

Environmental Stimuli and Aesthetic Response

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環境的 刺戟과 美的 反應

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= 要 約 =

人間은 역사적으로 衣食住와 같은 기본적 生存과는 무관한 '아름다움'을 왜 그토록 열렬히 추구해 왔는가? 본 논문은 이러한 문제의 해답을 찾고자 實驗美學者인 벨라인(Berlyne)의 理論을 중심으로 美的 反應에 관한 고찰을 하였으며 다음의 사항을 다루고 있다.

- 1) 美的 反應을 '자극-반응'의 動的 過程으로서 이해하고 이러한 動的 過程의 구조적 측면을 고찰하였다.
- 2) 美的 反應의 心理生物學的 작용을 고찰하였다.
- 3) 美的 反應을 초래하는 刺戟의 특성을 고찰하였다.
- 4) 美的 反應의 하나인 視覺的 選好에 관한 기존의 연구를 검토하였으며, 視覺資源연구에의 응용 가능성이 높음을 고찰하였다.

1. INTRODUCTION

People perceive environmental stimuli through their sense organs and, by way of the brain, respond to it in the form of muscle movement, gland secretion, emotional evocation, or thought modification. The aesthetic response seems to be nothing more than a certain aspect of everyday responses to environmental stimuli. This paper intends to identify the characteristics of aesthetic responses different from everyday human responses to environmental settings.

This paper deals with three aspects of the aesthetic response and the visual preference research: 1) characteristics of the aesthetic response as a dynamic process of stimuli-response interaction; 2) psychobiological mechanism of the aesthetic response; 3) the properties of stimuli which result in the aesthetic response; 4) visual preference research review.

2. AESTHETIC RESPONSE AS A PROCESS

A stimulus can be viewed from two differ-

ent aspects, i.e., functional and aesthetic. The functional aspect refers to specific biological or social roles of stimuli associated with specific universal or human needs or desires. The aesthetic aspect refers to artistic properties of objects. For example, a building has not only a functional aspect as a shelter for men but also some artistic characteristics as a source of artistic appreciation. Whether a stimulus is a pure art or not, it seems to have some aesthetic characteristics. The response to such characteristics of a stimulus can be called an aesthetic response.

STIMULI SEEKING: An exploratory response is related to a motivational condition which leads to stimuli seeking behavior before sense organs are stimulated. Berlyne (1971) has introduced two types of exploratory behavior, i.e., extrinsic and intrinsic. The extrinsic exploratory behavior refers to biologically valuable behavior such as looking for food or for a mate. On the other hand, the intrinsic exploratory behavior refers to the behavior which is not directly related to the biologically significant values. Among the two types of exploratory behaviors, most of aesthetic behaviors seem to be closely related to the intrinsic exploratory behaviors. Berlyne (1971 p. 99) has raised a question relevant to the aesthetic behavior:

..... why stimuli that are apparently neutral from a biological point of view, i.e., neither beneficial nor noxious in themselves and not associated with beneficial or noxious events, are so energetically sought after and welcomed

He then proposes two functional forms of the exploratory behaviors which seem to be relevant to aesthetic behaviors, i.e., specific exploration and diversive exploration. The two concepts, which seem to answer a part of the question above, have been described in detail by Berlyne (1971, p. 100):

Uncertainty can generate the kind of motiva-

tional condition that we call "curiosity". It may be termed "perceptual curiosity" if uncertainty stems from nonsymbolic stimulation and "epistemic curiosity" if it is produced by symbolic structures. It will impel action to obtain further stimulation from, or relating to, the object of the curiosity so that information capable of relieving the uncertainty can be absorbed. We then speak of *specific exploration*. On the other hand, one may seek out stimulation regardless of content or source, that has appealing collative properties. This has nothing to do with curiosity, but it may be actuated by boredom. Then, we have *diversive exploration*.

Although both types of the exploration are relevant to aesthetic behaviors the diversive exploration seems to be more closely related to aesthetic behaviors than the specific exploration¹⁾ (Berlyne & Peckham, 1966).

