AESTHETICS, AFFECT, AND COGNITION
Environmental Preference from an Evolutionary Perspective

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ABSTRACT: Scenes of the outdoor physical environment vary substantially in the extent to which they are preferred. Variables empirically found to predict preference can be analyzed both in terms of their information-processing implications and in terms of their evolutionary significance. Some of these predictors appear to require fairly extensive information processing, thus supporting the hypothesis that a rapid, unconscious type of cognition may precede certain affective judgments. Such ties between cognition and affect are understandable in the context of the proposed theoretical framework for environmental preference. This framework not only provides a coherent guide to research but also points to the pervasiveness and significance of aesthetics as a factor in human behavior and human experience.

ENVIRONMENT AND BEHAVIOR, Vol. 19 No. 1, January 1987, 3-32

Environmental preference research has been an area of intense activity in recent years. Substantial useful knowledge has been acquired and has begun to be applied to a variety of problems (see Daniel and Vining, 1983; Zube et al., 1982, for recent comprehensive reviews). There has also been considerable progress in methodological sophistication (e.g., Buhyoff et al., 1982; Schroeder, 1984). Nonetheless, certain serious gaps apparently remain. In their review of research in this area, Zube et al. (1982) point to a disturbing theoretical void. They criticize the tendency to fragmentary, unrelated research efforts. In addition, they warn of the danger that, lacking a theoretical approach that speaks to the "nature of the human-landscape interaction," there will be a lack of justification as to the importance of a concern for landscape in the first place.

This article arises out of an approach that constitutes an exception to these concerns—a program of research that has been over the past 15 years both coherent and theoretically guided. It also deals specifically with the nature of the human-landscape interaction, and as such at least hints at the larger issue of justification.

Although Zube et al. refer to this approach as "cognitive," this designation is incomplete. While it does indeed look at information-processing patterns, it is also concerned with two other domains of growing interest from a psychological perspective. The first is the issue of how cognition and affect are related. Zajonc's (1980) widely noted announcement that "preferences need no inferences" made it clear that the relationship between preference or aesthetics on the one hand and cognition on the other was both an important and complex issue. While this issue has been ignored by most cognitive theories, it is quite central to the approach described here.

The second way in which this approach is unlike most cognitive approaches is in its concern for the possibility of a biological substrate underlying what people prefer. In recent years there has been a growing interest in evolutionary factors in behavior. From an evolutionary perspective it

is reasonable to assume that not all stimuli are equal, that some stimuli that are of functional importance to the organism will have special affective properties associated with them. As Lachman and Lachman (1979: 144) have pointed out, "The human representational system is not neutral with respect to content." At the same time, Lumsden and Wilson (1981) note that "students of cognitive development have largely neglected the study of preference." They consider this to be an unfortunate omission, in part because of the potential bridge such studies could create between psychology and evolutionary theory.

The approach described here thus constitutes a synthesis of three themes. It is based on a body of research in environmental preference; it incorporates an evolutionary perspective; and it attempts to speak to the rather complex matter of the cognition-affect relationship. These three themes, in the indicated sequence, constitute the major portion of this article. The article then concludes with a hypothesis concerning the possible significance of preference in the ongoing functioning of the individual.

The purpose of this article is not only to describe a program of research and theory but also to suggest a new and larger role for aesthetics, broadly construed, as a central force in human experience and human behavior. The article begins with the description of a conceptual framework that places preference research in a larger theoretical context. This framework did not precede data collection; rather, it developed gradually in the context of an ongoing research program. Thus the presentation of this framework follows an essentially chronological order.

RESEARCH ON PREFERENCE: THE EMERGENCE OF A FRAMEWORK

For over 20 years the experimental study of aesthetics had been dominated by a single paradigm: the analysis of some index of preference or interest in response to stimuli

constructed to vary in terms of some informational dimension. Much of the research concentrated on Berlyne's (1960) "collative variables," such as novelty and surprisingness. Of all these variables, most emphasis by far has been placed on the complexity of the stimulus array. Based primarily on randomly generated visual stimuli, considerable research pointed to an inverted-U relationship between complexity and preference (e.g., Day, 1967; Vitz, 1966). In other words, there appeared to be an optimal value of complexity that was most preferred with values of complexity either higher or lower than that point, less preferred.[1]

A major departure from this paradigm was the work of Wohlwill (1968) who studied reactions to works of art and to photographs of the outdoor environment instead of randomly generated material. While the inverted-U relationship did appear despite the shift to a far less artificial stimulus array, in the case of the outdoor environment stimuli this result was relatively weak and failed to reach an acceptable level of significance.

