

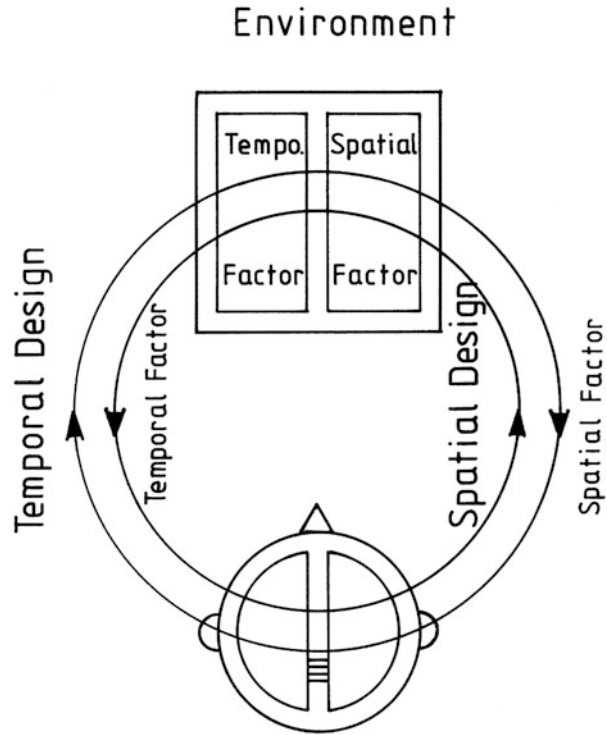
Preface

From a brain-grounded theory of design based on subjective preference of the sound field in concert halls (Ando 1985, 1998, 2007, 2009a, b) to a brain-grounded theory of temporal and spatial design in architecture and the environment, our research affirms that by encouraging personal traits and satisfying individual needs, subjective preference works as an approach to enhancing individual health and creativity. Most generally, subjective preference is regarded as the primitive response of a living creature that entails judgments that steer an organism in the direction of maintaining life, so as to enhance its prospects for survival. Therefore, subjective preference may be deeply associated with the base of aesthetics.

The auditory preference model consists of two kinds of internal representations of sound that are based on the autocorrelation- and crosscorrelation-like structures of sound as it presents itself to the two ears. The autocorrelation function (ACF) describes the monaural and temporal signal at each of the two ears, while the interaural crosscorrelation function (IACF) describes the binaural and spatial signals arriving at the entrances of the two ears. Remarkably, temporal sensations, such as loudness, pitch, duration, and timbre, are well described by the temporal factors extracted from the ACF of the sound signal; and spatial sensations, such as localization, apparent source width (ASW), and subjective diffuseness, are described by the spatial factors extracted from the IACF (Ando 2009a, 2015).

The information corresponding to subjective preference of sound fields was found in the effective duration of the ACF of the alpha waves, registered by both the electroencephalogram (EEG) as well as the magnetoencephalogram (MEG). The repetitive feature of the alpha wave, as measured in its ACF, was observed at the preferred condition. This evidence suggests that the basic theory of subjective preference may be applied to individual preference as well. By analyzing the MEG, we reconfirmed that the left cerebral hemisphere is associated with the temporal factors of the sound field, and the effective duration of the ACF alpha wave directly corresponds to the scale value of individual subjective preference. The right cerebral hemisphere is activated by the typical spatial factors, i.e., the magnitude of interaural crosscorrelation (IACC) and the listening level.

Fig. P.1 Interaction between environment consisting of temporal and spatial factors and the left and right human cerebral hemispheres, respectively, associated with the temporal and spatial factors. This is the ground of theory for designing the architecture and the environment as well as artistic works. Such a well designed environment realized by the subjective preference theory induces further creations developing individual personality (Ando 2009a)



The theory of subjective preference has been developed with auditory perception in mind; it can plausibly be extended to predict subjective preferences in analogous dimensions of visual perception. Thus, parallels can be drawn to temporal and spatial sensations in vision as well as to subjective preferences for visual environments. For example, the most preferred condition of a flickering light is expressed by the temporal factors extracted from the temporal autocorrelation function (ACF) of the modulated light stimulus. It is shown how the temporal and spatial factors of auditory and visual percepts are associated with the left and right human cerebral hemisphere, respectively.

A brain-grounded theory of temporal and spatial design has been proposed as indicated in Fig. P.1 (Ando 2009b).

