EVALUATING ENVIRONMENTAL SCENES USING DYNAMIC VERSUS STATIC DISPLAYS

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ABSTRACT: Perceivers' assessments of dynamic and static displays of environmental scenes were compared to evaluate how readily responses to static displays can be extrapolated to experience in situ. The dynamic displays were videotaped segments taken along a route presenting transition events characterized by the property mystery. The static displays were freeze frames from each segment. Results indicated that assessments of static displays do not simply parallel those of dynamic displays. Preference ratings were higher for static displays, but preference ratings in the dynamic condition were more strongly correlated with a wider range of variables. Moreover, epistemic ratings were higher for dynamic than static displays. Turn segments of the route, where the greatest amount of new information is revealed, produced the highest ratings on epistemic and evaluative variables. Differences across

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display modes point to a greater need for understanding environmental perceiving in relation to the dynamic quality of everyday experiences.

The extant research literature in environmental perception and aesthetics is a body of work largely based on the use of static representations of the environment either in the form of photographic prints or slides (Nasar, 1988b, 1994). At first glance, use of static displays would appear to be reasonable on both empirical and theoretical grounds. Empirically, it has been found that responses to color photographs and slides are similar to responses obtained from perceivers located at the actual site from which the image was captured (Stamps, 1990). Theoretically, the choice is consistent with the long-held view that perception is based on a static image projected on the essentially two-dimensional surface that is the retina of the eye. Examined more closely, however, both of these grounds can be questioned.

As to the empirical basis, having individuals evaluate a portion of the environment from a fixed location, even one in situ, is not usually the way individuals experience the environment. Typically, perceivers are moving with respect to and often through the environment. Humans and other sentient animals are mobile organisms—and continuously so. Recognizing that fact invites a theoretical reformulation of the process of perceiving along the lines developed in Gibson's (1966, 1979) ecological approach to perception (also see Heft, 1981, 1988, 1997).

Gibson proposed that perceiving involves, in large measure, the detection of invariant properties of the environment in the context of a changing array of stimulus information. Indeed, because we are mobile creatures, a plausible case can be made that perceiving would had to have evolved in part as a process of detecting invariant information in the context of a changing array of information rather than as a static image capturing process.[1] Through an extensive program of research, Gibson (1979) showed in convincing fashion how movement enhances the process of perceiving environmental features; or stated more precisely, how action is a critical facet of the perceptual process.

In light of these considerations, how well does the environmental perception and aesthetics literature, based as it is primarily on static displays, reflect the character of environmental experience under dynamic naturalistic conditions? We felt that making a start at exploring this question was a worthwhile endeavor. Its theoretical value has been touched on already. Practically, this comparison is important because the design process often involves the use of static representations in the form of either drawings, photographs, or models, and frequently all three. How well these displays evoke the same types and range of reactions among perceivers as do the same built structures experienced dynamically has an obvious bearing on the relative adequacy of these displays as part of the design process (Thiel, 1997).

PERCEIVING IN MOTION

The environment as experienced has dynamic rather than static qualities. The visual world, for example, continually undergoes change both from dynamic events in the world itself, such as the movement of trees in the wind, and from the visual changes generated from our own activities, such as locomotion. The kinds of dynamic changes considered in the present study are primarily those of the latter type, produced by movements of the perceiver in interaction with the environment. When perceivers are walking or otherwise traveling along paths in the environment, the visual field is undergoing continuous dynamic changes. Some of these changes include the following: a streaming or outflow of features from a center of expansion in the field of view accompanying forward movement (*optical flow*), differential rates of movement of stationary objects as a function of their relative distances from the perceiver (*motion parallax*), and the gradual covering and uncovering of objects behind other objects (*optical occlusion* and *disocclusion*) (Gibson, 1979). None of these changes are present in static displays.

A small number of researchers and designers in the environment-behavior area have long stressed the importance of dynamic simulation of the environment (Appleyard, Lynch, & Myer, 1964; Lynch, 1960; Thiel, 1970, 1997). This concern was a major impetus behind the design and construction of the Berkeley Simulation Laboratory with which researchers and designers could produce filmed trips through scale model environments (Appleyard & Craik, 1974). In one test of this simulator, responses to real-world drives, films of that drive, and films of simulated tours through the scale model were found to be comparable with respect to a wide range of assessment variables (Bosselmann & Craik, 1987).

Such findings go a long way toward justifying the use of dynamic displays such as film or videotape in environmental perception research (also see Heft, 1983, 1996). But, what is still unknown is whether the apparent differences between static and dynamic displays are of any consequence for the resulting research literature. When individuals are asked to evaluate environmental representations, do static displays of environments produce a pattern of results that differ in any systematic ways from dynamic displays of environments? This question motivated the present research.