The introduction of this substantially richer and more representative type of stimulus material was something of a two-edged sword. On the one hand it created the potential for studying variables not present in the stimulus material studied previously. On the other hand it introduced new complications as well. To suggest that preference for the outdoor environment followed essentially the same rules that applied to randomly generated nonsense material (Wohlwill, 1970) was to deny, at least implicitly, the importance of other variables such as the content or subject of the material. While carefully prepared nonsense material avoids the issue of content, the content of a collection of photographs of the outdoor environment will tend to vary widely. The emphasis on complexity as a sufficient basis for prediction of preference in the physical environment implies the comparative unimportance of content distinctions such as whether the scenes depict the natural or the built environment.

The relation of content and preference in the outdoor environment is too important an issue to be decided by default. Both theoretical and practical issues are at stake. The theoretical issue concerns the question of whether certain contents do in fact have a special status as far as human reactions are concerned. The practical issue concerns the laws mandating the preservation of certain natural areas based on their scenic quality. If content in fact does not matter to people, then, in principle, urban development replacing a natural area could be equally preferred (given appropriate manipulation of whatever variables turn out to be important). In other words, if the natural environment holds no special status as far as human aesthetic reaction is concerned, then legislation protecting scenic natural areas could be challenged on grounds of arbitrariness (cf. Bufford, 1973). A direct test of the role of content in preference (Kaplan et al., 1972) was thus amply motivated.

A potential problem with the Wohlwill (1968) study involved the sampling of scenes; there were only two scenes for each of seven complexity levels, and the scenes ranged from urban settings to arctic tundra. Thus Kaplan et al. (1972) included more scenes representing a smaller range of environments. The central focus of the study, the comparison of reactions to scenes of natural and built environments, yielded an overwhelming content effect. Natural scenes were so uniformly preferred over scenes of the built environment that only a single built environment scene (an urban park) was as preferred as the lowest rated natural scene. By contrast, Complexity played an unexpected role in this study: within each content domain a linear relationship was obtained, but across all 56 scenes, Complexity played no predictive role.

In a subsequent study, Wohlwill (1976) incorporated a similar content distinction, but with the scenes carefully selected to represent as wide a spectrum of Complexity levels as possible. There was a downturn in the function relating Complexity and preference for urban scenes at the

two highest Complexity levels. Unfortunately it was not possible to find natural scenes at these two Complexity levels; for these scenes, the relationship between Complexity and preference was linear and positive. Once again the role of content was substantial: The natural scenes as a group were vastly preferred to the urban scenes.

A THEORETICAL FRAMEWORK

While the original intent of the Kaplan et al. (1972) study was to assess the role of content in preference, the results of the study, like those that followed it, provided a fascinating new challenge that was difficult to ignore. Given the substantial variation in preference from scene to scene and the failure of Complexity to account for a major portion of the variance, there is a strong inclination to search for other predictors of preference. The discussion that follows describes the emergence of a theoretical framework out of a series of confrontations with data of this kind.

The Kaplan et al. (1972) study provided an ideal opportunity to search for such predictors. While the nature scenes were by far preferred to the built environment scenes, within the nature category there was a large range of preferences. The most preferred scenes tended to be of two kinds. They either contained a trail that disappeared around a bend or they depicted a brightly lit clearing partially obscured from view by intervening foliage. In both cases the scenes appeared to promise that more information could be gained by moving deeper into the depicted setting. This promise of additional information tentatively was labeled "Mystery."

This term was not adopted without some misgivings. It was not, after all, the sort of language that investigators trained in experimental psychology usually use. On the other hand, it did have a certain resonance to themes in the information-processing approach that was gaining momentum at that time. It did, after all, concern information, in that

it implied that there was new information that could be acquired by going deeper into the scene. It also concerned prediction; namely, the prediction that venturing further into the scene would indeed yield additional information. Unfortunately, it tended to be misinterpreted as an example of "surprise," one of Berlyne's collative variables.

The difference between the two concepts is instructive. Surprise requires that some aspect of a scene be unexpected. Mystery, as we intended it, refers to instances when the new information is not present, but is inferred from what is in the scene. It is unlikely that the new information predicted in a high-Mystery setting will be totally surprising when it is experienced, since there tends to be continuity in such settings between what can be seen and what is inferred.[2] Although Mystery continues to be included as an example of a collative variable (Wohlwill, 1976), it is quite different from the others precisely because of the centrality of inference in its definition. Some reassurance in the choice of the term came from the discovery of a previous similar usage. In their book on landscape design, Hubbard and Kimball (1917) used Mystery to refer to the "impossibility of complete perception." While their usage is somewhat broader than that intended here, the parallel is nonetheless striking.

In subsequent research the Mystery rating of each scene was determined by a panel of judges who were asked to assess the degree to which more could be learned if one were to venture deeper into the scene. For a recent and thoughtful analysis of the landscape configurations leading to a higher Mystery rating, see Gimblett et al. (1985). Relatively transparent foreground foliage turns out to be a frequent characteristic of high-Mystery scenes.

