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WHY ARCHITECTS AND LAYPERSONS JUDGE BUILDINGS DIFFERENTLY: COGNITIVE PROPERTIES AND PHYSICAL BASES

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Architects and laypersons experience buildings quite differently; this study investigated the physical and cognitive underpinnings of these differences. Laypersons and practicing architects assessed the global aesthetic quality and six key cognitive properties (complexity, clarity, friendliness, originality, meaningfulness, and ruggedness) of 42 large contemporary buildings, and 59 physical features of each building were independently scored. Lens model analyses revealed how these physical features are interpreted differently by the two groups, which apparently leads them to experience different cognitive properties, which in turn leads to different aesthetic conclusions. However, the results also suggest how architects and laypersons might better understand each other.

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INTRODUCTION

The architect ... must recognize that ... some of the designer's aesthetic perceptions do not exist in others ... The art of architecture is ... always an imposition. Compared to the other arts, it is more difficult to avoid architectural art.
(Izumi, 1965)

This early statement, by an architect, preceded the pioneering empirical work of Hershberger (1969) that established the well-known finding that architects and lay observers often disagree about the aesthetic quality of buildings. It also suggests why it is especially important to understand their differences. Architects are responsible for much of the public face of the built urban environment. Although they may build only about 5 percent of all buildings, they design most large commercial and office buildings, and these buildings have wider public exposure than other buildings. They, therefore, have a pervasive and long-lasting effect on the aesthetic world of everyone who lives in or visits cities.

The architect's goal, according to Vitruvius, should be to create buildings that possess firmness, commodity, and delight, sometimes translated as durability, convenience, and beauty:

All these [buildings] should be built with due reference to durability, convenience, and beauty. Durability will be assured when foundations are carried down to the solid ground and materials wisely and liberally selected; convenience, when the arrangement of the apartments is faultless and presents no hindrance to use, and when each class of building is assigned to its suitable and appropriate exposure; and beauty, when the appearance of the work is pleasing and in good taste, and when its members are in due proportion according to correct principles of symmetry.
(Vitruvius, 1960/ca. AD 25)

We are concerned here with the third quality. Presumably, beauty (or delight) should be experienced not only by architects, but also by members of the community. Yet many contemporary buildings are not delightful to many lay observers, although presumably they were to their designers. There is abundant evidence that architects' aesthetic evaluations of buildings differ from those of laypersons (e.g., Devlin, 1990; Duffy, *et. al*, 1986; Hershberger, 1969; Nasar, 1989; Nasar, *et. al*, 1990; Stamps, 1991; Vischer, *et. al*, 1986). If architects are to create buildings that are delightful in the eyes of others, as well as their own, they must understand how laypersons perceive and evaluate buildings.

Nasar (1988) found that architects did not merely disagree with laypersons about the aesthetic qualities of buildings, they were unable to predict how laypersons would assess buildings, even when they were explicitly asked to do so. It would seem that many architects do not know, from a lay viewpoint, what a delightful building looks like. If we are ever to have more delightful buildings in the eyes of the vast majority of the population who are not architects, this conundrum needs study and solutions.

Some progress toward this goal has been made by researchers who have considered building typicality or style as a useful concept (Devlin, *et. al*, 1989; Purcell, *et. al*, 1992) or observed that architects and laypersons use different categories in thinking about buildings (Groat, 1982), which may well result from the specialized training that architects receive (Downing, 1992; Wilson, 1996).

The present study takes a different but, one hopes, complementary tack in proposing that part of the solution lies in discovering the physical and cognitive bases of the differences in aesthetic criteria between architects and laypersons who must view, work in, or visit their buildings every day. Thus, one purpose of the present study is to identify objective building cues that are associated with aesthetic quality in both groups. Once these are known, the reasons why architects and laypersons disagree (and sometimes agree) will be clearer, and steps can be taken toward creating buildings that are admired by a larger proportion of the population.

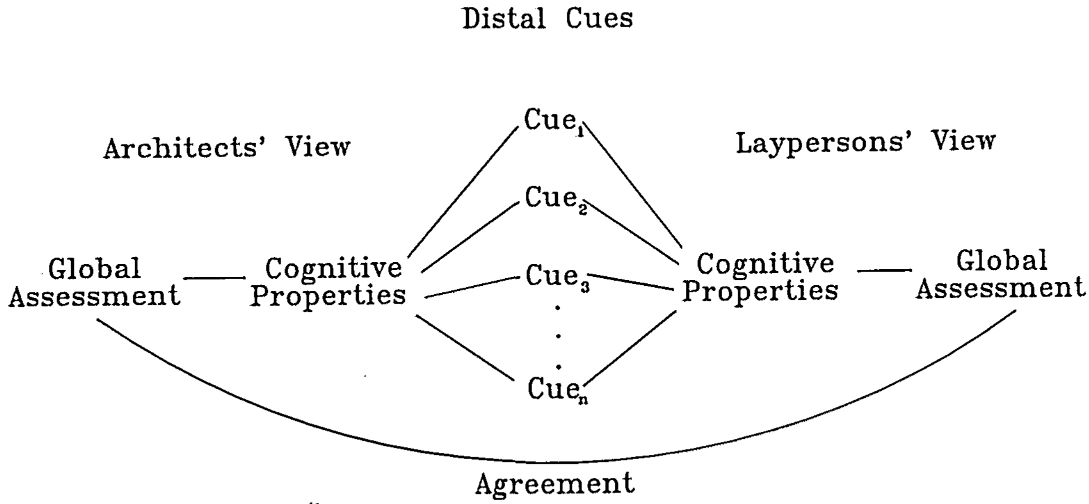

FIGURE 1. The lens model in generic form, as adapted for this study.

The second purpose of this study is to investigate how architects and laypersons infer more abstract qualities of buildings. For example, particular objective details of buildings presumably lead observers to say, "Aha — Art Deco," or "that's really ornate." In this study, the choice was made to investigate what might be called cognitive properties, that is, interpreted building qualities that may have more generalizable implications, such as complexity and clarity.

The third purpose of the study is to investigate the links between these cognitive properties and the two groups' overall conclusions about the buildings' aesthetic qualities. Is "clear," "complex," or "aesthetically" good in the minds of architects? Laypersons?

A modified lens model analysis (Brunswik, 1956) is used to examine the agreements and disagreements between architects and laypersons, and the cognitive underpinnings of these discrepancies and agreements (see Figure 1). At the center of the lens model are objective physical features of buildings, or cues. The model assumes that the physical features of a building influence the cognitive properties inferred by viewers and that, in turn, these cognitive properties influence the viewer's global impression of the building's architectural quality. The lens model is not so much an explanation as a description. It does not purport to explain why physical cues influence inferred cognitive properties which influence global aesthetic judgments; rather, it describes these relations and invites attempts at causal explanation.

Based on past research, the initial hypothesis is that architects and laypersons will disagree about the aesthetic merits of a typical set of contemporary buildings. If this happens, the model suggests that it occurs because the two groups attend to and weigh physical features differently, which results in the inference of different cognitive properties, which in turn leads them to reach different global aesthetic conclusions about buildings.

Evidence that certain cognitive properties are related to building preference has already been found. For example, preference seems to be greater for buildings that are moderate in complexity (e.g., Herzog, 1992; Wohlwill, 1974), moderate in novelty (cf., Berlyne, 1971), and for buildings that appear to be more novel, orderly or coherent (Devlin, *et. al*, 1989; Herzog, 1992).