TWO PERSPECTIVES ON ENVIRONMENTAL AESTHETICS

Two theoretical approaches to environmental perception and aesthetics were particularly relevant in the design of the present investigation.[2] Both approaches attempt to shed light on the motivational factors underlying individuals' preference for some kinds of environments rather than others, but one approach emphasizes the affective qualities at work in such circumstances and the other has a decidedly more cognitive focus.

The clearest example of the more affective emphasis is the application of Berlyne's (1972) psychobiological approach to aesthetics generally and to environmental perception more specifically (Wohlwill, 1976). Berlyne proposed that perceptual exploration and preference are related to the relative degree of curiosity or conflict, and hence arousal, generated for the perceiver by structural properties of visual patterns. Such properties, *collative variables*, include novelty and ambiguity of a given display as well as the degree of incongruity or fittedness among parts of the display. The collative property that received the most attention in early studies of environmental aesthetics was complexity, which was posited to be arousal producing because of the effort required to comprehend the available structure. Extrapolating from Berlyne's theoretical writings and empirical studies, Wohlwill (1975, 1976) hypothesized initially that environments characterized by intermediate levels of these collative properties, and hence generating intermediate levels of arousal, would be preferred over those that were either hypo- or hyper-arousing. Over the course of his research program, Wohlwill needed to adjust this initial working hypothesis in minor ways,[3] but overall, his investigations provided some support for the potential fruitfulness of this approach (also see Nasar, 1987, 1988a).

Although it is true that there is a cognitive element present in Berlyne's notion of collative properties (i.e., because conflict and thus arousal are generated in the process of the individual attempting to come to terms with the structural character of any particular stimulus configuration), the way these variables have been operationalized in this approach has relegated their cognitive qualities to relatively minor consideration. A research approach with an unequivocal cognitive emphasis is that developed by the Kaplans (Kaplan & Kaplan, 1989). Drawing on a more diverse set of conceptual resources but resting squarely on an information-processing approach, the Kaplans' primary concern was the functional value for the perceiver of understanding the organization or layout of the environment. From this starting point, environmental preference is considered to be related directly to how readily individuals are able to comprehend a given environmental scene.

Some of the structural environmental variables Kaplan and Kaplan (1989) identified as predictors of preference are coherence, legibility, complexity, and mystery. The variable *mystery* is especially pertinent in the present study. A scene is high in mystery, according to Kaplan and Kaplan (1989), if it draws the perceiver into the scene with the prospect of more information. Perhaps the prototypical example of a scene high in mystery is a path that extends from the foreground into the background, with the path eventually bending out of sight, for instance, around a stand of trees. This quality, also called a *deflected vista* in the design literature (Cullen, 1961), has been found to be associated consistently and positively with preference ratings (Kaplan & Kaplan, 1989).

In a static display, a scene characterized by mystery is a frozen moment in a path of travel; it is a pause in an extended event sequence as the perceiver travels along a path. Considered dynamically, mystery is close in spirit to Gibson's (1979) concept of a *transition.* Working from the ecological perspective, Heft (1983, 1996) found evidence for the navigational value of transitions along a path of travel that serve as perceivable relations between two vistas (a *vista* defined as an extended layout of surfaces). A transition is an especially rich perceptual event with occurrences of occlusion and disocclusion prominent over time as, respectively, once visible surfaces of the environment become hidden behind other surfaces and previously hidden surfaces gradually become visible as the perceiver travels along a path.

Here then is a variable that may be especially suited for a comparative examination of dynamic versus static displays. There is ample evidence from the Kaplans' research program that mystery represented in a static display evokes positive evaluations from perceivers (Kaplan & Kaplan, 1989). By comparison, how would perceivers respond to this type of display when it is presented dynamically as a perceptual event?

THE PLAN OF THE PRESENT INVESTIGATION

The theoretical perspectives sketched earlier can be drawn on to generate a diverse set of criteria against which dynamic and static displays can be contrasted. First, environmental displays can be assessed with respect to collative-type properties. Although such variables have been used in conjunction with static visual displays, in principle there is no reason why they cannot be used to assess dynamic displays. In addition, other variables derived from a more dynamic mode of perceiving could supplement such Berlynian variables and in some ways may be more appropriately applied to dynamic displays. The environmental property examined with respect to these various criteria was mystery, or alternatively conceptualized as the environmental event, a transition.

On methodological grounds alone, it seemed reasonable to limit our investigation of mystery/transitions to scenes sharing a comparable content. Although we could have allowed the content of the displays to vary widely—from cityscapes on one hand to wilderness scenes on the other—we felt doing so could potentially obscure the static versus dynamic contrast of primary concern to us. That is, by limiting the content of the range of conditions examined, effects from type of presentation (i.e., static vs. dynamic) might be revealed more readily. For this reason, the displays used in the present investigation varied in content in minor ways.