The addition of another predictor came about in a somewhat different fashion. Slides based on drawings and on actual scenes were used in a pretest. Participants complained that some of the settings were hard to understand; they failed to "hang together." They lacked the

symmetries, repeating elements and unifying textures that contribute to a "good gestalt." We labeled this new potential predictor "Coherence." The underlying informational theme in Coherence is the capacity to predict within the scene. The ease with which the information in the scene can be organized into a relatively small number of chunks is the central issue here. Following Miller (1956) as modified by Mandler (1975), one might hypothesize that a scene yielding 5 ± 2 chunks would be more highly preferred. Scenes that lacked such redundancy and were in fact difficult to organize and interpret were not only rated low in preference; they were actually resented. It would thus appear that factors aiding comprehension might be central to preference. In a subsequent study, R. Kaplan (1973) demonstrated that both Coherence and Mystery were, in fact, important predictors of preference. (In that study, as in those that followed, Coherence was scaled based on judges' ratings of the degree to which the scene "hangs together.")

In this way three candidate variables were identified: Complexity, Mystery, and Coherence. They had certain facets of similarity and certain differences; a matrix that expressed these relationships seemed called for. Such a matrix was proposed, Kaplan and Wendt, 1972, and subsequently modified, S. Kaplan, 1975, 1979b. For the sake of brevity and to reduce confusion, the theoretical analysis presented here follows the most recent version. The terminology is, however, somewhat altered.

The primary distinction here is between two affectively important informational outcomes. These outcomes are "Understanding" (comprehending or making sense of a scene) and "Exploration" (being held by the setting, being attracted by or pulled toward sources of additional information). Coherence contributes to the ease of comprehending a scene and hence belongs in the Understanding category. Both Mystery and Complexity concern information available for further processing and hence fall within the

Exploration category. Readers familiar with the environmental design area will recognize a parallel here to the concepts of "unity" and "diversity." These terms were not adopted here because they are usually taken to signify the opposite poles of a single dimension, whereas Understanding and Exploration are intended to be orthogonal categories. (The unity/diversity conception is also too readily absorbed into the Complexity construct, with attendant problems of an assumed optimal level.)

The other dimension of this matrix also concerns the information in the scene. This information may be immediately available (as in the case of Complexity) or it may be predicted or promised (as in the case of Mystery). Coherence in this respect is similar to Complexity in that the organization it supports is immediately present rather than promised or inferred. Table 1 shows the matrix representing the relationship among these themes.

One cell in the matrix has not yet been introduced. It concerns information that enhances comprehension. The inferred or predicted aspect suggests a concern with being able to continue to comprehend the environment, or in other words, to remain oriented in space. The concept of "Legibility," following a similar use of the term by Lynch (1960), was adopted to fit this combination. Just as Coherence allows one to predict and orient within the picture plane (the array that is before one), Legibility concerns the inference that being able to predict and to maintain orientation will be possible as one wanders more deeply into the scene.

The variables in the matrix apply to a large variety of environments and situations. What is common is the ease of achieving understanding or the attractiveness of exploration rather than any particular content. In addition, the early work pointed to certain contents that seemed to have a special effect on preference. These contents were called "primary landscape qualities": Water and foliage were two of the contents first identified as fitting this description.

TABLE 1
Framework for Predictors of Preference

	Understanding	Exploration
Immediate	Coherence	Complexity
Inferred, Predicted	Legibility	Mystery

THE IMPACT OF SUBSEQUENT RESEARCH

The early studies and the developing theoretical framework generated testable hypotheses and a number of related studies soon followed. These studies varied considerably both in the environments under study and in the nature of the individuals participating; the external validity of the research effort is of course enhanced by both sources of variation. At the same time a number of factors were common across all studies. All attempted to sample widely in terms of the range of scenes presented within a given type of environment. All used a 5-point rating scale of preference as the dependent variable. The predictor variables were assessed independently of the rating of preference (two of the earliest studies were exceptions to this rule) either by other participants or by a small panel of judges. Analyses of the data included an examination of content groupings based on monotone vector analysis (Lingoes, 1979) of the preference as well as an evaluation of the effectiveness of the various predictor variables.

The earliest set of studies examined reactions to scenes representing both the built and the natural environments. R. Kaplan (1973) analyzed the preferences of designers for such scenes; designers weigh Coherence more heavily

than others do in their preferences, a finding that has since been replicated (Grant, 1979). A subsequent series of studies compared the effect of brief and long presentation durations (Herzog, 1984; Herzog, et al., 1982; R. Kaplan, 1975). Gallagher (1977) looked at preference for a prairie restoration landscape surrounding a corporate headquarters building, and Ulrich (1977) focused on the roadside environment. In general these studies found strong support for the role of Mystery in the prediction of preference. Support for Coherence was less decisive, and Complexity fared particularly badly. The concept of Legibility had not yet emerged and thus was not examined in these early studies.