STIMULI SELECTION : People can see, hear, smell, taste, and feel all kinds of stimuli in everyday life. However, people can not respond to all the stimuli at a time. Therefore, even though all the sense organs are stimulated by diverse stimuli people need to select or discriminate specific stimuli and sense organs for information processing, which results in response behavior.

A stimulus can be selected through selective attention such as the case of music appreciation, playing games, etc. On the other hand a stimulus can be also selected due to its particular property such as a specific color or shape (Berlyne, 1971). While the selective attention refers to the intention of a subject, the particular property refers to the characteristics of an object. Although the two types of selection represent different aspects of the stimuli selection, they often seem to contribute together to a stimuli selection process. Once a subject decided his attention field such as music or painting, then the properties of stimuli within the attention field come into play in stimuli selection.

STIMULI PROCESSING: When people process information on stimuli, they seem to process it as a pattern instead of each separate stimulus. In other words, they seem to perceive the relationship among stimuli. Gestalt psychologists have shown many examples of how different patterns or configurations of stimuli influence visual perception (e.g., Arnheim, 1974; Koffka, 1935). A pattern may be called as an interrelationship among elements in stimuli.

Changes in the pattern of stimuli will result in different responses. Further, the differences (comparison) among the elements of present stimuli result in different degrees of complexity and thus influence exploratory and emotional responses (Berlyne, 1971). However, Berlyne's concept of the degree of difference among present stimuli seems to be similar to Gestalt psychologists' concept of the pattern of stimuli. That is to say, both concepts refer to the interrelationships among present stimulus elements.

On the other hand, the comparison between the present and past stimuli also influence the response behaviors (Berlyne, 1971). For example, the degree of difference between the present stimuli and the stimuli experienced in the past will result in different degree in novelty-familiarity or surprisingness-expectedness continuum. That is, a high degree of difference will result in a high degree of novelty. Similarly, a high degree of difference from what one expected will result in a high degree of surprisingness. Thus the degree of difference influences human responses to stimuli.

People process stimuli in visual field as a pattern and perceive the relationship among elements. They tend to compare the degree of differences among the elements of stimuli and thus judge the degree of complexity of it. Further, people tend to compare the degree of differences between present stimuli and the stimuli experienced before and thus judge

the degree of novelty or surprisingness.

RESPONSE TO STIMULI: The aesthetic responses seem to take similar forms as usual environmental responses. Although the aesthetic responses can be distinguished from the functional responses, i.e., responses to the functional aspects of stimuli, it seems difficult to draw a clear boundary between the aesthetic and other types of responses in everyday human life.

Human reactions to stimuli usually result in more than one sequential responses. Later responses are influenced by not only direct influences from stimuli but also earlier responses which are generally called "mediating responses" (Berlyne, 1971). While the earlier responses often can not be observed externally, the later responses often take the form of overt reactions or adaptations. However, both types of responses basically can share all forms of responses such as emotional, empathetic, motor, verbal and psychophysiological responses. These various responses seem to be related to each other and thus it seems difficult to completely isolate one type of response from others.

The emotional responses can include various states of mind such as sorrow, joy, fear, anger, etc. Although it is difficult to make clear distinction between emotion and feeling, emotion may be distinguished from passion or feeling described as love, hate, scorn, admiration (Lange, 1967, p. 35; Candland, 1977, p. 62). The emotional responses can be evoked by some stimuli which are very exciting or relieving and thus influence the later responses. The emotional responses are often caused by the stimuli situations similar to the past-experienced ones which had emotional impacts.

The empathetic responses, which are closely related to the emotional responses, seem to play an important role in aesthetic appreciation. The empathetic response can be thought as a participation in other's feelings or ideas. Peo-

ple tend to respond to such characteristics of external stimuli that seem to represent human feelings or meanings.

The motor responses can cause proprioceptive stimulation in an implicit or internalized form. The motor responses related to aesthetic responses, such as eye or hand movements, seem to enable people to symbolize absent objects or to comprehend present objects (Berlyne, 1971).

The verbal descriptions on stimuli are another type of responses to stimuli. They can discriminate or generalize stimuli through classifications. The verbal ratings, which is a type of verbal descriptions, have been frequently used as the visual preference or complexity measures.