Within this constraint, we attempted to vary systematically the amount or degree of mystery in any single display (static or dynamic) by presenting one of three segments of a transition. The first segment, the *approach,* is that portion of the path where the perceiver can first detect the coming change in the path's direction ahead. The second segment, the *turn,* is that portion of the route during which the path alters its direction; and this is where the greatest amount of occlusion and disocclusion occurs and hence new information is revealed. The third segment, the *resolution,* is that segment of the route during which the turn is concluded and the next vista first becomes visible. Stated more succinctly, the approach is what is visible from the initial vista before the turn; followed by the turn itself, which is a transition between the just departed vista and the vista to come; followed by the resolution where the succeeding vista comes into view.

From the perspective of Berlyne's framework, one might expect that uncertainty and hence arousal would change systematically across these three path segments, with the most uncertainty during the turn segment in relation to either the approach or resolution segments. In a relatively safe setting (e.g., in a setting where fear of crime is likely to be negligible, see Nasar & Jones, 1997), preference should be highest in conjunction with the higher uncertainty and hence curiosity generated in the turn portion of the event. The degree of mystery in each of these portions of the route would follow this same pattern, with the turn possessing highest relative mystery. Thus, the methodological paradigm employed here does not differentiate in any predictive way between these theoretical approaches. Instead, our more modest goal was the comparison of responses to static versus dynamic displays.

METHOD

PARTICIPANTS

The participants in the investigation were 51 undergraduate and graduate students, 30 attending Denison University and 21 attending Ohio State University. A total of 25 participants were randomly assigned to the epistemic variables condition, and 26 participants were in the evaluative variables condition (see the following). All of the Denison participants were undergraduates, and none of them had a background in design or planning. The Ohio State participants were graduate students in city and regional planning and a few of them had undergraduate degrees in architecture.

MATERIALS

A videotape prepared for use in earlier research (Heft, 1996) was edited for the purposes of the present study. The unedited videotape was taken through the front window of a van traveling about 15 miles per hour along a rural road. This path consisted of straight portions, curves, and moderate uphill and downhill slopes through an area mostly wooded on both sides of the road and interspersed with occasional open areas. A small number of built features (e.g., mailboxes, driveways, and cars passing in the opposite direction) also appeared in the videotape. The videotape was shot using a Panasonic PV-750 digital camcorder with a 52mm lens. The built-in stabilizing mechanism was engaged to minimize camera movement, although somewhat at the cost of limiting the field of view.[4]

The videotape was edited in such a way as to generate several transition sets. As described earlier, a transition was operationalized in the present study as consisting of three segments: an approach, a turn, and a resolution segment. With the goal of displaying unambiguous instances of each of these types of event segments, seven portions of the original videotape were identified by the experimenters as representative approach displays, eight portions were selected as suitable for use as turns, and eight segments were selected as resolution segments. Thus, there were a total of 23 dynamic segments selected from the original videotape to be used in the present study. Six seconds of each segment were presented to participants, and the segments were separated from each other by 12 seconds of a blank screen.

The static display segments were created by selecting one frame from each dynamic segment and freezing that frame for 6 seconds. The particular frame chosen was one that seemed a priori to display the most information within any given segment. Twelve seconds of blank screen separated the static segments.

For both the static and dynamic conditions, the total duration of the edited videotape consisting of 23 segments plus blank intervals for each condition was 6 minutes and 42 seconds. Moreover, for both types of displays, three different orders of the 23-segment sequence were generated to minimize order effects.

Participants at both institutions viewed the videotape individually in a room set aside for testing purposes. The edited videotape of the path was presented on a 19-inch color monitor with participants seated approximately 5 feet from the screen. The audio portion of the tape was muted during all showings.

DEPENDENT VARIABLES

Two sets of rating scales were prepared for the study (see the Appendix).

Epistemic variables. Four items were presented to assess the degree to which the displayed environmental scene motivated additional exploration. On a series of 5-point scales, participants rated each segment in terms of the extent to which they wanted "to explore further in the scene" (explore further), the extent to which they could "perceive that more information lay ahead" (more information), the extent to which they would "learn more by moving ahead" (learn more), and the extent to which "what lay ahead is unpredictable" (predictability).

Evaluation variables. Four items were designed to assess different affective dimensions along which displayed scenes could be evaluated. On a series of 5-point scales, participants rated how much they "liked" the scene (preference), how "inviting" the scene was (inviting), how "comfortable" they felt proceeding along the path (comfort), and how "curious" they felt about what happens next (curiosity).

