogo Prefectural Museum of Archeology in Onaka Archeological Park

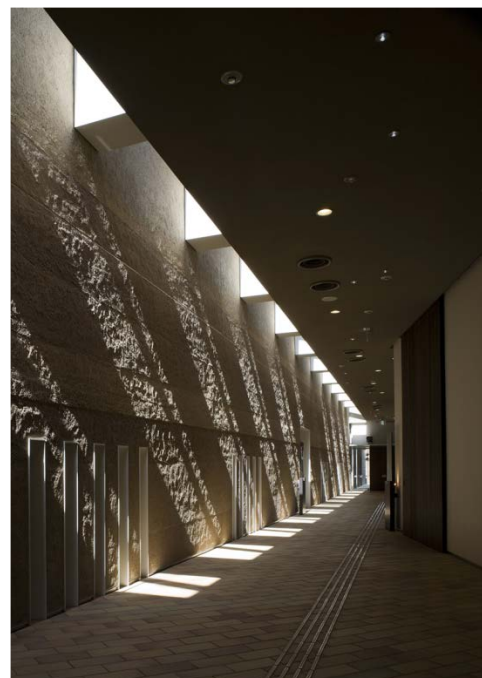


Photo. 2-9

Interior of Hyogo Prefectural Museum of Archeology
The wall which is consisted of the waste soil produced by the construction work

geological layers observed on the sidewalls of archaeological excavation trenches. The material used for making these walls contains the waste soil produced by the civil engineering work conducted at the site. This building, with its careful attention to the landscape and local history, is an example of an architectural design that is conscious of the 100-year cycle.

ii) 1000-year cycle

Obvious examples of architecture planned and designed within the predominant period of the 1000-year cycles are the large cathedrals, temples, and mosques related to the religions. Another subject related to this predominant period is the consideration for the global environment. We need to plan and design environment with a very strong awareness of the sustainability of the environment, the alleviation of global warming by reducing CO₂ emissions, and the preservation of biological diversity.

2.6 Other Predominant Periods (“Missing Links”)

Being engaged in the planning and designing of environments, it is empirically ascertained that one or more predominant periods remain unmentioned. These exist between the predominant period determined by cerebral physiology (with the time domain of 30 ms to several seconds) and those determined by ultradian-rhythms (sleep cycles with the period time domain of 70–90 min.). The following is a hypothesis regarding these unmentioned predominant periods.

One such predominant period has a period domain of 1–3 min, and the other has a period time domain of 10–15 min. We can only speculate whether these time domains are predominant cycles associated with the emotions and behaviors of a person.

However, it is attempted to summarize them through empirical and intuitive understanding. The former will be referred to as the “emotional present,” and the later as the “imaginary-present.”

i) The emotional present: 1–3 min

Direct stimuli to the brain are integrated to become recognizable as emotions. The time it takes for this development of emotions is presumed to be 1–3 min. Hypothetically, this is the time domain in which an image is formulated by recognizing changes in the surrounding environment, which occurs in the course of the voluntary actions of a person. For example, they could be the perceptual changes that occur while walking and the acoustic changes that occur while listening to music. This designing or planning associated with this predominant period may include the planning of a landscape along a road; the approach way; and the interior, which considers people’s movements inside the building. In the West, architectures are often positioned along shared lines of axis and offer a perspective of the entire architecture. In Japan, the space along an approach to the main architecture is given significant architectural attention. Visitors to the Mizu-mido at Honpuku-ji, designed by Tadao Ando, walking along an approach road, concrete wall of straight line appears. When They step into the opening that was drilled in the wall, they find a curved fair-faced concrete wall. Along the curved wall, the approach will continue on a slope and further 180 ° turn. While they reach the top at last, they see the lotus pond. Then, they find a stairway at the center of the pond that leads to a space below it. Descending this, they finally reach the sanctuary. This architecture has nothing resembling a façade. Instead, the approach provides visitors with different impressions at different moments.

In this sense, this architecture is a good example of temporal design attuned to the emotional present.



Photo. 2-10 Mizu-mido at Honpuku-ji
(Tadao Ando 0 Process and Idea;TOTO Press)



photo.2-11
Kaiyu-type garden in Rokuon-ji Temple
(primary color Art of Japan no.10 , Zen temple
and Rock garden; SHOGAKUKAN)

ii) Imaginary present: 10–15 min

Many people would agree to experiencing boredom when the cityscape remains constant for more than 10 or 15 min, especially a busy cityscape. Hypothetically, it is assumed that an image is formed through the integration of the previously mentioned moments of the emotional present, and that this process occurs in the 10–15 min time domain, identified as the imaginary present. This is exemplified by the way in which a 600–1000 m area, the distance covered in 10–15 minutes of walking, is easily graspable by our minds as same area of city and one colony. In addition, in the case of documentary films, etc., the maximum duration for uninterrupted concentration on a single theme is generally believed to be 15 minutes.