Three Stages of Human Life (Time): A Definition

For temporal design of the human environment, three stages of life which are granted to each individual person at birth are considered in this volume. The first of these is the physical life for which the main nutritive element is food, the second is mental life for which nutritive elements are culture and art including, for

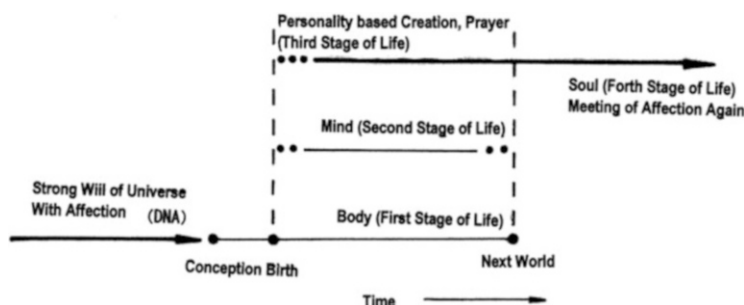


Fig. P.2 Three stages of human life defined in this volume that are taken into consideration in planning the temporal and spatial environment (Ando 2006).

Human life consists of: (1) life of body, (2) life of mind, and (3) life of creation, which is based on the unique personality of the individual that persists long after the individual has passed on. Thus, the third stage of life includes creations based on personality together with awaking higher perception, which continues to the fourth stage of life after passing the life (Fig. P.3). The third life is a source of joy that broadens a life from a philosophical standpoint, making it unique to humans compared to the life of animals who only enjoy first and second lives. Nourishing the first and second stages only inevitably induces “ill treatment” and further “wars” similar to animal life

example, music, painting, literature, and fashion. These two stages are what humans share with animals; the only difference lies in respective proportions. The third stage is distinctive of humans as shown in Fig. P.2 see also Fig. P.3; “the third life” is also considered the noblest of the three. According to individual DNA and the varying environmental conditions in which we grow up, each of us may have a unique purpose to find and work on throughout our lifetime (Fig. P.4). The elements that either nourish or prevent the growth and development of this stage are the limitations of art and science at the present stage, worship and philosophy, and degree of conscious design in the environment where individuals develop to find - or miss - their “mission”. It is possible to achieve health-promoting conditions on all three levels of an individual’s life by the temporal design of the environment.

It can be argued that science, technology, and art are forever immature (Fig. P.5) since they are always under development. The nineteenth and twentieth centuries are commonly viewed as the era in which technology made rapid progress. However, such progress came at the high price of environmental destruction and war. In hindsight we can say that it was overconfidence in our knowledge of science and technology that brought about such disastrous results; science and technology should be regarded as mere means for mankind, not as ends in themselves. In order to make a coming age of fulfilling human life a reality, we must understand mankind itself better; this can be achieved by incorporating the concept of the third stage of life into our thinking process. On this account, we should prepare an environment where every individual’s unique sensitivity is regarded and valued as the groundwork for a meeting place between science and art.

Fig. P.3 “Full of affection of universe” painted by Keiko Ando (2015)



The question of how many years mankind will be able to survive is currently the primary international and social concern. There have been major wars under the plea of racial liberation, religious liberation, or the liberation of a state, and the

“Seed” or DNA developed, since the big bang.

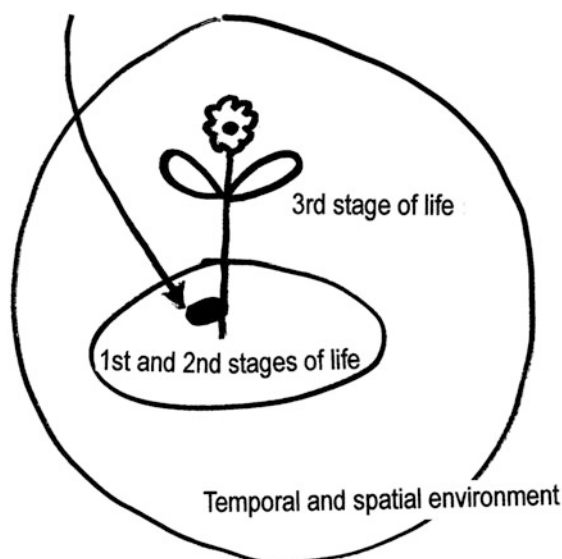


Fig. P.4 Development of the third stage of human life originating from a genetic “seed” that is nurtured in an appropriate temporal and spatial environment. In a preferred environment, the personality for a unique creation develops and effloresces like the flower of a healthy plant

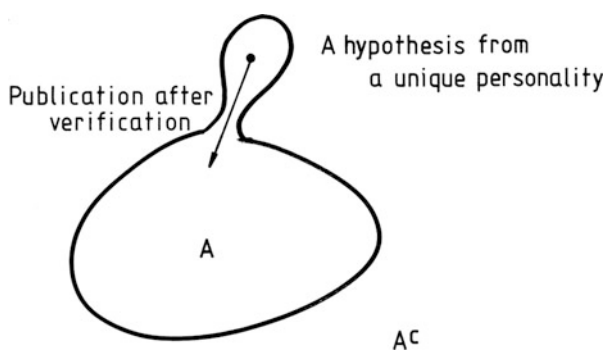


Fig. P.5 Sets of the known A and the unknown A^C . Creations start with a hypothesis from a unique personality. After verification of the hypothesis, the result may be published. This is a process of the third stage of life. Integration of these kinds of creations is called “culture”

likelihood of such events reoccurring cannot be denied at present. Therefore, we hope to make the liberation of unique personalities (the third life) the ultimate objective of this volume. The liberation of individuality here means to accept and value the diversity of individual traits in every person, and to cultivate creativity, which can be achieved only by supporting each individual potential.