A second wave of studies focused on particular types of natural environments. Anderson (1978) looked at forest management practices in a national forest area. Lee (1979) studied preferences for scenes of Louisiana wetlands. In the context of the rivers and marshes of Idaho, Ellsworth (1982) compared the effectiveness of a traditional landscape architectural approach with the informational approach described here; the latter proved superior in predicting preference. Herzog (1984) looked at preference for the forest environment. These studies provided strong support for the predictive roles of both Mystery and Coherence. Complexity fared somewhat better in these studies, but Legibility received little support. There is some indication, however, that part of the problem is with the way Legibility was initially described. Ellsworth (1982), while not finding Legibility an effective predictor, comments that spatial definition appears to be an important factor in preference. Since spatial definition is implicitly an aspect of Legibility, there is indication that further work is needed in developing this concept.[3]

While the majority of the studies using these predictor variables have been carried out using more or less rural settings, Herzog and his colleagues have examined preferences for urban scenes. An initial study looked at familiar

urban settings (Herzog et al., 1976); subsequently, preference for unfamiliar urban settings was examined as well (Herzog et al. 1982). In general all four predictor variables were effective; there was, however, an indication that for different contents the pattern of the effective predictors was different.

While obviously still incomplete and in need of refinement, an informational approach to environmental preference appears to be, in light of these studies, reasonably useful and productive. Issues that students of human behavior have been concerned with in widely different research areas are appropriately brought together in the context of preference.

TOWARD AN EVOLUTIONARY INTERPRETATION

The initial focus of our research program was on preference and its predictors. As the findings began to accumulate, however, an additional theme emerged. Interpretation of new findings repeatedly suggested parallels with the environmental circumstances under which humans evolved. Ultimately, considerations about human evolution played a role not only in the interpretation of results but also in the way the studies were designed and the content chosen as stimulus material.

An important step toward an evolutionary interpretation concerned the preference concept itself. We initially chose preference as a convenient measure, as a fairly simple and direct dependent variable. It soon became clear that preference was much more than that. Participants made preference judgments rapidly and easily.[4] They even seemed to enjoy the process. The results were not wildly idiosyncratic as folklore seemed to imply, but were remarkably stable and repeatable across groups with widely varying backgrounds.

Increasingly preference came to look like an expression of an intuitive guide to behavior, an inclination to make

choices that would lead the individual away from inapropriate environments and toward desirable ones. The centrality of information in these decisions seems quite appropriate. If humans are organisms whose survival through the course of evolution required the construction and use of cognitive maps (S. Kaplan, 1972, 1973), then being attracted by information would seem thoroughly adaptive. In particular, people should be enticed by new information, by the prospect of updating and extending their cognitive maps (Barkow, 1983). At the same time, however, they cannot stray too far from the familiar, lest they be caught in a situation in which they are helpless because they lack the necessary knowledge (Kaplan & Kaplan, 1982). These two vectors, which seem reasonable on theoretical grounds, match well the two categories of predictor variables, Exploration and Understanding, which have been shown to be reasonably effective in understanding preference data.

An inclination to prefer environments that make one's successful adaptation more likely would not be unique to our species. Among the vertebrates, habitat selection is a widespread tendency (Woodcock, 1982). What this means is that animals show a preference for the kind of environments in which their species prospers. In some instances, this occurs even if the animals have been raised in the laboratory and have had no direct prior experience with the environment in question (Wecker, 1964).

The widespread inclination toward habitat selection perhaps helps explain an otherwise potentially discordant note in the preference domain. Despite the ease with which participants in preference studies are able to make their judgments, and despite the highly regular and meaningful pattern of the results, participants are generally unable to explain their choices. They tend to be quite unaware of the variables that proved so effective in predicting what they would prefer.

Those inclined to emphasize the role of consciousness in human thought and action might find such a state of affairs discomforting. On the other hand, if there is an appropriate

parallel to habitat selection by human organisms, then such unconscious processing by humans is neither unreasonable nor unprecedented. Perhaps there is an evolutionary bias in humans favoring preference for certain kinds of environments just as there is an evolutionary bias favoring reproductive activities. In the case of sex we do not expect people to explain their inclinations on adaptive grounds, although such inclinations must ultimately derive from an adaptive basis. Indeed, as Hebb (1972: 121) has so eloquently pointed out, "The primary reason . . . is not to produce another generation of troublemakers in this troubled world but because human beings like sex behavior."

Both the nature of the predictor variables and the nature of the preference response itself tended to support an evolutionary interpretation. This is in contrast to the position taken by several investigators in this area. The claim is frequently made that the aesthetic reaction to landscape is largely or even completely a learned, cultural pattern (Lyons, 1983; Tuan, 1971). Given such assertions we tended to be rather cautious in making an evolutionary interpretation. Subsequent work, however, has tended to support the hypothesis that evolutionary factors play a nontrivial role in human preference patterns.