However, to the best of our knowledge, few studies have examined the ways in which all three aspects of the perception-evaluation process (basic physical cues, cognitive properties, and global aesthetic evaluation) work together in architects and laypersons to produce a broad picture of the way that architectural detail translates into global evaluation of buildings. A study by Devlin and Nasar (1992) is similar, but it investigated residences rather than large office or commercial structures.

TABLE 1. Means, standard deviations, and reliabilities of key variables.

	N	Mean	Standard Deviation	Interrater Reliability
Global impressions:				
Architects	8	4.65	1.31	.83
Laypersons	27	5.49	.90	.85
Cognitive properties:				
Clarity				
Architects	9	4.72	1.36	.77
Laypersons	19	5.69	1.02	.81
Complexity				
Architects	9	4.67	1.32	.83
Laypersons	19	5.65	1.13	.87
Friendly				
Architects	9	2.99	1.06	.67
Laypersons	19	4.09	1.04	.80
Meaningful				
Architects	9	3.51	1.28	.77
Laypersons	19	4.27	.98	.76
Rugged				
Architects	9	4.84	1.18	.71
Laypersons	19	5.57	.81	.71
Original				
Architects	9	4.37	1.37	.75
Laypersons	19	5.30	1.23	.88
Building Cues:	5			
Size		3.44	.96	.82
Number of Sides		4.65	1.20	.73
Number of Stories		13.93	13.37	.99
Stepped Stories		2.02	1.07	.87
Regular Stepping		1.82	.68	.76
Fenestration		5.07	1.66	.91
Glass Cladding		2.48	.83	.88
Reflectance		2.90	.96	.80
Metal Cladding		.86	.60	.84
Brick/Stone Cladding		1.68	1.20	.81
Roof Pitch		5.26	2.47	.74
Rounded		1.57	1.03	.90
Ornamented		2.94	.78	.71
Color Variety		2.60	.95	.88
Articulation		2.68	.74	.70
Columns		2.33	1.12	.81
Arches		1.92	.78	.85
Railings		1.98	1.07	.85
Canopies		1.80	.97	.73
Balconies/Porches		1.96	.97	.79
Sculpture		1.37	.80	.85
Triangles		1.64	.76	.88
People in Evidence		1.93	1.20	.95
Landscaping		2.46	1.19	.94
Roads		1.75	.54	.87

METHOD

Overview

The lens model analyses are based on ratings by five independent panels of judges who viewed exterior slide photographs of 42 large contemporary international buildings (for examples, see Gifford, *et. al*, 2000). One judge panel assessed 59 objective physical features of each building facade. Two separate panels of architects rated each of the same 42 slides; one rated the overall aesthetic quality of each building on a single scale, and the other rated each building on six cognitive properties. Two different panels of laypersons made ratings parallel to those of the two architect panels.

TABLE 1. Notes.

1. Global assessments could range from 1 ("terrible architecture") to 10 ("excellent architecture"). The cognitive properties could range from 0 to 9.
2. Brief definitions of, and coding for, the reliably measured building cues:
   Size: From among the smallest 20 percent of the sample (1) to among the largest 20 percent of the sample (5)
   Number of Sides: From triangular (3) to the normal (4) etc. up to round (9)
   Number of Stories: From ground to roof, total number
   Stepped Stories: Wedding-cake-like layering, from none (1) to 4+ layers (5)
   Regular Stepping: No layers (1) to even layering (2) to irregular layering (4)
   Fenestration: Less than 5% (0) to more than 85% (9) of the exterior walls are windows
   Reflectance: Less than 10% (1) of the exterior consists of shiny material, up to over 75% (5) is shiny
   Glass Cladding: Zero (0) to over 80% (5) of the exterior walls are glass
   Metal Cladding: Same as for glass
   Brick/Stone Cladding: Same as for glass
   Roof Pitch: Run twice rise (1) to rise twice run (3)
   Rounded: Corners and edges sharp (1) to rounded (5)
   Ornamentation: No ornaments (surface decorations, stepping, articulation) (1) to ornaments are the main feature of the facade (5)
   Color Variety: All one color (1) to four or more (5)
   Articulation: Facade flat (1) to heavily articulated (4)
   Triangles: Three-sided figures visible: Not at all (1) to dominant feature (4)
   Columns: From none (1) to some (3) to many (5)
   Arches: Same as for columns
   Railings: Same as for columns
   Canopies: Same as for columns
   Balconies: Same as for columns
   Sculpture: Same as for columns
   People in Evidence: Human presence, such as plants, toys, tools, etc.: Scored as for columns
   Roads: Visible in image: Scored as for columns
   Landscaping: Visible in image: Scored as for columns

TABLE 2. Pearson correlations among the building cues (n = 42).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Arches	-																					
2. Articulation	24	-																				
3. Balconies	-14	20	-																			
4. Canopies	19	-06	46	-																		
5. Color Variety	13	18	06	-03	-																	
6. Columns	15	07	12	-02	-08	-																
7. Ornamented	35	49	07	03	08	24	-															
8. Glass	-14	-21	16	00	-44	16	-06	-														
9. Landscaping	05	-16	-03	-16	-11	-06	-17	-19	-													
10. Metal	-08	-17	24	02	-08	-26	08	36	19	-												
11. People	-07	25	33	12	05	08	06	07	-13	-17	-											
12. Pitch of Roof	-25	09	19	-14	00	-26	17	12	04	13	00	-										
13. Railings	-32	-00	74	29	-09	-06	20	36	10	48	20	25	-									
14. Roads	07	31	00	05	13	02	02	-07	-13	-24	24	05	02	-								
15. Rounded	-22	-06	35	26	-16	09	16	06	-10	12	29	-05	31	10	-							
16. Sculpture	14	22	-21	05	-04	-02	16	-10	07	-17	-24	-00	-13	07	-15	-						
17. Sides	13	16	33	29	-02	32	37	-13	15	-08	14	-10	01	-11	38	05	-					
18. Stone/Brick	22	42	- 14	06	39	11	15	-69	02	-48	15	-24	-19	45	04	19	-02	-				
19. Stories	08	-08	-08	-09	-51	14	07	62	-22	-01	-21	01	-05	03	-13	-04	-20	-36	-			
20. Triangles	36	10	-34	-16	07	-16	30	-23	-02	-00	-22	21	-32	-13	-29	09	-03	22	06	-		
21. Stepped	17	02	07	-09	-16	15	22	23	-05	-31	-15	02	-16	-10	-11	-10	09	-22	54	-09	-	
22. Size	11	03	18	09	-47	24	01	50	-05	01	-07	00	15	-10	-12	-07	11	-28	68	-21	44	-

Once the reliability (interrater agreement) of each judge panel was established, the judges' scores and ratings were pooled so that each building had a single score for each reliable physical cue, for each cognitive property (6 for architects and 6 for laypersons), and for global aesthetic quality (1 for architects and 1 for laypersons; see Figure 1).