An architectural design that considers this predominant period is the Kaiyu-type garden (stroll gardens with a central pond), such as that found at the Katsura Imperial Villa and Rokuon-ji Temple. A Kaiyu-type garden typically has a large pond at the center, a path around the pond, an artificial hill, a small island in the pond, bridges, rocks of various shapes, an arbor, and a tea house. Such elements provide the visitors with changing scenery as they walk around the garden, while also imparting a strong unified image of the garden. Thus, such gardens are pioneering examples of temporal design related to this time domain.

3. SUMMARY

Table 2 summarizes Sections 2, D–VI, addressing different predominant periods and their relationships with the design and planning of architectures and urban environments, including references to natural phenomena, human physiology, human life, and culture.

	Predominant period	Stimulus to a brain	Nature	Physiology Culture	Candidate for plan / design	Temporal designing in the third stage in human life	
						Architecture	Remarks
Neurologic presence* 1/1000 s.	1 ms	Stimulation	Sound (acoustic) Light (visual)	Neural spike time The first stages of human development	Safety, Security Basic performance in the architecture		Building standards Professional ability of architects
Psychological presence second	30ms ~ 5s		stream sound sound of wave singing of insects	brain waves breathing, heart tempo of music	acoustic space, music hall garden, exterior, flame of fireplace feel of materials of buildings	MIYAMA-Conseru Belle Forêt TSUYAMA Orbis Hall	te
Emotional presence* minute	1 min ~ 3 min	Time sense of European and American-style for eternity and permanence	(Street scape)	Walking Body activity	Thermal environment Pedestrian space	Planning for street scape Mizu-Mido/Honpuku-Ji	Total of stimulus for five senses
Imaginary presence*	10min ~ 15min		(Town scape)	Image of a group	Planning for town scape Approach space Garden, Exterior	Esplanade (Tetsugaku-no-michi) Kaiyu-type garden (KATSURA Villa) TESHIMA-Museum	Total of emotion
REM-nonREM sleeping cycle	70 ~ 90m	Time sense of Japanese-style for eternity and permanence	Altitude & shadow of sun and moon wether	Sleep cycle	Function planning Section planning	Row House in Sumiyoshi Approach of Konpirasan-temple	On-time designing Off-time designing
Circadian- rhythm day	25h		Alternation between day and night Rise & fall of the tide	Greeting, Praying Routing-works	Freedom from routine-works Theater, Museum, GMCs Presentation at weekend in theater	Jodo-ji/Jodo-do KOBE-Fashion-Plaza	
weekly cycle	1 week	Time sense of European and American-style for eternity and permanence		TV program Classes in a school	Demand to non-everydayness Resort, Sightseeing spot	Traditional village, city Disney World	Demanded vacation or stimulation to escape from the repetition of a monotonous week
Circalunar- rhythm month	1 month		Waxing and waning of the moon	Menstruation phenomenon of the women	Garden Toko-no-ma, Tsukimi-dai (retire to view the moon)	KATSURA Imperial Palace Daikaku-Ji (Viewing the moon using Osawa Pond)	Progress of the confirmation Volume confirmation
Circannual- rhythm year	1 year	Time sense of European and American-style for eternity and permanence	Seasons, Sunset and sunrise time, Growth of the creature	Farming, Festival Delivery period fiscal year, Terms	Landscape, Garden Sound environment during pregnancy	Festival in JAPAN Shougatsu, Setsubun, Sekku, Hanami Tanabata, Bon, and so on	Confirming of the aging by a festival memorial day Update of the sense by the year
Life stage 3years- cycle*	3 years			mental and physical growth prevalence	Growth of the brain cell Education (language, music) Midterm plan in organization	Utase elementary school	Interval of the orbit adjustment in the long term project Mental and physical stage of growth
Life stage 10years- cycle*	10 years	Time sense of European and American-style for eternity and permanence	Sunspot	Each period at life (infants period) Fashion	town-scape (Static Scape) infrastructure plan urban (re)development	Housing used method by skeleton infill	Renewal of the architecture Mental stage of growth
Life stage 30years- cycle*	20-30 years			Alteration of generations	Landscape City planning National land planning	ISE grand Shrine	Recurrence in the fashion
Culture stage 100years* century	100 years	Time sense of European and American-style for eternity and permanence		Duration of life	Culture		Establishment of the history recognition
Culture stage 1000years* millenium	1000 years				Civilization	Magnificent cathedral, temple and mosque	History editing

* Author's hypothesis

Table 2. Sense of time (Left hemisphere of the brain) and temporal designing

REMARKS

The paper summarized the predominant periods in human life that are footholds in the implementation of temporal design.

Further, it presents a provisional proposal concerning the topics of focus for different types of predominant periods.

Previously, temporal design has been employed in architectural plans, both consciously and unconsciously. Urban planning, for instance, requires constant awareness of temporal factors. In this paper, a systematic description of such practices is provided. Since this field of study needs further exploration, it is hoped that the hypothetical nature of this paper be accepted, and that interdisciplinary research related to this topic will be promoted and continued. Based on a belief that the sense of time is deeply rooted in cultures and is

specific to different races, unique theories concerning temporal design are expected to develop for the different cultures of different nations. It is hoped that this effort will contribute to the formation of societies that support enjoyable and active lives as well as the development of "life" in the third sense of the word.

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