The first research finding of this kind was reported by Balling and Falk (1982). They studied preferences of individuals of different ages for various kinds of environments. While a variety of settings had been studied in previous work in environmental preference, this was the first study to systematize the range of environments represented. Five different biomes were used—namely, desert, rain forest, savanna, mixed hardwoods, and boreal forest. Since familiarity and hence experience has been shown to be an important factor in preference, one would expect that any evolutionary influences on biome preference would be most evident at a fairly young age, when familiarity factors might be exerting only a limited influence. This pattern was in fact obtained. There was a substantial

preference on the part of young children (8- and 11-year-olds) for savanna over all other biomes. By the age of 15 the hardwood forest had risen in preference to equal the savanna level. Since the participants in this research were from the eastern United States, the increased preference for hardwoods with increasing age is a predictable outcome of increasing familiarity. On the other hand it could be argued that such a familiarity effect would be least strong in children, given their limited experience with any environment. Thus the younger children's decided preference for savanna, the environment in which the human species is believed to have evolved, is consistent with an evolutionary interpretation. This is in fact the interpretation that Balling and Falk adopt.

A second study pointing to a possible role of evolutionary factors in human preference was reported by Orians (1985). He suggested that manipulated landscapes such as ornamental gardens might reflect a preference for patterns characteristic of the savanna biome. More specifically, he studied the tree forms selected out of all forms available to the Japanese gardener. He found that both selection and pruning practices favor the shapes characteristic of savanna.

A third kind of converging evidence came from a quite unexpected source. Jay Appleton, a British geographer, produced a thoughtful study of English landscape painting. In *The Experience of Landscape* (1975) he puts forward a theory whose two main components are Prospect and Refuge. Prospect refers to having a grand view, an overview, as it were, of the landscape. Refuge refers to having a safe place to hide, a place from which one can see without being seen. Preferring settings with these properties might sound as if it would confer an adaptive advantage, and that is indeed the interpretation that Appleton favors. Although this does not constitute empirical support in the usual sense of the term, it is interesting to discover a totally independent type of scholarly work arriving at a strikingly

similar conclusion—namely, that human landscape preferences are concerned with information, and more particularly, with the gathering of information on the one hand and the danger of being at an informational disadvantage on the other.

An empirical examination of this tantalizing perspective was not long in coming. Woodcock (1982), in a landmark study, wanted to test the Prospect and Refuge approach and the Understanding and Exploration approach in the same context. He also was concerned to see the operation of these variables in the context of certain critical biomes. He chose three of the biomes Balling and Falk had included: savanna, mixed hardwoods, and rain forest. As their study had included only four scenes to represent each of their five biomes, there was reason to question the adequacy of the environmental sampling. By restricting the sample to only three biomes, Woodcock could sample each of them far more thoroughly, using 24 examples for each.[5]

To represent the domains of Understanding and Exploration, Woodcock chose the predictor variables of Legibility and Mystery. In order to have well-defined variables representing the Prospect and Refuge theory, he decided to partition Appleton's original concepts into a "primary" and "secondary" version of each. In each case the primary version involved a view that showed the desired quality had been achieved, while the secondary version involved seeing a place from which it could be achieved. Thus Primary Prospect was defined as a good view or vista while Secondary Prospect was defined in terms of a hill or other vantage point from which one might expect to have a good view. Likewise Primary Refuge involved a view from cover, where one could see without being seen. Secondary Refuge, then, was defined in terms of a view of some area from which one could see without being seen. All six predictor variables were rated by a panel of judges; the 72 scenes were rated on a 5-point preference scale by 200 participants.

Three of the predictor variables fared well in this study.

Mystery, Legibility, and Primary Prospect were all strong predictors. Further analysis of these data suggests a complex relationship among these variables.[6] Mystery and Legibility interact such that a high-Mystery, high-Legibility scene is even more preferred than would be expected given the independent contribution of these variables. Primary Prospect and Legibility interact in a quite different fashion. A high-Primary Prospect scene will tend to be preferred whether it is legible or not, but preference for a scene low in Primary Prospect is dependent upon Legibility. In other words, the grand vista can be so engaging that the possibility of getting there and back is not a consideration. By contrast, lacking such a vista the focus shifts to such practical matters as moving through the terrain without getting lost.

Although Primary Prospect was a strong predictor, the other predictors based on Appleton's theory fared less well. Secondary Prospect and Secondary Refuge predicted significantly in the savanna biome only. Primary Refuge behaved in a fashion strikingly counter to expectations. In Woodcock's (1982) study scenes high in Primary Refuge were characteristically views from woods or brushy areas, looking out toward a clearing or more open area. Such scenes tended to be less preferred although not significantly so. Primary Refuge turned out to be, if anything, a negative predictor. Apparently the problem with a hiding place in the woods is that one is in the woods.