Considering the various forms of responses, we can see these responses occurring together as a composite response to stimuli. That is, a set of stimulus seems to evoke various forms of responses at the same time. For example, when one perceives environmental stimuli, he comprehends the stimuli through his eye movement (motor), becomes excited or relieved (emotional or empathetic), and may express his emotion with verbal labels.

In summary, a set of stimuli evokes several

responses and the final (later) response depends on the mediating responses as well as the direct influences of stimuli (Fig. 1). Although it is very difficult to make a clear distinction between the aesthetic and ordinary human responses, there seem to be certain characteristics of the aesthetic responses related to stimuli seeking, selection, processing, and responses related to stimuli seeking, selection, processing, and response. That is to say, the ideas of non-biologically related exploration, specific color and shape selection, pattern recognition and comparison, and empathetic response seem to be relevant to an understanding of the aesthetic responses (Fig. 1).

3. HEDONIC VALUE AND AROUSAL POTENTIAL

Aesthetics can be thought as being mainly related to art. However, the art is only a part of the whole realm of aesthetics. Everyday events can be shown to have aesthetic aspects to some degree (Berlyne, 1974). Beautiful, sublime, or interesting properties of the works of art or environmental stimuli are thought to result in various degrees of positive or negative hedonic values in individuals (Ber-

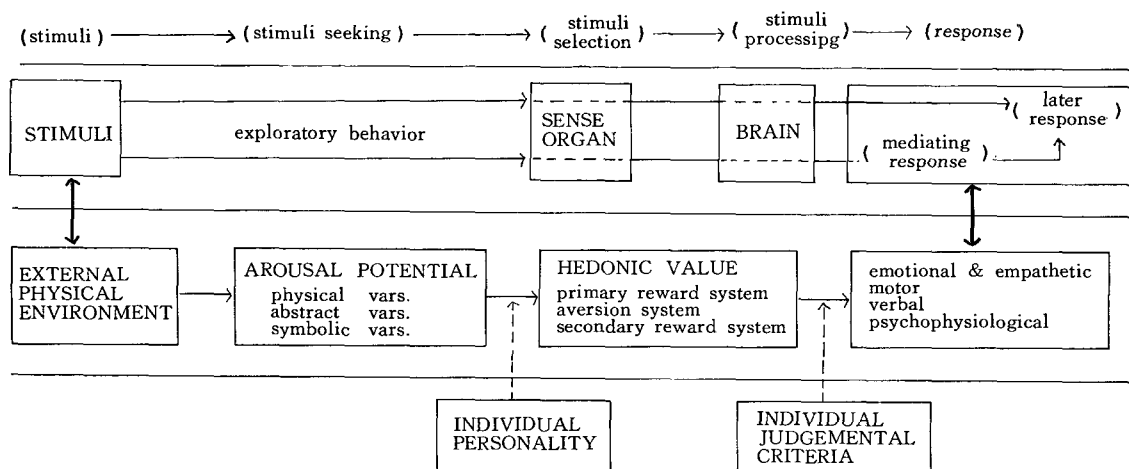


Fig. 1. Aesthetic response as a process.

lyne, 1971).

INVERTED U-SHAPED RELATIONSHIP :
The hedonic values are related to pleasure, preference, reward value or incentive values. On the other hand, various properties of stimuli contribute to "arousal potential" which implies "overall power to excite the nervous system, to command attention, and to influence behavior (Berlyne, 1973, p. 14)". The hedonic value (or pleasant-unpleasantness) can be described as a function of arousal potential (or stimulus concentration). An inverted U-shaped relationship between the hedonic value and arousal potential has been consistently found (Berlyne, 1973; Pfaffmann, 1960; Wohlwill, 1966). The relationship can be summarized into three aspects: 1) a low level of arousal potential is related to an indifference in hedonic value; 2) a moderate level of arousal potential is related to a high hedonic value; 3) an extremely high level of arousal potential is related to a low level of hedonic value. However, Eysenck (1973) who used the term "level of stimulation" instead of Berlyne's "arousal potential", contended that a low level of stimulation was related to a negative hedonic value rather than a neutral (indifferent) hedonic value. The complete absence of stimulation seems to result in unpleasantness (Darley, et al., 1981). However, the general inverted U-shaped relationships are still assumed in both cases.