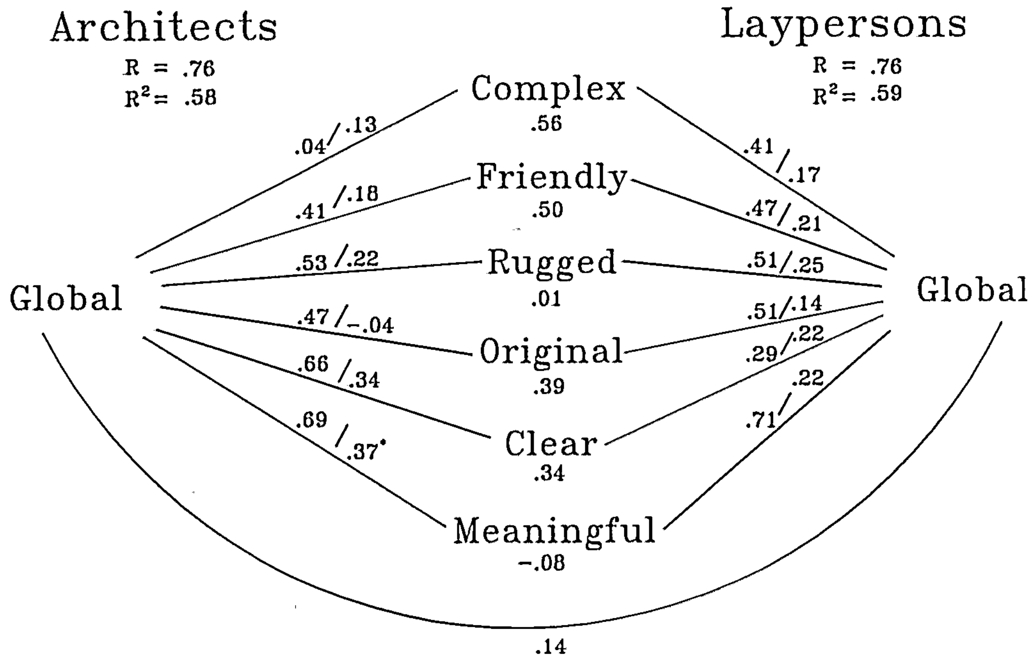

FIGURE 2. The lens model, showing links (Pearson r^2) between the cognitive properties and the global impressions of the buildings for architects and laypersons on the left of the slash marks, and the standardized beta weights for each cognitive property when all six were entered in a regression equation predicting the global assessment to the right of each slash mark. Under each cognitive property is the agreement (Pearson r) between the inferred cognitive properties of the architects and laypersons about the buildings. The R and R^2 values are based on using all 6 cognitive properties as predictors of global assessment.

Participants

Lay judges (total n = 43) were represented by community residents who were recruited by letter at random from a city directory, and students in an undergraduate psychology class participated for a small amount of course credit. Both groups were told they would be evaluating slides representing current architecture.[1] All lay participants were asked whether they had any architectural training (none did). We have no reason to believe their knowledge of the study's purpose would affect the hypotheses, or that community and student judges would differ; there is some evidence that demographic differences are not particularly important in this context (Stamps, 1991; Stamps, *et. al*, 1997). One group of these laypersons (n = 27) provided global aesthetic evaluations of the buildings and a separate group of them (n = 16) rated the 6 cognitive properties of the buildings.

Architects (total n = 17) were represented by local registered, practicing architects who were recruited by letter. Again, one group (n = 8) gave global aesthetic evaluations of the buildings, and a separate group (n = 9) provided their 6 cognitive properties.

The physical features of the buildings were scored by an independent group of judges, university undergraduates (total n = 13), who were trained to use The Architectural Coding System (TACS), an instrument developed for this project that includes specific scoring criteria for 59 objective features of building exteriors.

Buildings

Color photographs of 42 buildings from North America and Europe were selected from recent books and issues of architecture journals. The goal was to include a broad representation of large contemporary commercial buildings. The images were re-photographed as slides by the University's profes-

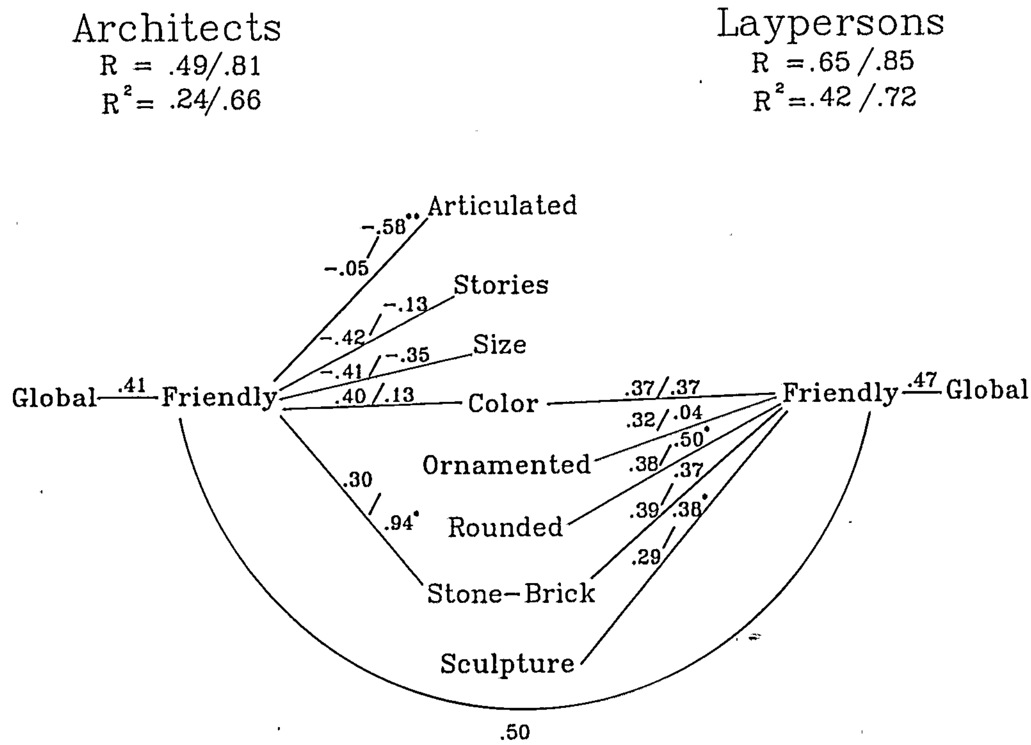

FIGURE 3. The lens model, showing links between physical cues and building friendliness that are significant either on simple-r or beta-weight bases (where only one of the two was significant, the other value is shown, even if it was not significant, for comparison purposes). The multiple-R and R^2-values on the left of the slashes are those computed using only physical cues with significant simple rs, and those on the right of the slashes were computed using all 22 reliable cues. The links indicated by lines show, on the left of the slashes, significant simple r^2 (r^2 .39 are p .01, r^2 .33 are p .025, and r^2 .30 are p .05), and, on the right of the slashes, significant beta weights (***p .01, **p .025, *p .05), computed when all 22 cues were simultaneously entered in a regression equation.