Participants were assigned to either the epistemic variable condition or the evaluative variable condition. Within each condition, the order of the items was counterbalanced across participants.

PROCEDURE

After being handed a data sheet and seated behind a desk facing the monitor, participants were read the following instructions, which were also printed at the top of the data sheet:

> You will be seeing videotapes of drives through the countryside. The videotapes of the drives have been edited into small segments, and we will show you separate segments of the drives. As you view each segment, we'd like you to imagine that you're actually there moving through the environment. After each segment, you will have 12 seconds to judge the scene ahead on the four scales listed below. After each scene, you should write the number 1, 2, 3, 4, or 5 that best fits your judgment of the scene.

Presented below these instructions were detailed definitions of each variable to be rated (presented in the Appendix) and below these was a clearly labeled 4 by 23 grid (4 variables by 23 segments) for responses. The data sheet was set up in this way so that variable definitions were always available to participants if needed.

Following the display of each segment and while the monitor's screen was blank, participants in the epistemic variable condition and the evaluative variable condition responded to the four items on the data sheet. That is, each participant was asked to provide four responses for each of the 23 segments (or 92 responses per participant).

RESULTS

Cronbach's alpha values for reliability were calculated for participants' ratings of each variable both across the two testing locales as well as within each locale to determine if the data from the two samples could be justifiably combined. Alpha values of an acceptable magnitude were obtained across the two samples (and comparable values were obtained within each sample) for five of the eight original variables: explore further, unpredictability, learn more, curiosity, and comfort (see Table 1). As a result, the data for each of these five variables were combined across the samples, and this full set was used in subsequent analyses. For several reasons, preference responses were also combined across the two locales and employed in subsequent analysis, although the alpha value was not especially high (alpha = .64). Obviously,

TABLE 1
Reliability of Ratings Between the Two Samples (Cronbach's alpha estimates)

Epistemic scales (n = 22)	
Explore further	.89
Unpredictability	.86
Learn more	.89
More information	.74[a]
Evaluation scales (n = 22)	
Curiosity	.90
Comfort	.79
Inviting	.63[a]
Preference	.64

a. These items were excluded from subsequent analyses (see text for details).

this variable is especially relevant in discussions of environmental aesthetics, and in any case, it is reasonable to expect a comparatively lower degree of agreement on preference between participants. At the same time, the level of agreement within each sample was comparable (Denison: alpha = .50; Ohio State: alpha = .57). Lack of agreement across the two samples on the variables more information lay ahead and inviting as well as low reliability within the samples led us to exclude these items from the later analyses based on the combined samples. (Possibly some ambiguity as to the precise meaning of these variables for participants accounted for the low reliability.)

The participants' evaluations of the landscape displays, combined across both samples, were examined using a 2 × 3 analysis of variance (ANOVA), with the first factor (dynamic vs. static presentation) a between-subjects factor and the second factor (the three transition segments) a within-subjects factor. The means, *F*, and *p* values for these two variables are presented separately in Tables 2 and 4, respectively. There were no significant interaction effects.

DYNAMIC VERSUS STATIC DISPLAYS

The results of the ANOVA indicate that participants responded differentially to static and dynamic displays of the landscape. When the data are collapsed across type of transition segment (see Table 2), the dynamic displays were rated as significantly higher than static displays on the epistemic variable, the likelihood of learning more by moving ahead along the path (dynamic = 3.38, static = 2.89, respectively; $F = 8.63$, $p < .01$). Consistent with this trend, the mean rating of wanting to explore further ahead was also

TABLE 2
Mean Scores for Static and Motion Displays

	Type of Display		
	Dynamic	*Static*	F*(1, 19)*
Epistemic scales			
Explore further	3.23	2.92	2.61 (*p* = .12)
Unpredictability	2.82	2.92	.36
Learn more	3.38	2.89	8.63**
Evaluative scales			
Curiosity	3.11	3.34	4.66**
Comfort	3.35	3.25	0.09
Preference	3.05	3.23	5.24*

*$p < .05$. **$p < .01$.

higher in the dynamic condition than the static condition (dynamic = 3.23, static = 2.92), although this difference failed to reach statistical significance ($F = 2.61$, $p = .12$). There is some evidence, then, that the dynamic display evoked a comparatively stronger assessment that there was more to be perceived by continuing to move through the setting than did the static displays.

In contrast, for two items defined a priori as affective variables, dynamic displays received slightly lower ratings. Specifically, preference was significantly lower in the dynamic as compared to the static condition (3.05 vs. 3.23, respectively; $F = 5.24$, $p < .01$), and curiosity was rated comparatively lower in the dynamic condition as well (3.11 vs. 3.34, respectively; $F = 4.66$, $p <. 01$).