In attempting to determine whether this surprising result could be explained on some other basis, Woodcock tried a number of post hoc predictor variables. (It should be noted that this is a feasible strategy in research of this kind. Since post hoc ratings can be reliably made by judges, independently of any knowledge of the preference results, the fact that the data have already been collected is not contaminating.) Of the different variables explored, only one proved to have a significant effect. This variable was named Agoraphobia, implying the discomfort associated with wide

open areas, largely lacking in protective cover. When the Primary Refuge and Agoraphobia results are combined it becomes clear that neither being out in the open nor being in the woods is favored. These opposing vectors would tend to place the individual right at the forest edge. Ecologists point out that such an area is the richest in terms of life forms; it is likely to be the safest as well.

COGNITION AND AFFECT FROM THE PERSPECTIVE OF ENVIRONMENTAL AESTHETICS

Although much work needs to be done before a fully adequate theory of environmental preference is available, theoretical developments thus far seem reasonably encouraging. An informational approach based on the broad categories of Understanding and Exploration seems to be a useful tool. An evolutionary perspective also seems to hold considerable promise. Fortunately, although these two viewpoints are generally not found together, they are thoroughly compatible (S. Kaplan, 1972; Kaplan and Kaplan, 1978; Lachman & Lachman, 1979). Another conclusion one can draw from environmental preference research to date is that there appears to be substantial information processing occurring in the course of arriving at a preference judgment. Thus environmental preference might offer a useful new perspective on the cognition/affect relationship. Further, theoretical frameworks that have contributed to an understanding of environmental preference might appropriately be applied in this new context as well. Interest in the role of preference in the ecology of the mind has been given a substantial boost by Zajonc's (1980) stimulating article. While this article has unquestionably helped focus attention on the relationship of cognition and affect, Zajonc's position is not without its problems. These difficulties have been ably documented by Seamon and his colleagues (Seamon, Brody, and Kauff, 1983; Seamon, Marsh, and

Brody, 1984), Holyoak and Gordon (1984), and Lazarus (1984). The purpose of the present article is not to add to these reservations. It does, however, seem appropriate to point out ways in which environmental preference research and theory can lead to a reconceptualization of Zajonc's arguments that might at the same time be both more fruitful and less controversial.

It is important to recognize that in his assertion that "preferences need no inferences," Zajonc is not stating that preference never relies on cognition but rather that there exist instances (which may be rather commonly encountered) in which preference occurs without the intervention of any cognition whatsoever. In effect this establishes a suggested dichotomy between two classes of preferences, those that are cognitively mediated and those that are direct and unmediated. From the perspective of research and theory in environmental preference, there appear to be not two but a whole spectrum of different relationships between input and affect, with the cognitive component varying considerably across this spectrum.

In order to discuss the range of roles that cognition might play in preference, it is necessary to be clear on the range of mediating processes appropriately called cognitive. At present there is a widespread tendency to assume that cognition is by definition a conscious calculational process. Such a perspective is limiting and distorting (Lazarus, 1982); fortunately it has not gone unchallenged (e.g., Bowers, 1981; Dreyfus, 1972; Posner and Snyder, 1974).[7] It also flies in the face of one of psychology's most important contributions to intellectual history—namely, that many important psychological processes (not only affective ones) are not accessible to conscious observation.[8] Thus in the discussion that follows, it is assumed neither that cognition is necessarily a conscious process nor that it necessarily involves calculation.

With consciousness eliminated as a criterion for whether a process is cognitive or not, one is left with the nature and

quantity of processing involved. Perhaps one of the most striking impressions to be gleaned from working with informational predictors of preference is that the processing requirements differ for the different predictors. A striking contrast is provided by a comparison of the two Exploration predictors, Complexity and Mystery. Complexity appears to require relatively little processing. Whether there are many different things in the scene, or few, can be determined based on the information provided in the stimulus array.

Mystery, by contrast, is quite another matter. This predictor is, as we have seen, based on the assessment of whether one could learn more by proceeding deeper into the scene. A key issue here is the fact that there are a large number of different environmental patterns for which this can be the case. Scenes high in Mystery can thus vary widely. Some contain a bending path. Others contain a brightly lit area partially obscured by light foliage. Others are dominated by visually impenetrable foliage, but with a hint of a gap which one could pass through. Even slight undulations of the terrain can contribute substantially to Mystery.

What these scenes share is a complex relationship that exists between the observer and the environment. That relationship cannot be detected directly in terms of feature analysis. If one were attempting to build a computer model of such a process it would be exceedingly unlikely that any combination of features could be identified that would yield a consistently valid conclusion concerning Mystery. In contrast, a far more promising procedure might be to use the feature information to construct a rough conceptual model of the three-dimensional space represented by the scene. Then, by simulating locomotion within this hypothetical space, it could be determined if more information would be acquired. Three aspects of such an approach are pertinent here; (1) it captures the relational nature of the construct; (2) it mirrors what the judges are asked to do when rating scenes in terms of Mystery; and (3) it is

inferential, reflecting the *potential* information in the scene. Thus Mystery seems to call upon a reasonably complex, albeit unconscious, inferential process.