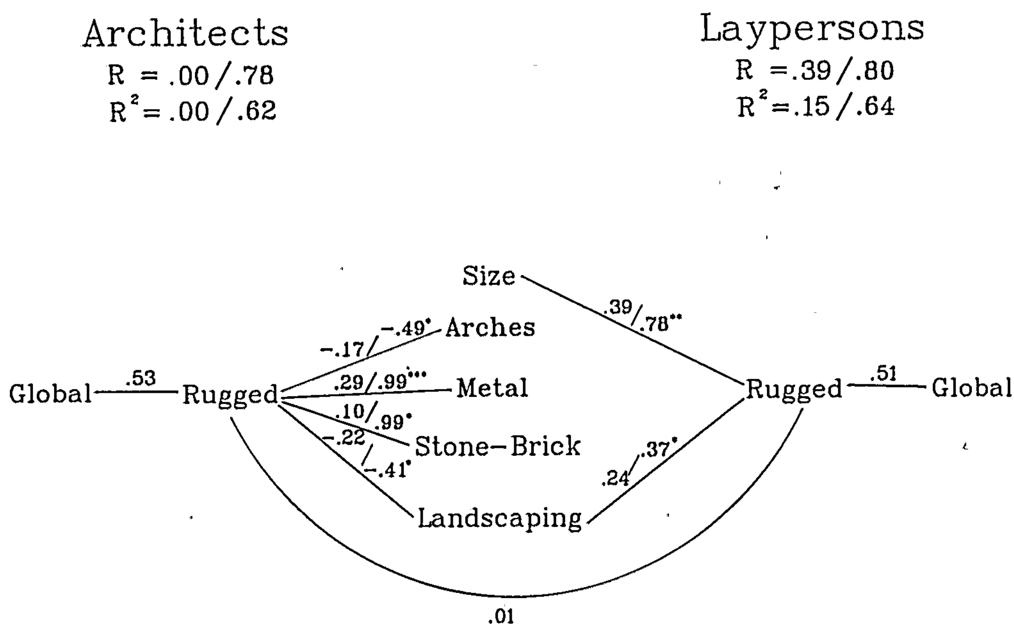

FIGURE 4. The lens model, showing the significant links between physical cues and building ruggedness. See Figure 3's caption for details.

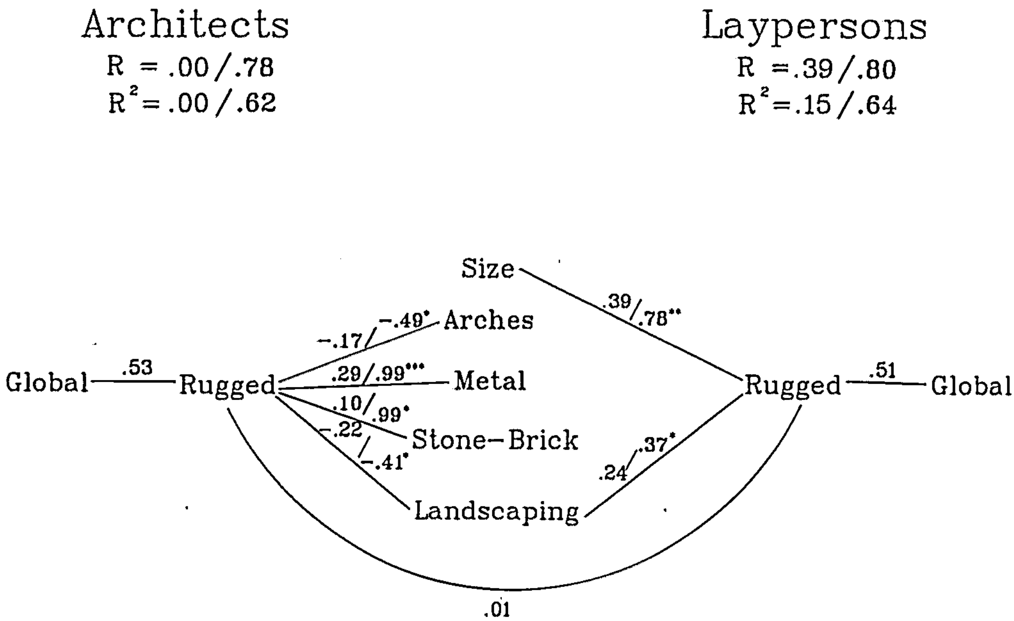

FIGURE 5. The lens model, showing the significant links between physical cues and building originality. See Figure 3's caption for details.

sional photographer, who shot them according to cropping instructions which were aimed at eliminating or minimizing neighboring buildings and land uses.

Measures

The global aesthetic measure asked the lay and architect judges to use their own standards to rate each building on a 10-point scale on which 1 was labeled "terrible architecture" and 10 was labeled "excellent architecture."

The cognitive property measures were assembled and adapted from the work of Berlyne (1971), Kuller (1979), and Nasar (1994). The goal was to include a relatively small set of properties that would cover most of the cognitive "territory" associated with preference. Six cognitive properties were selected, and these were presented to the judges as bipolar scales: complex (as opposed to simple); friendly, sociable, warm (as opposed to cold, unsociable, unfriendly); rugged, strong, potent (as opposed to delicate, weak, wimpy); unique, original, creative (as opposed to typical, unoriginal, uncreative); clear, coherent, unified (as opposed to disorganized, confusing, ambiguous); and meaningful, symbolic, expressive (as opposed to meaningless, messageless, unexpressive). Each of the six ratings was made on 10-point (0-9) scales on which higher scores signified the complex, friendly, rugged, original, clear, and meaningful ends of the properties.

The physical features of the buildings were measured as 59 separate objective elements of the building exteriors. They include building features in seven categories: overall form (e.g., height, relative size, number of sides), roof (e.g., pitch), walls (e.g., material, reflectiveness), windows (e.g., percent fenestration), amenities (e.g., columns, sculptures), and context (e.g., landscaping, fountains).

The 59 cues were scored by judges who were trained to use TACS. Two judges were asked to score all 59 cues for all 42 buildings. This task proved very taxing for the two judges (they each made 42 x 59, or 2478 ratings in all), so 11 additional raters were trained to score portions of the whole set of 59 cues for 42 buildings. This was planned so that each cue for each building was rated three times by the 11 additional raters as a group. Thus, when their ratings were combined with those by the original two raters, each of the 59 cues was scored by five judges for each of the 42 buildings.