REWARD AND AVERSION SYSTEMS: Berlyne (1973), further, interpreted the general inverted U-shaped relationship as an interaction of "primary reward system" and aversion system. There seem to be three hedonic systems in the reticular formation of the brain on which the hedonic effects of stimuli depend, i.e., primary reward, aversion and secondary reward systems (Berlyne, 1971, pp. 82-86; Eysenck, 1973). The primary reward system is inhibited by the aversion system and the aversion system is inhibited by the secondary reward system in the brain. Thus the

secondary reward system, by way of inhibiting the aversion system, seems to have indirect rewarding effects. However, the aversion system does not seem to be inhibited by the primary reward system.

INDIVIDUAL AND CULTURAL DIFFERENCES : The general relationship between arousal potential and hedonic value can be further illuminated in terms of individual and cultural characteristics. Under a given low degree of arousal potential, an introverted person has a higher positive hedonic value than an extroverted person. By the same token, under a given high degree of arousal, an extroverted person has a higher hedonic value than an introverted person (Eysenck, 1973). Even though the curve shapes (inverted U-shape) of both types of persons may take same forms, the curve of the extroverted person shifts to the right from that of the introverted person along the X-axis representing arousal potential. Therefore, the relationship between arousal potential and hedonic value is affected by the individual personality.

On the other hand, Daniel, et al. (1973, p. 338) have suggested the idea of judgemental criteria or standards in aesthetic judgements based on the Theory of Signal Detectability.

An observer's judgements may be viewed as a combined product of his perception of the represented area and a more general component, his judgemental criteria. The latter component might have been based on the observer's preconceived notions of what a "treatment" look like and on his general idea of the relative importance of "detecting a treatment" ²⁾.

They have found substantial differences among individual observer's criterion values. That is, some observers frequently use the higher end of a rating scale, while others often use the lower end of a rating scale. They interpret an aesthetic judgement depends on two components, i.e., perception of stimuli and

individual judgemental criteria. They assume each set of stimulus evokes a certain level of perceptual value (hedonic value) in individual and a representation of the value varies according to the individual judgemental criteria. In other words, the concept of judgemental criteria is not related to actual individual differences in perceiving environmental stimuli, rather, it is related to the differences in representing the perceived stimuli. The concept may be added to the model of arousal potential and hedonic value. That is, the arousal potential of stimuli evokes hedonic value in individual and the individual representation of the hedonic value varies according to the individual judgemental criteria.

Cross-cultural studies show some degree of agreement (e.g., Berlyne, et al., 1974; Shafen & Tooby, 1973) as well as disagreement (e.g., Lawlor, 1955; McElroy, 1952) in aesthetic judgements. However, most of the studies found high consistencies within a cultural group. Child (1969, p. 893), after examining various cross cultural studies, has contended that the cross cultural study "has gone further toward identifying some bases of inter-cultural disagreement than agreement." Berlyne, et al. (1974) have found agreement in judging the collative properties such as complexity and novelty but have failed in finding agreement on hedonic values such as pleasantness and excitement. Although further studies need to be directed toward a more conclusive cross-cultural effects on the arousal-hedonic-value relationship, existing studies seem to suggest more similarities in judging the arousal potential (complexity or novelty) and less similarities in judging the hedonic values (pleasantness or excitement).

In summary, the aesthetic properties of environmental stimuli seem to result in positive or negative hedonic values in individuals. The hedonic values can be shown as a function of the arousal potential or level of stimulation. Further, the degrees of the hedonic values are systematically related to the prim-

ary reward, aversion, and secondary reward systems in the brain. Even further, the individual and, possibly, cultural differences seem to influence the arousal-hedonic-value relationships. And the individual judgemental representation of the hedonic value depends on the individual judgemental criteria.