The relative impact of dynamic versus static displays is also revealed by comparing the intercorrelation matrices of the dependent measures assessed under both display conditions (see Table 3). The table indicates that responses under the two conditions were similar in many ways and different in others. As to their similarity, the three epistemic variables (desire to explore further, degree of unpredictability, and likelihood of learning more by moving ahead) as well as the affective variable curiosity resulted in a strikingly similar pattern of intercorrelations in both the dynamic and the static conditions. A factor analysis confirmed a single factor with high loadings for all three epistemic variables in both conditions, and in each case, the variable learn more by moving ahead had the highest loading (dynamic = .92, static = .96, respectively). With regard to other similarities in both the dynamic and static conditions, as unpredictability decreased, feeling comfortable moving ahead increased (dynamic: $r = –.68$, static: $r = –.78$, respectively).

TABLE 3
Pearson Correlations Between Scales[a]

	Explore Further	*Unpredictability*	*Learn*	*Curiosity*	*Comfort*	*Preference*
Static display						
Explore further	—					
Unpredictability	.92**	—				
Learn	.89**	.94**	—			
Curiosity	.88**	.83**	.86**	—		
Comfort	–.78**	–.78**	–.76**	–.80**	—	
Preference	.23	.17	.22	.29	.09	—
Dynamic display						
Explore further	—					
Unpredictability	.76**	—				
Learn	.89**	.84**	—			
Curiosity	.84**	.79**	.80**	—		
Comfort	–.36	–.68*	–.38	–.57	—	
Preference	.75**	.53	.73**	.72**	.08	—

a. Significance levels adjusted using Bonferroni correction for multiple analyses.
*$p < .05$. **$p < .01$.

Despite these common patterns, it is to be noted that the relationships in the static condition tend to be stronger than in the dynamic condition. These matrices differ in two other ways: Consistent with the immediately preceding observation, a number of correlations that are small to negligible in the dynamic condition are sizable in the static condition. Notably, however, one set of relations that did not show this pattern is those between preference ratings and the other variables. Preference ratings in the dynamic condition were significantly correlated with three of the five remaining dependent measures but with no variables in the static condition. Specifically, in the dynamic display condition, preference was positively correlated with degree to which further exploration is desired (r = .75), degree to which more would be learned by moving ahead (r = .73), and amount of curiosity evoked (r =. 72).

In summary, when comparing the responses to the two different types of displays, we find a mixed picture. Whereas there are numerous similarities in patterns of response, as seen in a comparison of the correlation matrices, there are numerous differences as well. When the displays are directly compared, as they were in the ANOVA, the differences are at least as great (i.e., as numerous) as the similarities. As to the differences, the dynamic displays

TABLE 4
Mean Scores for the Approach, Turn, and Resolution Segments

	Approach (A)	*Turn (B)*	*Resolution (C)*	F*(2, 38)*
Epistemic scales				
Explore further	2.65	3.81	2.88	33.96**[a]
Unpredictability	2.41	3.67	2.58	21.22**[b]
Learn more	2.68	4.03	2.99	49.26**[c]
Evaluative scales				
Curiosity	2.64	3.98	3.02	42.19**[d]
Comfort	3.59	2.86	3.45	11.12**[e]
Preference	2.96	3.31	3.14	2.98
(*p* = .06)				

a. Post hoc tests: B > C** B > A** C >A*.
b. Post hoc tests: B > C** B > A**.
c. Post hoc tests: B > A** B > C** C >A**.
d. Post hoc tests: B > A** B > C**
e. Post hoc tests: B > A** B > C**
*$p < .05$. **$p < .01$.

evoked higher levels of wanting to learn more by moving ahead and wanting to explore further, whereas curiosity and preference were higher for the static displays.

TRANSITION SEGMENTS

With regard to the other main effect, the transition segments, the results of the ANOVA indicate that participants sharply responded in different ways to the three segments (see Table 4). When the data are collapsed across presentation type (i.e., dynamic or static), the turn segment was assessed as being highest in participants wanting to explore further along the path (3.81 vs. 2.65, 2.88), highest in its relative degree of unpredictability (3.67 vs. 2.41, 2.58), and highest in offering the possibility to learn more by moving ahead (4.03 vs. 2.68, 2.99). Consistent with this pattern of results, the turn segment of the transition received the lowest ratings of comfort (2.86 vs. 3.59, 3.45), the highest ratings of curiosity (3.98 vs. 2.64, 3.02), and marginally the highest ratings for preference (3.31 vs. 2.96, 3.14; $F = 2.98$, $p = .06$). Overall then, the turn segment differed from either approach or resolution segments in expected ways for five of the six variables (and the sixth was marginally significant), indicating that this portion in the path where the greatest occlusion/disocclusion effects occur evokes a wide range of epistemic and affective reactions.

