DECODING MODERN ARCHITECTURE
A Lens Model Approach for Understanding the Aesthetic Differences of Architects and Laypersons

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ABSTRACT: The physical and affective bases of the differences between architects' and laypersons' aesthetic evaluations of building facades were examined. Fifty-nine objective features of 42 large modern office buildings were related to ratings of the buildings' emotional impact and global aesthetic quality made by architects and laypersons. Both groups strongly based their global assessments on elicited pleasure (and not on elicited arousal), but the two groups based their emotional assessments on almost entirely different sets of objective building features, which may help to explain why the aesthetic evaluations of architects and laypersons are virtually unrelated.

How are observers' appraisals of architectural aesthetic quality formulated? Presumably, observers make them in part on the basis of a building's

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physical features. This is an ancient and obvious truth. Pythagoras, for example, believed that the beauty of buildings could be ordered in mathematical terms (Murphy & Kovach, 1972), and the concept of the golden section proposes a precise geometrical specification of architectural beauty.

However, aesthetic appraisals are not based solely on geometric or physical features of buildings. Among many personal and contextual factors that influence appraisals of the environment in general and of architectural beauty in particular are the observer's emotional responses to buildings (Mehrabian & Russell, 1974). This is the focus of the present study: the connections between physical characteristics of buildings, the emotional impact of the building on the observer, and the observer's global appraisal of the building.

More specifically, the study has three purposes. First, it aims to demonstrate that particular physical features of buildings produce predictable affective responses in observers. Second, it seeks to show that these affective responses are in turn reliably associated with observers' global evaluations of buildings. Third, it compares the global evaluations of architects and laypersons in an attempt to help clarify the long-standing problem (Hershberger, 1969) of architect-layperson differences in architectural appraisals.

DESIGN AESTHETICS: RESEARCH APPROACHES

In the design aesthetics literature, at least four research approaches may be found. One examines specific objective features of the built environment as direct predictors of aesthetic appraisals. For example, in terms of building interiors, the presence of windows (Kaye & Murray, 1982), unusually high ceilings (Baird, Cassidy, & Kurr, 1978), and square as opposed to rectangular rooms (Nasar, 1981) have all been associated with higher preference ratings. Exterior features such as curved lines and decorated articulated facades (Frewald, 1990) as well as cleanliness and ornateness (Nasar, 1983) also appear to boost preference. Architectural style, age of the building, and visual bulk have been found to affect preference (Stamps, 1991b, 1992, 1993, 1994; Stamps & Nasar, 1997) although results are mixed: Some studies report that popular styles are preferred over avant-garde styles (Stamps & Nasar, 1997), whereas others find the reverse (Stamps, 1993).

The second approach considers the relation of more abstract variables such as cognitive constructs to building preference. For example, preference seems to be greater for buildings that are moderate in complexity (e.g., Wohlwill, 1974). Buildings that appear to be more orderly or coherent are preferred (e.g., Herzog, 1992). Aesthetic appraisals depend in part on the degree to which a building appears compatible with its immediate context (e.g.,

Groat, 1994). However, this study does examine these cognitive concepts or what might be called *formal aesthetics* (Nasar, 1994)

Third, some researchers examine goodness of fit or prototypicality as a key to observer preference. For example, Purcell and Nasar (1992) reported that preference increases with the degree of discrepancy from the goodness of example (of high architecture and popular architecture). However, this may be true more for architects than for laypersons who may prefer buildings and objects that are better examples of prototypes (Whitfield, 1983).

A fourth approach, which is employed in this study, considers the mediating role of affect: how observers' affective responses to their architectural preferences are related to their preferences for different building facades (Mehrabian & Russell, 1974; Russell, Ward, & Pratt, 1981). In this view, approach-avoidance behaviors (that may be likened to preference) are governed by the pleasure and arousal elicited by the setting. For example, Kuller (1980) found that pleasure is more often elicited by rounded-off architectural forms than by square-edged forms.

Beyond these four approaches, it is also clear that not all observers appraise buildings in the same way. For a full understanding of architectural appraisal, it is important to learn how the appraisals of different groups vary. As Hershberger (1969) noted long ago, probably the most salient group comparison is that between architects and nonarchitects.

Therefore, this study investigates the similarities and differences between the aesthetic appraisals of architects and laypersons by examining the roots of their appraisals in the physical features and the affective impact of building facades.

The tool chosen for this enterprise is a modified lens model (Brunswik, 1956).