4. VARIABLES OF AROUSAL POTENTIAL

Arousal increase or decrease refers to the increased or decreased intensity of stimulation. People seem to be in a certain level of arousal at a certain moment. The level of arousal is related to various psychophysiological states and properties of external environmental stimuli. These states and properties refer to various arousal raising or lowering factors: periodic changes in the body such as sleep and waking, deficits of vital substances or disturbances within the body such as hunger, thirst, fear, anger, etc., stirring up by external stimuli such as work of art, music, noise (Berlyne, 1971, p. 68). Among these factors, the external stimuli patterns seem to be most relevant to aesthetics or art. The external stimuli, more specifically visual stimuli, seem to have three important properties, i.e., physical, abstract, and symbolic. The physical properties represent diverse characteristics of the physical environmental stimuli. On the other hand, the abstract and symbolic properties represent the interaction between man and stimuli.

PHYSICAL VARIABLES: The physical variables refer to the characteristics of various stimuli related to five senses such as visual, auditory olfactory, palatine, and tactile stimuli. Among them, the visual stimuli are characterized by the properties such as color, shape, texture, and size. For example, hues toward the red are more arousing than cooler hues at the other end of a visible spectrum (Berlyne, 1971).

ABSTRACT VARIABLES: There seem to be

certain abstract properties in stimuli which are evoked by the interaction between physical stimuli and man. The abstract properties such as complexity, congruity, novelty, and surprisingness seem to result through the visual stimuli processing. Feimer (1981, p. 42) has interpreted this variable as a "transactional variable" because people "characterize physical properties of the environment in terms of their human significance." On the other hand, Berlyne (1973) has suggested collative variables which is mainly the product of comparison. The variables include diverse properties of stimuli, i.e., novelty - familiarity surprisingness - expectedness, complexity - simplicity, and so on. The abstract variables seem to depend on various man - stimuli interactions and comparisons, i.e., degree in which a stimuli is distinct from those one experienced before, the degree in which a following stimuli violate the anticipation of it, and the number of unique elements in a stimuli.

SYMBOLIC VARIABLES: When people perceive stimuli, they seem to process the associated meaning of stimuli as well as the physical characteristics of it (e.g., Anderson, 1981; Buhyoff & Leuschner, 1978; Hodgson & Thayer, 1980). The symbolic variables, like the abstract variables, can be evoked by the interaction between man and environmental stimuli. However the symbolic variables are different from the abstract variables in the sense that they seem to reflect individual attitude and personality which is formulated through one's past experiences. For example, when people see an industrial plant their responses are influenced by the associated meaning of the plant as well as purely physical characteristics of it. That is, the negative aspects of it such as radioactivity or air pollution, or the positive aspects of it such as employment or product seem to influence human responses to the plant. In other words, they are more closely related to the individual

and social significance of stimuli than the abstract variables.

The ecological variables suggested by Berlyne (1973), which refers to biologically important activities, do not seem to be directly related to aesthetic behaviors. However, the ecological variables seem to represent the content of stimuli rather than the physical pattern of it. In other words, the biologically significant (or symbolic) meanings associated with the contents of stimuli situation seem to give impacts on the arousal potential. An apple in a picture for example, may increase the arousal potential of a hungry person. Thus the Berlyne's ecological variables seem to represent another aspect of the symbolic variables.

Wade (1981) has distinguished six types of symbolic meanings which a building (object or stimulus) can have, i.e., self, function, behavior, purpose/product, person/institution, and ultimate symbol³⁾. These various symbolic meanings of stimuli apparently influence the arousal potential and, in turn, the aesthetic responses.

These three variables of arousal potential seem to be interrelated with each other and thus any one of the variables does not solely give impacts on the arousal potential. In other words, each stimulus situation consists of some properties of all three variables and the degree of arousal potential seems to depend on the integration of these three variables.

5. VISUAL PREFERENCE AS AN AESTHETIC RESPONSE

Visual preference can be interpreted as an individual like - dislike for visual stimuli. And it can be thought as a form of aesthetic responses. Therefore, it shares all the characteristics of the stimuli seeking, selection, processing, and response with the aesthetic responses (refer to Fig. 1). Further, the visual preferences can be represented as a broader

term, i.e., hedonic value. Thus the visual preference, like hedonic value, can be thought as a function of the arousal potential as discussed in section 3. That is, various properties of environmental stimuli possess certain degrees of arousal potential and thus result in various degrees of visual preferences. More specifically the variables of the arousal potential, i.e., physical, abstract, and symbolic variables as well as the individual differences can be the variables of the visual preferences.