The point of all this is not to say that preferences do (or do not) require inferences. Rather, there appears to be a considerable diversity of cognitive processes involved for the different predictors. Preference does not depend upon conscious calculation or even on calculation of any kind in the usual sense of the term. But it often does depend on cognitive processes of varying kind and varying amount. Surely this variation is worthy of further study.

A HYPOTHESIS CONCERNING ENVIRONMENTAL PREFERENCE IN THE ONGOING FUNCTION OF THE INDIVIDUAL

From an evolutionary perspective there may be great advantages in making a quick, automatic prediction about the informational possibilities of a place one is approaching. In locomoting through varied terrain the appropriate direction to be taken requires continual reevaluation as the very process of moving through the landscape opens up new vistas and new possibilities. Speed of processing is thus essential if one is to keep up with new information and respond accordingly. In this way preference would help keep the individual in an environment in which orientation and access to new information can be maintained easily—quite apart from the particular purposes that the individual was pursuing at that moment. This idea of an implicit analysis of the function an object or environment might serve for an individual has previously been proposed by Gregory (1969) and S. Kaplan (1975). Gibson (1979) has proposed a similar concept. The term he used, "affordance," is a particularly apt choice, since the focus here is on what the object or environment in question affords the perceiving organism.

Since the rapid assessment of what the environment holds in store is assumed to be automatic and unconscious, it would be economical as far as processing capacity is concerned. It would be even more efficient if it immediately resulted in an affective code; that is, if it were immediately and automatically categorized as either good or bad. It is important not only to be able to recognize environments that aid one's functioning; one should also prefer them. It would be adaptive for animals to like the sort of settings in which they thrive. As we have already seen, the habitat selection literature amply demonstrates that this is frequently the case (Woodcock, 1982). In many instances, there would be an advantage in having a certain inherited component in such preferences, since the appropriate environment for a given species is likely to be relatively similar for different generations. Having to learn that set of parameters anew for each successful generation could be costly; here again the evolutionary assumption is supported by the habitat selection data. Such an automatic assessment of the possibilities of an environment, accompanied by an immediate affective code, could provide a most efficient guide for ongoing behavior. The individual would be intuitively drawn away from unpromising places and toward places that afforded more positive opportunities.

Another area in which a cognitive factor in preference seems likely to be important concerns the role of content. As already mentioned, certain contents such as trees, water, and foliage have a strong impact on preference. It should be emphasized that the operative factor here is the knowledge and not merely the visual pattern on which it is based. In other words, knowing that one is in the presence of such contents seems to have a strong impact. Perhaps an example would be useful. Imagine looking out the window of an office one is about to occupy and noting with satisfaction the view of the trunks of several nearby large trees. Being told that these were actually painted concrete pillars made to look like trees but completely lacking foliage

would likely make an affective difference. In fact, for many people, potted plants that turn out to be plastic lead to a prompt reversal of affective sign (Zajonc's argument about the stability of affective codes notwithstanding). Thus the content component of prefence, although it functions rapidly and without conscious reflection, necessarily connects to affect via the individual's cognitive structure.

Having a rapid cognitive reaction with affective concomitants in response to particular contents is adaptive for much the same reasons that similar reactions to information patterns are adaptive. Just as environments in which one can learn and maintain one's orientation should be valued, so should environments that possess indications of properties that support human life. Water, trees, and foliage are all indicators of the habitats in which human survival is more likely. The most preferred settings, of course, combine informational and content components (Kaplan, 1982). Savanna- or parklike settings constitute good examples of the combination of favorable process and content; such environments tend to be highly preferred (Balling and Falk, 1982; S. Kaplan, 1979a; Rabinowitz and Coughlin, 1970).[9]

Thus environmental aesthetics can be seen to be both efficient and economical. And the impact of this process is far from trivial; by influencing choice and guiding locomotion it plays an important role in determining the environment in which the individual is located. There are strong system relationships here. Just as affect leads to being in a particular environment, being in that environment has an important impact on subsequent stimulus input and that input, in turn, leads to new cognitive and affective states (Kaplan, 1985).

From this perspective, environmental aesthetics is not a special case of aesthetics but a reflection of a broad and pervasive function. In fact, some of the more traditional aesthetic domains may be derivative of this more basic function.

AESTHETICS REVISITED: SOME CONCLUDING COMMENTS

Research in environmental preference has not only yielded insight into the aesthetics of landscape; it turns out to have considerable theoretical interest as well:

(1) The way preference feels to the perceiver stands in sharp contrast to the process that underlies it. Preference is experienced as direct and immediate. There is no hint in consciousness of the complex, inferential process that appears to underlie the judgment of preference. Given the range of variables that are being assessed, the underlying process must be carried out with remarkable speed and efficiency.