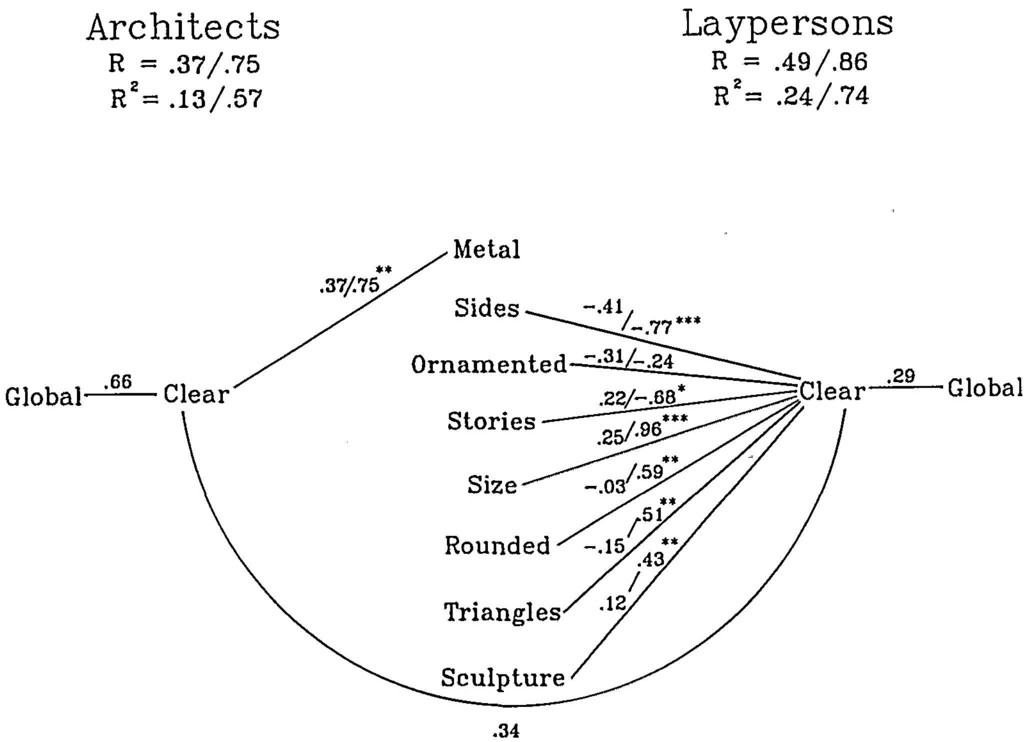

FIGURE 6. The lens model, showing the significant links between physical cues and building clarity. See Figure 3's caption for details.

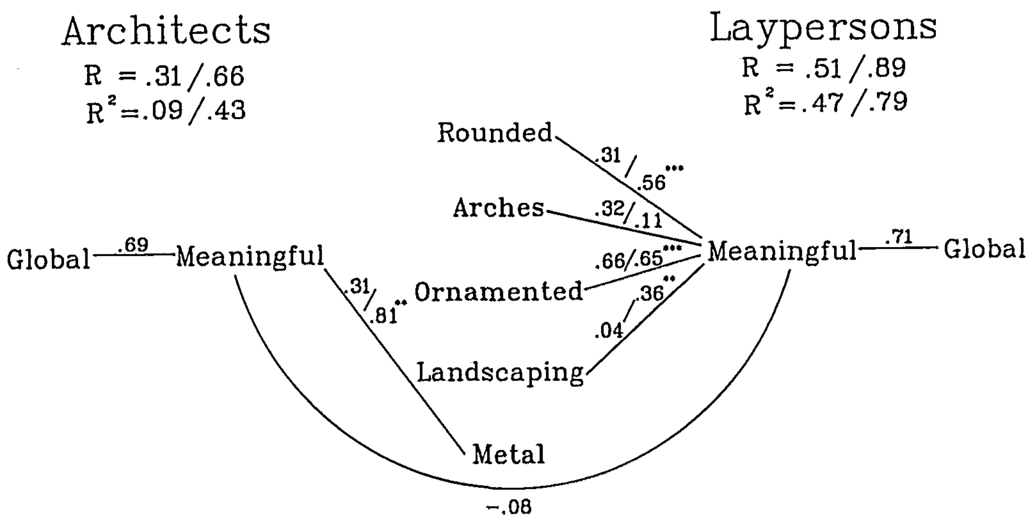

FIGURE 7. The lens model, showing the significant links between physical cues and building meaningfulness. See Figure 3's caption for details.

RESULTS

Means, Standard Deviations, and Reliabilities

The means, standard deviations, and reliabilities of the lay and architects' ratings, and those for the physical cues, are reported in Table 1. Interrater agreement was assessed as intraclass correlations

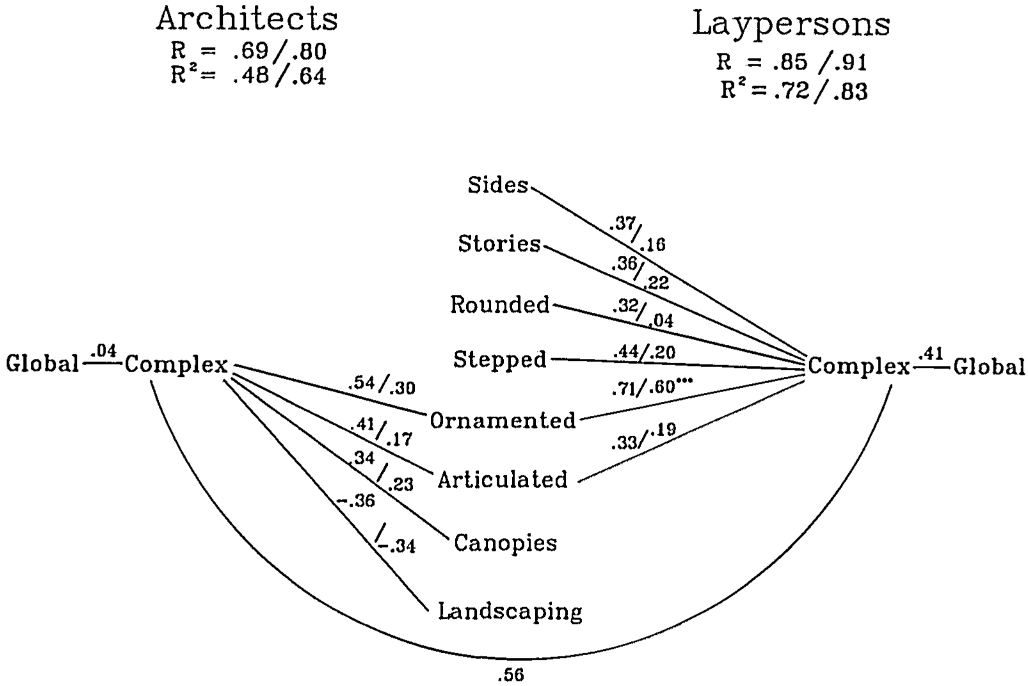

FIGURE 8. The lens model, showing the significant links between physical cues and building complexity. See Figure 3's caption for details.

(Shrout and Fliess, 1979, formula ICC 3, *k*). The reliabilities of the lay ratings for the six cognitive properties were: complex, .87; friendly, .80; rugged, .71; original, .88; clear, .81; and meaningful, .76. The interrater agreement for the laypersons' global impression was .85. The reliabilities of the architects' ratings for the six cognitive properties were: complex, .83; friendly, .67; rugged, .71; original, .75; clear, .77; and meaningful, .77. The interrater agreement for the architect's global impression was .83. With a median reliability of .77, these ratings were deemed to be adequately reliable.

Of the 59 building cues, 25 met the minimum criterion for reliability (.70), and the median interrater reliability of these 25 cues was .85 (see Table 1). Cues that did not reach adequate reliability tended to have little variability across buildings or were visually unclear in the photographs. Only cues that were rated with acceptable levels of reliability were used in subsequent analyses.[2]

Next, in the interest of parsimony, ways to reduce the number of building cues were considered. The simple correlations among the cues were examined (see Table 2). Three features that concerned glass (percent fenestration, reflectance, and glass cladding) all were intercorrelated over .85. Two cues referring to the "steppedness" of the facades, i.e., whether the stories were stepped and whether the steps were regular, also were intercorrelated over .85. These five cues were standardized and then averaged to create two cues subsequently called "glass" and "stepped." This left 22 reliable and potentially useful physical cues for use in the subsequent analyses.