There have been many studies on the visual preferences of the external environmental stimuli in design, planning, and management areas as well as experimental and environmental psychology areas. Each professional area seems to deal with some specific variables in which they are interested. Comparatively speaking, designers seem to focus on the physical characteristics of environmental components such as color, lighting, texture, shape, etc. (e.g., Bartholomew, 1976; Horn, 1974; Lau, 1970; Porter, 1974). Planners have been interested in the optimum degree of complexity in urban environment (e.g., Repoport & Hawkes, 1970; Rapoport & Kantor, 1967; Lozano, 1974). Environmental resource managers have been mainly interested in the physical magnitude (area, perimeter) of the environmental components such as vegetation, water, etc. (e.g., Buhyoff & Leuschner, 1978; Buhyoff & Wellman 1980; Carls 1974; Dearing, 1979; Shafer, et al., 1969). Psychologists, on the other hand, have been trying to find underlying psychobiological and theoretical relationships between environmental stimuli and its effects on the human aesthetic responses (e.g., Berlyne, 1960, 1971, 1973, 1974, Eysenck, 1973).

PHYSICAL VARIABLES: Among the research mentioned above, studies in the visual resource management areas have made a considerable progress in finding the relationships between visual preferences and external environmental stimuli. Most of the recent em-

perical attempts have been focused on the impacts of magnitude (e.g., perimeter, area) and viewing distance of physical stimuli components on the visual preferences (e.g., Buhyoff & Leuschner, 1978; Buhyoff & Wellman, 1980; Carls, 1974; Dearing, 1979; Shafer, et al., 1969).

ABSTRACT VARIABLES: There have also been studies on the relationships between visual preferences and abstract properties, specifically complexity, of visual stimuli. In general, the inverted U-shaped relationship between them has been consistently found (e.g., Kaplan, et al., 1972; Vitz, 1966; Wohlwill, 1968). It is not surprising to see the similarities between the complexity-preference curve and arousal-hedonic-value curve discussed in section 3, i.e., inverted U-shaped relationship. The complexity is one of the variables of the arousal potential and the preference is one of the properties of the hedonic values. Therefore, it seems reasonable to see the similarities between the two curves. Further, the similarity seems to suggest that there exists a positive relationship between the complexity and the arousal potential of stimuli.

SYMBOLIC VARIABLES: Although associated symbolic meanings of stimuli play obvious roles in the formation of visual preferences (Heath, 1968, p. 24), it seems difficult to isolate the symbolic variables to study the impacts of meaning on the visual preferences. However, there have been a few studies concerning the relationships between the preference and implied meaning of stimuli (e.g., Anderson 1981; Buhyoff & Leuschner, 1978; Hodgson & Thayer, 1980). These studies have indicated that implied human or negative influences on natural landscape such as reservoir, tree farm, leased grazing range, and insect damage result in low ratings of visual preferences.

GROUP AND INDIVIDUAL DIFFERENCES: There have been many studies concerning

group differences and similarities. These studies are usually combined with the studies on the three variables discussed above. There exist both evidences of agreement (Buhyoff, et al, 1978; Daniel & Boster, 1976; Zube, 1973) and disagreement (Peterson & Neumann, 1969) between diverse groups. Although preference patterns are similar between professional groups (landscape architect or architect) and general public, the professional groups seem to show lower ratings and small variances than the general public (Arthur, 1977). Further, personal preferences of the professional group are found to be unrelated to other people's preferences (Buhyoff, et al., 1977). It seems difficult to draw a definite conclusion on the differences or similarities between different groups. However, existing studies seem to show more agreements on very beautiful or ugly scenes, and more disagreements on the scenes that are neither one nor the other (De-aringer, 1979).

The policy capturing has been applied to investigating individual and group differences in policies concerning preference judgement and found to be useful (Propst & Buhyoff, 1979). On the other hand, the Theory of Signal Detectability has been utilized in developing a visual preference measurement technique which is independent of individual judgemental criteria (e.g., Daniel, et al., 1973; Daniel & Boster, 1976). However, the technique based on the Theory of Signal Detectability takes account of the individual differences in judgement representation rather than the individual differences in perceiving environmental stimuli.