(2) Aesthetic reactions reflect neither a casual nor a trivial aspect of the human makeup. Aesthetics is not the reflection of a whim that people exercise when they are not otherwise occupied. Rather, such reactions appear to constitute a guide to human behavior that has far-reaching consequences. Many everyday behaviors, such as organizing one's work space and arranging and maintaining one's home, may reflect factors of this kind. Even in patterns of thought, avoiding certain directions and aproaching others may be based as much on feelings of mystery, coherence, and the like, as on the specific content involved. Aesthetics could thus be seen as a set of inclinations, however intuitive or unconscious, which might influence the direction people choose not only in the physical environment but also in other domains.

(3) Environmental preference may be a topic of considerable potential interest within psychology. It may provide a window on cognition-affect relationships that can readily be studied under controlled conditions without the oversimplification that so readily distorts transplants from field settings.

(4) Environmental preference may constitute an important conceptual link in analyzing how evolution could have an impact on behavior. Much recent discussion of potential evolutionary influences has tended to ignore psychological mechanisms. Here preference could play a useful bridging function. It is a domain in which, based on animal studies, an evolutionary role might be expected. The factors that have been demonstrated empirically to be predictors of preference are consistent with such an evolutionary interpretation.

(5) It is now quite clear that there is more to experimental aesthetics than optimal complexity. Further, since the additional components that have been discovered concern adaptive functioning in a complex environment, they are of some theoretical interest. These components also point to the high premium placed on information. Both the acquisition of new information and its comprehension turn out to be central themes underlying the preference process.

NOTES

1. Despite the rather widespread acceptance of the optimality hypothesis, this position has serious theoretical difficulties (Martindale, 1984a) and fared badly in an ingenious series of direct experimental tests (Martindale, 1984b).

2. It might be argued that "Mystery" is semantically too close to "surprise" to be an appropriate name for this variable. After all, when one reads a mystery, does one not expect to be surprised? Upon close examination, however, this turns out to be a misleading association. A well-crafted mystery allows one to generate hypotheses, directly parallel to the effect of partial information in an environment. "Surprise," in contrast, is a rather undiscriminating term. One can be surprised by something that happens with no prior warning; the suddenness that is appropriate to the meaning of surprise is quite inappropriate in the case of Mystery.

3. The initial efforts to define "Legibility" described a scene high in this variable as being one in which one could "venture out without getting lost." This led judges to award high Legibility scores to desolate open spaces. The definition was thus modified to include "being able to get back again" as well. This change in definition made visual differentiation of the scene and the presence of distinctive landmarks far more salient. In research carried out since this definitional shift, Legibility has been a more effective predictor (cf. Woodcock, 1982).

4. Participants not only make a quick response; they are capable of doing so after only a brief glimpse of the stimulus array. R. Kaplan (1975) studied preference ratings made of scenes presented for 10, 40, or 200 msec. These brief exposure ratings correlated .97 with ratings of scenes presented for 15 sec.

5. Through the kind assistance of John Balling and John Falk their scenes constituted a subset of the scenes used for each of the three biomes under study.

6. These analyses were performed subsequent to the completion of the dissertation; David Woodcock kindly made available the data on which the additional analyses are based.

7. The most recent salvos in the debate between Zajonc (1984) and Lazarus (1984) seem to hinge in large measure on whether cognitive appraisal is a necessary part of affect. This issue appears to be orthogonal to the cognition-affect relation that is expressed by the preferences for different environments.

8. This insight dates back at least to Ach (1905/1951) and Messer (1906/1964) of the Wurzburg school of introspection. For a useful discussion, see Blumenthal (1977).

9. Two misunderstandings often arise in discussions of hypotheses concerning innate biases toward particular types of landscape. First, there is the presumption that genetics somehow precludes learning. Note, however, that well-documented inherited mechanisms such as imprinting show a substantial sensitivity to learning. A bias is a disposition; it makes some sorts of learning easier than others. It is a factor in how experience is processed and interpreted, not a substitute for it. A second misunderstanding concerns variability. There is the presumption that "innate" means " unvarying," that if a bias is inherited then everyone should have it. Since the theory of evolution is based on genetic variation, it is striking that this misconception is so widespread. Physical features widely assumed to be inherited such as stature, hair color, and facial features can be observed to vary widely. Sometimes the universality assumption is raised in the context of groups, such as Eskimos or aborigines living in strikingly contrasting environments. It is suggested that these groups probably have different preferences, the implication being that this undermines the genetic hypothesis. On the contrary, it would be highly maladaptive for individuals in such extreme environments to prefer savanna. Here culture and environment would be expected to have a profound effect on genetic patterns. Such interactions of culture and genetics may be more common than is generally realized; for helpful discussions of this theme, see Midgley (1978) and Friedman (1979).

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