Lens Model Analyses

Overview. First, each group's pooled global aesthetic assessments of the buildings were correlated with their pooled ratings of the six cognitive properties. Next, the degree of agreement (expressed as Pearson correlations) between the two groups on the cognitive properties was computed, across the 42 buildings (center of Figure 2). Finally, the two groups' agreement on the global aesthetic evaluation measure was computed (the curved line in Figure 2).

TABLE 3. Pearson correlations between the cognitive properties for architects and laypersons.

	Clear	Complex	Friendly	Meaningful	Rugged	Original
Clear	34*	-29	24	77**	-64**	53**
Complex	-36*	56**	31**	-11	15	30
Friendly	05	22	50**	28	20	6
Meaningful	17	60**	62*	08	57**	52**
Rugged	47**	1	10	44**	01	72**
Original	-26	78**	40**	78**	14	39**

Note: The correlations for the architects are in the upper half of the matrix, those for the laypersons are in lower half, and the agreement between the two groups are in the diagonal. Decimal points are omitted. *p<.05; **p<.01, two-tailed.

Next, each of the 22 reliable physical cues was correlated with the lay and architect ratings of the 6 cognitive properties, and the latter were in turn correlated with the global impressions. The lens models that display these results are shown in Figures 3 to 8. The significant simple correlations representing at least medium effect sizes (Cohen, 1988) are shown in these lens models.[3] The curved lines represent the degree of agreement between the architects and the laypersons for each cognitive property.

Because the physical cues were variously intercorrelated (see Table 2), regression analyses that included all 22 reliable physical cues as predictors of each cognitive property were also conducted.[4] The resulting standardized beta weights represent the unique contribution of each physical cue, controlling for the influence of all the other 21 cues, to the prediction of each cognitive property. The lens models also include each physical cue with a significant beta weight; thus, Figures 3 to 8 include all cues that were important by either the correlation/effect-size *or* the beta-weight methods.

The simple correlations and the beta weights offer complementary views of the role played by each cue: the simple correlations depict what might be called the *natural* relations between the physical cues and the cognitive properties, given that certain physical features of buildings inevitably are intercorrelated in actual buildings, whereas the standardized beta weights provide a picture of the *pure* role played by each physical cue, that is, after influence of all other cues has been controlled.

Agreement on global evaluations. As shown in Figure 2, agreement between the architects' and laypersons' global assessments of the buildings was small. Across the 42 buildings, their assessments were virtually unrelated ($r = .14$; $p = .30$). This replicates the numerous previous studies cited in the introduction. As noted earlier, however, the more important question addressed in the following analyses concerns the physical and cognitive *bases* of this finding.

The cognitive bases of non-agreement. Figure 2 shows how global assessment of the buildings is related to each of the cognitive properties for the laypersons and for the architects. Based on the simple correlations, the cognitive properties were, in general, quite strongly related to both groups' global assessments; 10 of the 12 exceeded $r = .40$. The architects and laypersons agreed quite closely about the importance for global assessments of four of the six cognitive properties: both groups appear to believe better buildings are those that are more meaningful, friendly, rugged and original. On two cognitive properties, the groups agreed less: clarity was more strongly related to global assessment for architects than for laypersons, and complexity was more strongly related to global assessments for laypersons than for architects.

These findings allow for an examination of whether the results replicate previous findings, one purpose of the study. If the previous findings are treated as hypotheses, one would expect that preference for buildings should increase with building novelty, coherence, and complexity arranged so that moderate complexity is given the highest coding (because the previous findings were that moderate complexity was most preferred; an inverted-U-shaped relation). These hypotheses were tested for the architects and laypersons separately; this complements the study's main purpose, which is to compare the perspectives of the two groups.

For the architects, neither complexity nor its inverted-U-shaped version were related to the overall aesthetic quality ratings (the r for complexity was less than .05, but that for its inverted-U-shaped version was -.28, $p = .069$, marginally significant). However, both clarity ($r = .66$; defined on the rating form as clear, coherent, and unified) and originality (defined on the rating form as unique, creative and original) were significantly related to greater overall aesthetic quality, as predicted. Moderate originality was not preferred more, contrary to Berlyne's (1971) expectations.

For the laypersons, complexity was significantly related to higher overall aesthetic quality. Its inverted U-shaped version was not. The lay judges agreed with the architects that more original buildings have greater overall aesthetic quality. Also, in agreement with the architects, but again contrary to Berlyne's (1971) hypothesis, moderate originality was not preferred; in fact, it was less preferred. However, in contrast to the architects, building clarity did not predict laypersons' overall aesthetic quality, at least not as strongly.

Thus, all the previously reported relations were replicated, but not in both groups; the architects and laypersons use originality (or novelty) the same way in arriving at their global impressions, but they use complexity and clarity (or coherence) in different ways: the architects tend to link clarity to overall quality, whereas the laypersons tend to link complexity to overall quality.

When all 6 cognitive properties were simultaneously used to predict global assessments, each one's independent importance emerged as the resultant standardized beta weights. Based on the beta weights (shown on the right side of the slashes in Figure 2), the architects appear to place most weight on a building's clarity and meaningfulness when they assess its overall aesthetic quality. Laypersons rely on several cognitive properties about equally, although those include clarity and meaningfulness.

For both groups, the multiple correlation between the six cognitive properties and the global assessments was $R = .76$; thus, almost 60 percent of the variance in their global assessments of the buildings was accounted for by these cognitive properties. Collectively, the six cognitive properties do seem to form a substantial proportion of the basis for global assessments of architecture in both architects and laypersons.

Nevertheless, as noted earlier, architects and laypersons do not agree very strongly about the overall aesthetic quality of particular buildings. This apparently occurs for four interrelated reasons. First, the groups' use of the six cognitive properties shows a somewhat different pattern. Second, the groups disagree about which buildings embody the six cognitive properties (e.g., their agreement about which buildings are meaningful is $r = -.08$ and which are rugged is $r = .01$; see the center portion of Figure 2).

Third, the cognitive properties along which they rank the buildings fairly similarly (e.g., complexity $r = .56$ and friendliness $r = .50$), are properties that, in beta-weight terms, are not heavily relied upon by either group to reach their global assessments (.13 and .17 for complexity, and .18 and .21 for friendliness). Fourth, the two groups seem to think about the six cognitive properties in different ways. Correlations among the properties for the two groups vary (see Table 3). For laypersons, an original building is also complex, but this is less so for architects. For architects, an original building is rugged and clear, but neither of these is true for laypersons. For architects, a meaningful building is clear; this is not so for laypersons. Instead, for laypersons, a meaningful building is complex; this is not the case for architects.

Another important set of reasons for the lack of global aesthetic agreement between the two groups may be their different weighting of the physical cues as bases of the cognitive properties, as described next.

The physical bases of nonagreement. In general, the lens model approach predicts greater agreement between groups when both groups weight physical cues heavily and in the same direction to reach their conclusions. The extent to which this was so in this study is shown in the lens model links between the physical cues and the six cognitive properties, each of which will be considered in turn.

Friendliness. The two groups use quite different physical cues to reach their judgments of building friendliness (see Figure 3). In terms of significant simple correlations, architects viewed the buildings as more friendly when they were smaller, shorter, and exhibited more color variety. These three cues account for 24 percent of the variance in the architects' assessments of the buildings' friendliness.