THE LENS MODEL FRAMEWORK

The framework for examining aesthetic appraisals proposed in this study is based on the theoretical and empirical work of Brunswik (1956). The modified lens model is not itself a theory of aesthetics but rather a useful and unified framework for displaying the ways in which different groups presumably (a) respond to particular objective features of the physical environment, (b) integrate these reactions into emotional impressions, and (c) translate the emotional impressions into an overall aesthetic evaluation of a building (see Figure 1).

The lens framework assumes that the same process occurs, in general terms, in both architects and laypersons, hence their depiction as mirror

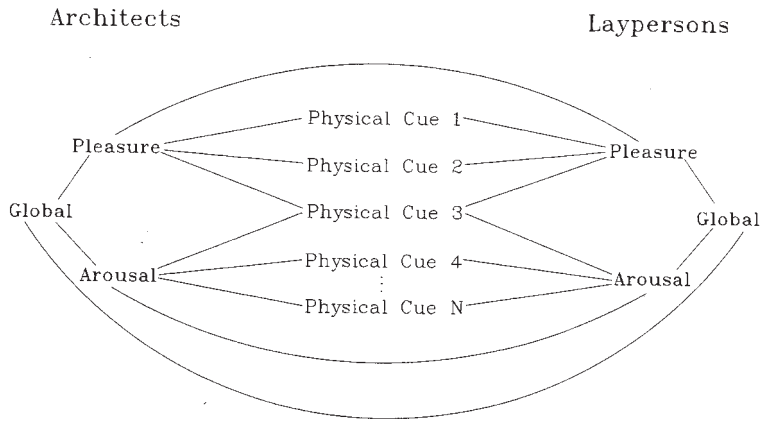

Figure 1: The Basic Lens Model, Showing Hypothetical Links Between Physical (distal) Cues, Emotional Responses, and Global Impressions of the Buildings

images on the left and right sides of the lens in Figure 1, but that the process may differ in its details for the two groups. The framework also includes an agreement index as a quantitative measure of the similarity of judgments made by architects and nonarchitects.

Perhaps most important, the lens framework provides information about which distal cues are used by each group to formulate their judgments and how strongly each cue is relied on by each group. This feature of the lens framework should help explain just how (that is, on which bases) the appraisals of architects and laypersons diverge, if they are found to diverge (once again) in this study. For example, the analyses may show that the emotional impact of buildings on architects derives from different building features than does the emotional impact on nonarchitects or that architects and nonarchitects derive their overall aesthetic appraisals from the same (or from different) emotional responses to buildings.

ARCHITECTS VERSUS LAYPERSONS

The aesthetic preferences of architects and laypersons often have been compared (e.g., Devlin, 1990; Devlin & Nasar, 1989; Duffy, Bailey, Beck, & Barker, 1986; Friedman, Balling, & Valadez, 1985; Groat, 1982, 1994;

Hershberger, 1969; Nasar, 1989; Nasar & Kang, 1989; Nasar & Purcell, 1990; Purcell & Nasar, 1990; Stamps, 1991a, 1993; Vischer & Marcus, 1986). The general finding from these studies has been that architects and nonarchitects differ in their assessments of buildings or the way they conceptualize buildings although some researchers (e.g., Hubbard, 1996) found that the groups share certain common conceptualizations of architecture. Occasionally, experts and laypersons reach similar conclusions in their appraisals yet seem to think about architecture in different ways (Groat, 1994).

Hershberger (1969) provided early empirical evidence that architects and nonarchitects perceive physical settings in fundamentally different ways. He compared the semantic differential ratings of buildings by three groups (architects, prearchitects, and laypersons) and found that the architects differed significantly from the other two groups. He attributed these differences primarily to training and experience.

Groat (1982) used a sorting task to determine which categories architects and a lay group (accountants) use to interpret buildings. She found that the accountants tended to sort buildings on the basis of preference and type, whereas architects used categories such as design quality, form, style, and historic significance. Again, these differences appear to be due primarily to training so that, for example, architects could clearly distinguish between modern and postmodern designs, whereas the lay group could not.

In another study, Groat (1994) reported that although lay and experts (design review commissioners, some with design training and some without) agreed to a significant degree in their rankings of a set of infill buildings, the groups differed in the way they conceptualized compatibility (of the infill building with the existing buildingscape); different criteria were used, and the experts tended to use more and different criteria.