Existing studies on the visual preferences are basically theoretical and methodological testings. It is an ordinary and necessary trend in a young field. Therefore, most of the experimental studies are molecular studies, i. e., they are dealing with only one or two specific variables of visual preferences at a time. Considerable progress has been made in the study of relationships between visual prefer-

ence and the unit variables such as magnitude of the physical components, group differences, and abstract variables. However, comprehensive approaches to the visual preference measurement have not been attempted. In the real world, people process environmental stimuli as a whole and thus all the physical, abstract, and symbolic variables seem to contribute together to the visual preference. Therefore, for a better understanding of the aesthetic judgement, multidimensional studies need to be directed (Hamilton, et al. 1979).

On the other hand, the studies of visual preference are often limited to a relatively small number of subjects. Thus, it is difficult to generalize those findings base on a small size to the whole population. Therefore, experiments based on a larger sample size need to be conducted in order to enhance the generalizability of the experiments.

Recent studies are mostly empirical and thus seem to be lack of strong theoretical bases. Although there has been considerable research, general theoretical and rational relationships between visual preference and environmental stimuli do not seem to exist (Buhyoff & Wellman 1980). For the selection of important variables and derivation of rational response functions, further theoretical bases need to be provided.

Furthermore, most of the visual preference studies have been using natural landscapes which are relatively homogeneous. However, urban environment mainly consists of man-made elements which are usually quite complex and heterogeneous. Therefore, it seems difficult to apply the findings in natural environment to urban environment. Thus further studies need to be conducted in urban environment for a more general theory of visual preference (Zube, 1976).

In summary, visual preference is a form of aesthetic response and thus it depends on the physical, abstract, and symbolic variables as well as individual and group differences. Al-

though there has been a considerable amount of empirical findings in the visual resource management area, further studies need to be directed toward the multidimensional approach and theory development. At the same time, larger sample sizes and more diverse environmental settings need to be considered for further generalization of these findings.

6. SUMMARY AND CONCLUSIONS

Although aesthetic responses are mainly related to art, some part of everyday human responses to environmental stimuli can be thought as the aesthetic responses. The stimuli are sought by specific human exploratory reasons, and specific stimuli are selected through human sense organs. The exploratory aspects of the aesthetic behavior are mostly related to non-biological needs or adaptations. The information passed through sense organs are processed as a pattern and, through comparison with the previous stimuli or among stimuli elements, the degree of novelty or complexity can be resulted. The stimuli evoke several responses in sequence. The later response depends not only on the stimuli but also on the earlier response. The responses referring to aesthetic behaviors can take various forms such as emotional, empathetic, motor, verbal, and so forth.

On the other hand the physical, abstract, and symbolic properties of stimuli contribute to determining the degree of arousal potential. Environmental stimuli are thought to have arousal potential which is systemically related to the hedonic value through primary reward, aversion, and secondary reward systems in the brain. The relationship between arousal potential and hedonic value can be represented as an inverted U-shaped curve and the relationship seems to be influenced by the individual personality. Further, the judgemental representation of the hedonic value varies according to the individual judgemental criteria.

Visual preference is a form of aesthetic response and it depends not only on the physical, abstract, and symbolic characteristics of stimuli but also on the individual and, possibly, cultural differences. Although most research in visual resource management area have focused on visual preferences, further research need to be directed toward multidimensional approaches and theory developments on the relationships between visual preferences and environmental stimuli.

NOTES

1) Berlyne & Peckham (1966) contended that "specific exploration must be more closely related to scientific and philosophical behavior and directed thinking, whereas diverse exploration must have more to do with seeking entertainment, play, aesthetic behavior, and artistic thinking".

2) The treatment refers to different types of vegetative treatment, i.e., uniform stripcut, irregular stripcut, clearcut, and so on.

3) Wade (1981) implied that the ultimate symbol refers to the human belief or thought about his existence and environment by saying "the building is usually both evidence and symbol of the understanding that individual's have of themselves in relation to their environment, in light of their belief about a purpose for their existence".

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