Based on the beta-weight approach, architects judge friendliness very much on the basis of the appearance of brick or stone in the facade, and to a moderate degree on the basis of a less-articulated facade. The 22 physical cues, as a group, accounted for two-thirds of the variance in the architects' judgments of building friendliness.

Based on the significant simple correlations, the laypersons assessed buildings as friendlier based on one of the same cues as did the architects, the greater use of stone or brick, but also on three other cues: more roundedness, more ornamentation, and more color variety. These cues accounted for 42 percent of the variance in lay assessments of friendliness. Based on the beta-weight approach, ornamentation appears less important, sculptural elements appear more important, and the other three cues remain moderately important. The 22 physical cues account for 72 percent of the variance in lay assessments of building friendliness. Agreement about building friendliness between the two groups across the 42 buildings was fairly strong. This appears to arise from the similar use of the color variety and stone-brick cues by the two groups.

Ruggedness. Based on the simple correlations, assessments of ruggedness were barely related to the 22 physical cues. No cue significantly predicted architects' assessments; only building size predicted lay judgments, and it accounted for just 15 percent of the variance in their assessments (see Figure 4).

However, based on the beta-weight approach, the architects saw ruggedness when buildings were clad in metal, stone, or brick, had fewer arches (perhaps a potential structural weak spot) and, in terms of building context, were surrounded by less landscaping. In contrast, the laypersons concluded that larger buildings and those *with* landscaping were more rugged.

The 22 cues collectively accounted for 62 percent of the architects' ratings and 64 percent of the lay ratings. The two groups used no cues in the same way, and agreement between them about which buildings were more or less rugged was nonexistent.

Originality. For architects, building originality was associated with the greater presence of metal cladding and the lack of landscaping, based on the simple correlations; these 2 cues accounted for 40 percent of the variance. (See Figure 5.)

Laypersons saw rounded and ornamented buildings as more original; these two cues alone accounted for 70 percent of the variance.

The beta-weight approach showed that architects additionally saw buildings with more stone or brick cladding as more original; all 22 cues accounted for three-quarters of the variance in their ratings. Laypersons used only ornamentation as a cue; roundedness was no longer important. The 22 cues accounted for 82 percent of the variance in their originality ratings.

Despite the lack of agreement between the groups about which of the 22 physical cues were associated with originality, agreement about which buildings were more or less original was moderate.

Clarity. By both analytic methods, buildings that were more clad in metal were seen by architects as clearer. (See Figure 6.)

That single cue accounted for 13 percent of the variance in their ratings; all 22 cues accounted for 57 percent of the variance. Laypersons' assessments of clarity were much more complex. Based on the significant simple correlations, clarity was a function of fewer sides, fewer canopies, and less ornamentation (24 percent of the variance). Based on the beta-weight approach, clarity was implied by buildings with fewer stories but with greater size, those with fewer sides, and those that were more rounded and included triangle and sculptural elements (74 percent of the variance). Agreement between the groups was moderate.

Meaningfulness. Once again, metal cladding figured in the architects' judgments; buildings with more metal cladding were seen as more meaningful, by both methods (9 and 43 percent of the variance). (See Figure 7.) The laypersons, however, inferred more meaningfulness when buildings were more rounded, more ornamented, and included arches (47 percent of the variance); roundedness and ornamentation remained important, arches were less important, and landscaping was more important, based on the beta-weight method (79 percent of the variance). The differences in cue use apparently resulted in virtually zero agreement on building meaningfulness.

Complexity. Based on simple correlations, building complexity was significantly related, for architects, to more articulated facades, more canopies, more ornamentation, and less landscaping. (See Figure 8.) Together, these four physical cues accounted for 48 percent of the variance in architects' ratings of complexity. No cues were significant on their own in the beta-weight approach, but the 22 cues accounted for 64 percent of the variance in architects' judgments of complexity.

For laypersons, complexity was significantly related, based on the simple correlations, to two of the same four cues used by architects: more articulated facades and more ornamentation. However, laypersons significantly based their impressions of complexity on four other physical cues, none of which were used by architects: more sides to the building, more stories, more rounded sides, and more stepped facades, which together with ornamentation and articulation account for 72 percent of the variance in lay ratings of building complexity. Beta-weight analyses showed that ornamentation was weighted most strongly; all 22 cues accounted for 83 percent of the variance.

Although the two groups used only two cues out of nine in the same way, agreement between them about the relative complexity of the buildings was fairly strong. This may occur in part because both groups relied fairly heavily, according to the beta-weight analyses, on ornamentation as a physical cue to complexity.

DISCUSSION

Architects and non-architects often disagree about the aesthetics of contemporary buildings. The results confirm this conclusion, which has had empirical support for 30 years (Hershberger, 1969). The primary goal of this study, however, was to understand the reasons for this now established outcome: to investigate the cognitive and physical bases of the disagreement.

The Lens Model Approach to the Problem

The study clearly shows how the physical cues and cognitive properties are related to the overall aesthetic building evaluations of architects and laypersons. The adapted lens approach to comparing professional with lay perspectives on building aesthetics appears to provide a fruitful avenue to understanding their similarities and differences in aesthetic values.

A potentially more parsimonious framework for describing how groups assess architecture would directly relate the physical cues to the overall assessments, skipping the cognitive properties. This possibility was considered, but only 4 physical cues were significantly correlated with the global assessments by the two groups, out of 44 possibilities (22 cues for each group). Thus, it would seem that including the cognitive properties as an intermediate step in modeling the assessment of architecture by the two groups clearly is worth the slight increase in the complexity of the model.

Attending to Different Cues

The lens model approach to this problem is based on the notion that overall aesthetic agreement will be greater if observer groups use the same physical cues in the same way. In this study, out of the pool of 22 physical cues that were reliably rated, the laypersons and architects as a whole used 14 of them (plus one context cue, landscaping) as significant bases for their cognitive properties of contemporary commercial buildings. The architects used these building cues 12 times to draw their cognitive inferences; the laypersons used them 21 times. However, there were only 3 instances in which both groups used the same cue in the same way. Thus, one would expect agreement to be quite low; the two groups apparently infer cognitive properties by attending to quite different sets of objective cues.

To illustrate this with one cognitive property, architects and laypersons agreed that a meaningful building is an aesthetically good building (the simple r^2 were .71 and .69), but the two groups used no physical cues in common as the basis for deciding which buildings are more (or less) meaningful. As a consequence, their agreement about which buildings are meaningful was virtually zero.

Architects and laypersons also seem to think about the 6 cognitive properties in different ways, which further explains why they reach different overall conclusions. For example, based on Table 3, architects see original buildings as also being clear and meaningful, but not rugged, whereas laypersons do not see original buildings as clear or meaningful, but do see them as rugged. For laypersons, buildings that are complex tend also to be meaningful, but this is not so for architects. Of course, neither set of meanings is more correct than the other, but the results point toward gaps in meaning that need to be addressed as part of a cognitive reconciliation campaign in architectural schools and perhaps in the popular press so that the two groups are aware of their linguistic differences.

Attending to Unmeasured Cues

One apparent paradox in the results needs explanation. The two groups use no physical cues to originality in the same way, yet they agree to a moderate degree which buildings are more or less original. The lens model explanation for this finding is that both groups are, after all, using some physical cues in a similar manner, but these must be cues that were not investigated in this study. One challenge for the future, then, is to discover these so-far unidentified physical cues that account for the moderate agreement underlying the agreement in the inference of these cognitive properties.