A well-designed environment could be a meeting place for art and science and may help to discover individual personality as the minimum unit of society. Temporal and spatial factors associated with the left and right cerebral hemispheres, respectively, may be well-used in design that blends a built environment together with Nature. In turn, such environments may support the development of the human cerebral hemispheres, especially during the period from the very beginning of life to about 3 years of age.

Role of Individuals in Society

Space (land) was once thought to be a personal possession, and time was thought to be the same for everyone in the past. But in fact space (including the environment) is something common to all mankind from generation to generation, and fundamentally, time is that which belongs to the individual because of the nature of life. It is ideal to build an environment as well as a society where people can enjoy healthy physical, spiritual and individual time for creation.

Above all, we would like to establish that the possibility to nurture creativity (to make a contribution generation after generation) as it presents itself in individual time is unique to mankind, as is the possible liberation of individuality. In other words, there are mysteries solvable only by each person's individuality due to differences in the DNA and the emergent viewpoints, which will never be generated again (Fig. P.6). Such unique solutions may gain their eternal value only when unveiled, and it is no exaggeration to say that those mysteries unsolved are much like solutions that remain unfound as a result of uniform education.

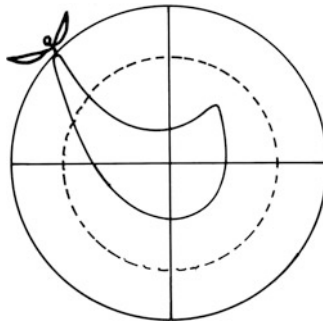


Fig. P.6 Individual potential steered by the personality (DNA “seed”) in a particular direction to discover something original that has not been previously known. For example, typical directions are music, arts, athletics, mathematics, science, engineering, literature, medicine, history, geophysics, agriculture, economics, business, and other fields to be developed by individual personalities. The *dotted circle* in the figure depicts an individual conforming too much to the accepted norm, thus not discovering anything new and original. For example, competitions are not a good environment for the development of the third stage of life (e.g., “honor students”) because they place too many restrictions on what is acceptable

Mysteries of this sort exist at different points of every human activity. To provide a place for all individuals to nurture a task that has been given to them until a solution sprouts out of their heart-mind should be the starting point of education. We believe that this kind of education will be ultimately established, so that the human and global environment (time and space) may contribute to a healthy development of culture and science. For these reasons, it is ideal to liberate the original individuality from all idol worships of mere economic efficiency, status, reputation, and so forth. Such individual liberation will not only mark a process towards peace as it entails mutual respect between individuals and diversity groups, but also holds hidden potential for becoming the path to protect all lives from environmental destruction. In order to develop individual personality and creation, we are attempting to provide a means for the temporal design of our environment for the third stage of life in addition to the first and second lives, as a hope for the sustenance and perseverance of life. This may be a base for the flourishing of each individual and development of a healthy society and environment.

It is worth noting that the dimension of the head of newborn babies is relatively large because this part is first developed in the body. If we consider an extended analogy, it is highly recommended that the facilities most closely related to the human brain be first designed in house and urban planning, such as museums, concert halls, libraries, churches, and any institutions that may be important for the development of the third life. The arms and legs, corresponding to highways and communication systems, may be developed later on. Because of the continuing global climate change, a dynamic method for the temporal design of the environment that blends human life with the natural environment should be considered.

Previous Major Publications Related to This Topic

Ando Y (1985) Concert hall acoustics. Springer, Heidelberg

Ando Y (1998) Architectural acoustics, blending sound sources, sound fields, and listeners. AIP Press/Springer, New York

Ando Y (2007) Concert hall acoustics based on subjective preference theory. In: Rossing T (ed) Springer handbook of acoustics. Springer, New York

Ando Y (2009a) Auditory and visual sensations, Peter Cariani (ed). Springer, New York

Ando Y (2009b) Theory of temporal and spatial environmental design. In: McGraw Hill 2009 yearbook of science & technology, pp 384–389

Ando Y (2015) Opera house acoustics based on subjective preference theory. Springer, Tokyo

Soeta Y, Ando Y (2015) Neurally based measurement and evaluation of environmental noise. Springer, Tokyo

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