PREDICTORS OF PREFERENCES

Regression analyses were performed to determine if any of the variables would function as predictors of preference. Because the epistemic variables were all highly intercorrelated, only the variable learning more by moving ahead was examined because it had the highest factor loading of the three variables (see earlier descriptions). Learning more predicted preference ratings only in the dynamic condition ($t = 5.53$, $p < .01$, beta coefficient = .52, adjusted $R^2 = .58$). Among the two evaluative variables (excluding preference), ratings of curiosity predicted preference in the dynamic condition ($t = 2.40$, $p < .05$, beta coefficient = .31, adjusted $R^2 = .19$). As the intercorrelations suggest (Table 3), no variable functioned as a reliable predictor of preference in the static condition.

SUMMARY

What does this somewhat complex set of findings suggest? First, at a minimum, the findings indicate that reactions to static displays do not simply parallel those of dynamic displays. In addition to the differences revealed by the intercorrelations, a main effect for display type was found on three of the eight dependent measures. Second, the turn segment of the transition had a discernable impact on all but one rating variable. It was evaluated as comparatively higher on explore further, unpredictability, learn more, curiosity, and preference (marginally); and lower on comfort. Third, preference was somewhat higher for static displays, but the dynamic displays had a more robust effect on preference ratings in relation to the other dependent measures. Consistent with this pattern, predictors of preference (i.e., looking ahead and curiosity) were in evidence only in the dynamic condition. In addition, preference was comparatively higher for the turn segment of the transition sequence.

DISCUSSION

Put most simply and most generally, the results of this study indicate the following: Investigations of some environmental variables using static displays with the assumption that perceivers' reactions to these displays will be identical to their reactions to dynamic displays, and by extension to environments in situ, rest on an unwarranted assumption. For this reason, researchers and designers need to be aware of the potential limitations of the extant research literature when attempting to make a simple extrapolation from this body of work to experience in environments.

Looked at more closely, the results suggest some ways in which perceivers' reactions differ across these two presentational modes. First, the epistemic or motivational value of dynamic displays appears to be higher than for static displays. Participants in the dynamic condition in the present study indicated a higher likelihood that more would be learned by traveling further along the path and marginally expressed greater interest to explore further along the path in the dynamic condition.

Second, preference ratings appear to be elevated for static displays relative to dynamic displays. Although the present data do not offer an obvious explanation as to why this should be so, the higher ratings for curiosity in the static conditions raise the possibility that static displays engender greater uncertainty and in turn, along the lines of the Berlyne-Wohlwill argument, higher preference. However, the modest correlation between curiosity and preference in the static condition (r = .29) coupled with a failure to find through regression analysis that curiosity predicted preference in this condition offers at best rather weak support for this explanation. (We will return shortly to another factor that may partially account for this finding.)

Third, despite the higher preference for static displays, the character of this response in the static condition was comparatively more limited or less rich. The results indicate that preference was unrelated to any epistemic or evaluative variable in the static condition, whereas it was correlated to a variety of epistemic and affective qualities when assessment was made in relation to the dynamic displays. That is, when evaluating dynamic displays, participants' preference ratings were positively related to wanting to explore further, to the likelihood of learning more by exploring further, to curiosity in relation to the segment, and marginally to the unpredictability of the segment. Indeed, expecting to learn more by exploring further and curiosity predicted preference in the dynamic condition. Metaphorically put, preference ratings in relation to dynamic displays were quite a bit thicker and richer than they were in relation to static displays.

Finally, the results did confirm the expected pattern of response to the turn portion of a transition—that is, to mystery. When examined across presentational mode, this portion of the transition received the highest ratings for all three epistemic variables and two of the three affective variables included in the analysis. Surprisingly, the third affective variable, preference, differed only marginally among the three path segments, with the turn segment receiving the highest preference ratings.

The failure to find a stronger preference effect for the turn segment is not consistent with typically high ratings for mystery in prior research. Possibly the effect was attenuated here because in all of the displays used in the present study, mystery was present to some degree. That is, whereas occlusion-disocclusion effects were prominently presented during the turn segments, the promise of such effects were also present in the approach segments (where the turn was visible ahead) and in most resolution segments (where a turn or the crest of a hill was often visible in the distance). We expect that if the transition/mystery variable had been more consistently controlled, a stronger effect would have emerged.