Materials versus Form

When the cue-use patterns are examined across the six cognitive properties, certain differences may be observed. The architects' cognitive properties were significantly associated with variations in building materials (i.e., whether the facade was clad in metal, stone, or brick) 11 times (4 as simple correlations and 7 as beta weights), whereas the laypersons' impressions were significantly linked to building materials only once. In contrast, the laypersons' assessments were correlated with building form (e.g., roundedness, ornamentation, and degree of articulation) 16 times, but those of the architects was connected to building form only 3 times. This suggests the generalization that architects are more influenced by building materials and laypersons are more influenced by building form.

The Socialization of Architects

Clearly, architects are socialized by their professional education in ways that create or widen the aesthetic gap between themselves and the public (Wilson, 1996). However, architects have been told for years by architects and others (e.g., Osmond, 1957; Izumi, 1965) that it is essential they understand the views of their those who will be using and viewing their buildings. With the lens model approach, it is possible to learn the underlying objective bases of the differences in taste between the two groups, so that architects might be taught how others think about buildings.

One might conclude that architects should design buildings to suit the public *rather* than themselves; that creativity and originality must be sacrificed to some lowest common denominator. However, architects need not merely pander to their lay preferences when they use their understanding of lay thinking. It is possible to create buildings that delight both themselves and the public; several buildings in this sample of 42 were given very high overall aesthetic ratings by both groups. The pedagogical goal suggested by the present study is a broader form of architectural education or socialization that stresses both the creative extension of the great aesthetic trends *and* a better understanding of public taste. The greatest architects will be those with the creativity to design buildings that are delightful to design professionals *and* the public.

NOTES

1. Although informing participants of the study's topic might have led to the selection of more laypersons with an interest in architecture, we see no reason or evidence to suggest it would attract laypersons with any particular architectural bias. The results, therefore, may generalize more to laypersons with some interest in architecture than to those without any interest. Perhaps there is no pressing need to generalize to laypersons who do not care about architecture. At any rate, the University's human subjects committee requires that participants know the basic nature of the study, and it would be discourteous and perhaps impossible to recruit participants without informing them of the study's topic.

2. Interrater reliabilities less than .80 indicate that the construct in question is somewhat fuzzy to judges, assuming that the buildings themselves represented adequate variability in the construct. One might add judges until the reliability reaches the usual standard (.80). However, if that requires a large number of judges, the standard has been reached forcibly: the construct is not very clear to any typical judge. We chose to include some slightly fuzzy constructs because despite their slight lack of clarity, they significantly related to objective building cues. If the constructs could be made clearer (perhaps through more extensive definitions, for example), one would expect the relations with objective building properties to be even stronger because the error associated with construct fuzziness would be reduced. Thus, we recommend that future investigations define certain of these constructs more fully and clearly.

3. When a large number of correlations are computed, there is a chance of Type II errors, when one thinks of correlations as being either null or non-null. Thus, the reader may wish to grant more credence to correlations in the figures that exceed .39 ($p < .01$). However, some authors (e.g., Cohen, 1988) argue that correlations should be considered estimators of effect size, the magnitude of a relationship, and that correlations of .30 (the smallest presented in the figures, except where smaller ones are presented for comparison purposes), represents a "medium" effect size, a non-trivial relation between variables.

4. Multicollinearity is a potential problem with multiple regression. The degree of the problem may be seen in Table 2, wherein all variables' intercorrelations are on view. There, one may see that after the "glass" and "stepped" cues were combined, as noted earlier, because multicollinearity was a potential problem, multicollinearity problems are absent: out of over 230 correlations, the highest is .74, and the vast majority are less.

REFERENCES

Berlyne DE (1971) *Aesthetics and psychobiology.* New York: Appleton-Century-Crofts.

Brunswik E (1956) *Perception and the representative design of psychological experiments.* Berkeley, CA: University of California Press.

Cohen J (1988) *Statistical power analysis for the social sciences* (2nd edition). Hillsdale, NJ: Erlbaum.

Devlin K (1990) An examination of architectural interpretation: Architects versus non-architects. *Journal of Architectural Planning and Research* 7:235-244.

Devlin K, Nasar JL (1989) The beauty and the beast: Some preliminary comparisons of "high" versus "popular" residential architecture and public versus architect judgments of same. *Journal of Environmental Psychology* 9:333-334.

Duffy M, Bailey S, Beck B, Barker DG (1986) Preferences in nursing home design: A comparison of residents, administrators, and designers. *Environment and Behavior* 18:246-257.

Gifford R, Hine DW, Muller-Clemm W, Reynolds Jr DJ and Shaw K (2000) Decoding modern architecture: A lens model approach for understanding the aesthetic differences of architects and laypersons. *Environment and Behavior* 32:163-187.

Groat L (1982) Meaning in post-modern architecture: An examination using the multiple sorting task. *Journal of Environmental Psychology* 2:3-22.

Hershberger RG (1969) A study of meaning and architecture. *Dissertation Abstracts International.* 2435-A.

Herzog TR (1992) A cognitive analysis of preference for urban spaces. *Journal of Environmental Psychology* 12:237-248.

Izumi K (1965) Psycho social phenomena and building design. *Building Research* 2:9-11.

Kuller R (1979) A semantic test for use in cross-cultural studies. *Man-Environment Systems* 9:253-256.

Nasar JL (1988) Architectural symbolism: A study of house-style meanings. Paper presented at the *19th Annual Meeting of the Environmental Design Research Association.* Pomona, CA.

Nasar JL (1989) Symbolic meanings of house styles. *Environment and Behavior* 21:235-257.

Nasar JL (1994) Urban design aesthetics: The evaluative qualities of building exteriors. *Environment and Behavior* 26:377- 401.

Nasar JL, Purcell T (1990) Beauty and the beast extended: Knowledge structure and evaluations of houses by Australian architects and non-architects. In H Pamir, V Imamoglu, and N Teymur (Eds.), *Culture, space, history.* Ankara, Turkey: Sevki Vanh Foundation.

Osmond H (1957) Function as the basis of psychiatric hospital design. *Mental Hospitals* (Architectural Supplement) 8:23-30.

Purcell T, Nasar JL (1992) Experiencing other people's houses: A model of similarities and differences in environmental experience. *Journal of Environmental Psychology* 12:199- 211.

Shrout PE, Fleiss JL (1979) Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin* 86: 420-428.

Stamps AE (1991) Comparing preferences of neighbors and a neighborhood design review board. *Environment and Behavior* 23:618-629.

Stamps AE, Nasar JL (1997) Design review and public preferences: Effects of geographic location, public consensus, sensation seeking, and architectural styles. *Journal of Environmental Psychology* 17:11-32.

Vischer JC, Marcus CC (1986) Evaluating evaluation: Analysis of a housing design awards program. *Places* 3:66-86.

Vitruvius (1960) *The ten books on architecture.* (MH Morgan, Trans.). New York: Dover. (Original work written before AD 27; exact date unknown).

Wilson MA (1996) The socialization of architectural preference. *Journal of Environmental Psychology* 16:33-44.

Wohlwill J (1974) The place of aesthetics in the study of the environment. Paper presented at the *Symposium on Experimental Aesthetics and Psychology of the Environment at the International Congress of Applied Psychology*. Montreal, Canada.

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