The similarity in content among these scenes raises a further question. Some previous research has shown variation in preference and other responses across different types of scenes (Herzog & Miller, 1998; Herzog & Smith, 1988). In particular, Herzog and Smith (1988) looked at urban and natural scenes and at scenes likely to be judged as high in danger and scenes likely to be judged as less dangerous. They found preference ratings to be depressed by danger, and this was the case to a greater extent for urban than nonurban settings. Still, mystery proved to be an independent predictor of preference. In a second study, Herzog and Miller (1998) varied the degree of mystery in a scene and found that mystery was uncorrelated with danger except for field/stream scenes where there was a positive relationship between these two variables. In the present study, which used exclusively rural scenes, the pattern of inverse relationships in the static condition between epistemic variables and comfort (i.e., the greater degree perceivers judged they could learn more by moving ahead, the less comfortable they felt) is consonant with these findings, although this relationship was attenuated in the dynamic condition. Herzog and Miller also found preference to be correlated positively with openness and to be a function of danger, mystery, and type of setting. These latter results suggest that mystery may be confounded with scene content and other scene features such as openness.

Such findings prompt us to raise the question, how would mystery and preference relate in settings other than those used in the present study? Both Gibson's framework and the Kaplans' perspective would lead one to expect mystery to be a rather robust predictor of preference. Without further inquiry in conjunction with a variety of setting types, we do not know whether this prediction is warranted. In this regard, it should be noted that the settings examined in most prior investigations (Herzog's excepted) as well as in the present study are likely to be experienced as relatively safe and without potential dangers or uncertainties. However, transitions or mystery occurring in a setting that has potential dangers or hazards (e.g., an urban campus at night) may well be evaluated in a negative manner (Nasar & Jones, 1997). These considerations suggest that contextual factors may need to be given greater attention than they have in the past. The psychological effect of structural variables, such as mystery, is likely to be moderated by the functional characteristics specific to particular types of settings. This point suggests for future research a more fine-grained approach than we have adopted here comparing different types of settings. Moreover, the interaction of perceived safety/danger and mystery as predictors of preference examined in conjunction with dynamic displays has been unexamined to date. Our findings lead us to expect a different pattern of results as a function of presentation type.

An additional shortcoming of this study is the broad criteria we employed to designate a scene as either an approach, turn, or resolution. Within each of these categories, no doubt finer distinctions could be made resulting in a more fine-grained analysis than we were able to offer here. To take this additional step, more precise descriptive tools other than these broad categories would be needed. Benedikt's concept of the "isovist" may serve as a useful model for drawing finer within-category distinctions and in turn allow for more precise relations between environmental layout and psychological experience to be explored (Benedikt, 1979; Benedikt & Burnham, 1985).

Because drawings, models, and simulations of a static nature are the common modes of presentation both in research and design, it is important to reflect further about why preference ratings may have been higher in the static versus the dynamic condition. The word *picturesque* may provide some insight here. In Western cultures at least, assessment of environmental beauty may more naturally occur in relation to static rather than dynamic displays. Pictures and images fill our culture, and adopting a detached evaluative stance toward static displays is commonplace. Indeed, static displays invite a detached viewpoint; they are a stop in the flow of ongoing perceptual experience. In contrast, asking for preference assessments of dynamic displays, as we did in the present study, requires that individuals do something that they do not regularly do. Under circumstances in which they do not commonly engage in much reflection—namely, in relation to dynamic experience in the environment usually accompanying perceiving/acting—we asked the participants to do just that, to adopt a detached stance. These two factors working jointly—namely, the familiarity of making detached judgments of static displays on one hand and the unfamiliarity of doing so in relation to dynamic experience on the other—might account for the difference in preference ratings and the direction of this difference under these two conditions. Apart from the merits of this possibility, the results indicate that drawings, models, and other static simulations of a scene may lead to elevated preference ratings in relation to the in situ experience of moving through the represented setting.

In addition to the specific questions this research attempted to address, there was a broader intention at work here. A rather limited presentational mode has dominated research on environmental perception and aesthetics. On theoretical grounds drawn largely from Gibson's ecological approach, we anticipated perceivers' responses to dynamic displays versus static displays to be different. We believe that our data support this admittedly general claim, and to the extent that they do (and that the findings can be generalized to a broader participant population), the present research should prompt investigators in these and related areas of research to move beyond static displays as the sole way to present representations of environments to perceivers. By doing so, not only will an empirical literature on the experiential nature of dynamic displays be generated, but also, a better understanding of how the current literature based on static displays might be translated into predictions of reactions in situ will become possible.

NOTES

1. If vision were based on a static image, movement would only impede perceiving, resulting in a smearing or blurring of the projected retinal image. Theorists have tried to overcome this obvious limitation by positing the existence of a shutter-like process that captures snippets of stimuli accompanied by an integrative process that assembles these snippets. Note that this general model, which has had numerous instantiations in psychology, follows from the assumption that vision entails the reception of static patterns of stimulation.

2. Other theoretical models are expressed in the research of Peron, Purcell, Staats, Falchero, and Lamb (1998) and Ulrich (1983).

3. Two significant changes were recognition that complexity and scene content may to some extent be intrinsically related and that some types of scenes may be preferred over others primarily because of their content. Specifically, scenes of the built environment reach higher levels of complexity than largely natural scenes ever do, and there is a consistent preference for natural scenes over built scenes independent of levels of complexity. Furthermore, Wohlwill found the degree of fit between natural and built features in a setting to be an especially strong predictor of environmental preference (Wohlwill & Harris, 1980).

4. A brief technical note: In the course of attempts to film or videotape a route through the environment, we have found that maintaining the camera in a fixed position in the vehicle does not work well in recording turns approximating 90 degrees or less. A display created from a fixed camera pivoted around a turn produces a dizzying effect as the landscape rapidly sweeps by. A more gradual and realistic display is generated with a hand-held camera whose field of view anticipates the physical turn of the vehicle. Also, keeping in view the edge of the path on the inside of the turn as the vehicle changes direction is a good rule of thumb. Bosselmann (1993) independently reported the value of this filming technique.

APPENDIX
Epistemic Scales

1. EXTENT TO WHICH YOU WANT TO EXPLORE WHAT LIES AHEAD (low-high). This involves the degree to which there is enough going on to be worth further exploration. If there appears to be little going on to warrant further exploration, you should score it as 1 (low). If there appears to be much going on to warrant further exploration, you should score it as 5 (high).
   Exploration

Low				High
1	**2**	**3**	**4**	**5**

2. EXTENT TO WHAT LIES AHEAD IS UNPREDICTABLE (predictable-unpredictable). This involves the degree to which you encounter a sudden and unexpected change from what has gone before. If the scene is similar to what previous segments led you to expect, you should score it as 1 (low). If it is a large mismatch to what the previous segments led you to expect, you should score it as 5 (high). Varying levels can be indicated by choosing numbers between 1 and 5.
   Unpredictability

Low				High
1	**2**	**3**	**4**	**5**

3. EXTENT TO WHICH YOU CAN PERCEIVE INFORMATION THAT LIES AHEAD (complete-partial). This refers to the degree to which the scene provides information about what lies ahead. If you kept going immediately beyond where the segments ends and if you would not perceive any new information, you should rate the scene as 1 for (little). If you kept going immediately beyond where the segment ended and you expect to perceive a great deal of information, you should rate the scene as 5 for (much). Varying levels can be indicated by choosing numbers between 1 and 5.
   Information about what lies ahead

Little				Much
1	**2**	**3**	**4**	**5**

4. EXTENT TO WHICH YOU COULD LEARN MORE BY MOVING FORWARD (low-high). This refers to the degree to which you could learn more by moving forward into the scene. In those instances when you would learn little new by moving forward, such as a head-on view of a straight road vanishing in the distance, you should score such a scene as a 1 (low). In contrast, where you could see more of the landscape (not presently in view) if you continued on, such as around a curve or over a hill, you should score the scene as a 5 (high). Varying levels can be indicated by choosing numbers between 1 and 5.

Learn more by moving forward

Low				**High**
1	**2**	**3**	**4**	**5**

Evaluative scales

1. PREFERENCE (low-high). This refers to the degree to which you like this segment, where 1 (low) indicates a low level of preference for the segment and 5 (high) indicates a high level of preference. Varying degrees of preference can be indicated by using numbers between 1 and 5.

Low				**High**
1	**2**	**3**	**4**	**5**

2. INVITING (low-high). If you feel like moving further into the scene, it would be an inviting segment. If you feel like you want to avoid it or back away, it is uninviting. Score it as a 5 (high) if you find the segment inviting. Score it as 1 (low) if you find it as uninviting. Varying degrees can be indicated by using numbers between 1 and 5.
Inviting

Low				**High**
1	**2**	**3**	**4**	**5**

3. COMFORT OR FEELING SAFE (low-high). This refers to the degree to which you feel comfortable (or safe) proceeding along the path. 1 (low) indicates that you feel a low level of comfort in the scene, and 5 (high) indicates you feel a high level of comfort in the scene. Varying degrees of comfort can be indicated by using numbers between 1 and 5.
Comfort

Low				**High**
1	**2**	**3**	**4**	**5**

4. CURIOSITY (low-high). This scale indicates the degree to which you feel curious about what would happen next as you move along the path. 1 (low) indicates you have a low level of curiosity about what will happen next, and 5 (high) indicates you have a high level of curiosity about what will happen next. Varying degrees of curiosity can be indicated by using numbers between 1 and 5.
Curiosity

Low				**High**
1	**2**	**3**	**4**	**5**

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