Devlin (1990) compared users', viewers', and architects' perceptions of two Chicago office buildings. Nonarchitects tended to provide evaluations that were predominantly affect based and descriptive, whereas architects' provided evaluations that were more abstract and conceptual.

That architects perceive physical settings differently than nonarchitects is not surprising given the different learning histories associated with the two groups. However, these differences are important because they can often result in severe mismatches between designer and lay preferences. Given that part of the architect's job is to understand client (that is, lay) perceptions, these differences are not trivial. Moreover, one study even suggested that not only do architects have different preferences than nonarchitects, they do not seem to understand what the public likes. Nasar (1988) found that when architects were asked to predict what nonarchitects would find appealing, they were often unable to do so.

The advantage of the lens framework is that it provides a useful way to clearly identify which specific physical features and emotional responses underlie differences in the global assessments made by architects and nonarchitects. This information might ultimately be used by architects to predict lay responses to their work and thus increase lay satisfaction with their creations (Hershberger & Cass, 1988). It might also be used to educate laypersons about why architects like certain buildings that may seem unattractive to most laypersons. In general, it should promote understanding about the particular bases of lay and architect preferences for various built forms.

METHOD

DESIGN, PARTICIPANTS, AND BUILDINGS

Overview. A set of large, modern (1980s and 1990s) office buildings was chosen. The lay judges were community residents and university students with no architectural training; the architects were drawn from the local group of practicing licensed architects. Slides of the buildings were shown to small groups of judges who were asked to rate each building. Objective physical features of each building were scored by a separate group of trained judges.

Buildings. The goal was to examine a more-or-less random sample of large, modern office buildings to make the results as generalizable as possible to this category of building. Recent issues of *Architectural Record* and similar publications were scanned, and 42 images were selected and rephotographed as slides by the university's professional photographer (see the appendix for a list of the buildings and Figures 4 through 9 for some photographs). Complete uniformity in photographic angle and style could not be attained, but the authors did select color images that included a whole-building view. The selected photos were cropped where possible to eliminate or minimize neighboring buildings and land uses.

Judges and measures. Five different sets of judges were used so that judgments in the different portions of the lens model remained independent. Two separate groups of registered practicing architects rated their global impression ($n = 8$) of and the degree of pleasure and arousal ($n = 9$) elicited in them by each building.[1]

Two separate groups of lay judges, both mixtures of community residents who volunteered for no reward and introductory psychology students who

received a small amount of course credit, participated. The community residents were selected by choosing listings from the city directory in a systematically random manner (e.g., the 10th name on every 20th page). Each was phoned and asked if he or she would help by judging the architecture of some buildings. The authors asked each lay judge (n = 27 for global impressions and n = 19 for pleasure and arousal) whether he or she had any architectural training (none did).

The global measure asked 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 pleasure and arousal measures were based on those developed by Mehrabian and Russell (1974). A graphic circumplex method similar to that developed and validated by Russell, Weiss, and Mendelsohn (1989) for eliciting these ratings was created (see Figure 2) in which pleasure is represented in the horizontal plane by a dimension ranging from *ugly* (*displeasing*) to *beautiful* (*pleasing*), and arousal is represented in the vertical plane by a dimension ranging from *arousing* (*intense*) to *unarousing* (*numbing*).

Participants indicated the nature of their emotional response by marking a spot on the circumplex; emotions are assumed to shade continuously between the orthogonal dimensions of pleasure and arousal (e.g., *exciting* is represented by the upper right quadrant between *high pleasure* and *high arousal*). They were instructed to depict stronger responses by placing marks farther from the center of the circumplex, which is the no-emotion point.

All participants were trained to use the circumplex by explaining it carefully and then asking them to rate one or two outdoor nature scenes as trial judgments. They were then asked to explain their rating; if their ratings corresponded to their verbal statements, it was assumed they understood how to use the circumplex rating system. A few participants initially were confused, but after doing one or two trial ratings, all of them perfectly understood how to use the circumplex method of recording their affective responses.

The physical features of the buildings were measured as 59 separate objective elements of the building exteriors, such as the number of stories, the percentage of the facade that was glass, and so on, using an instrument developed for this project called The Architectural Coding System (TACS). These measures of the facade form the physical cue basis (center) of the lens model (see Figure 1).

TACS represents an attempt to develop a coding system for every discrete exterior physical feature of an architectural structure that might influence perceptions of architecture. TACS includes coding schemes for the 59 separate features of architectural facades in 10 categories: overall form, roof, walls, wall appearance, wall textures, wall patterns, windows, amenities,

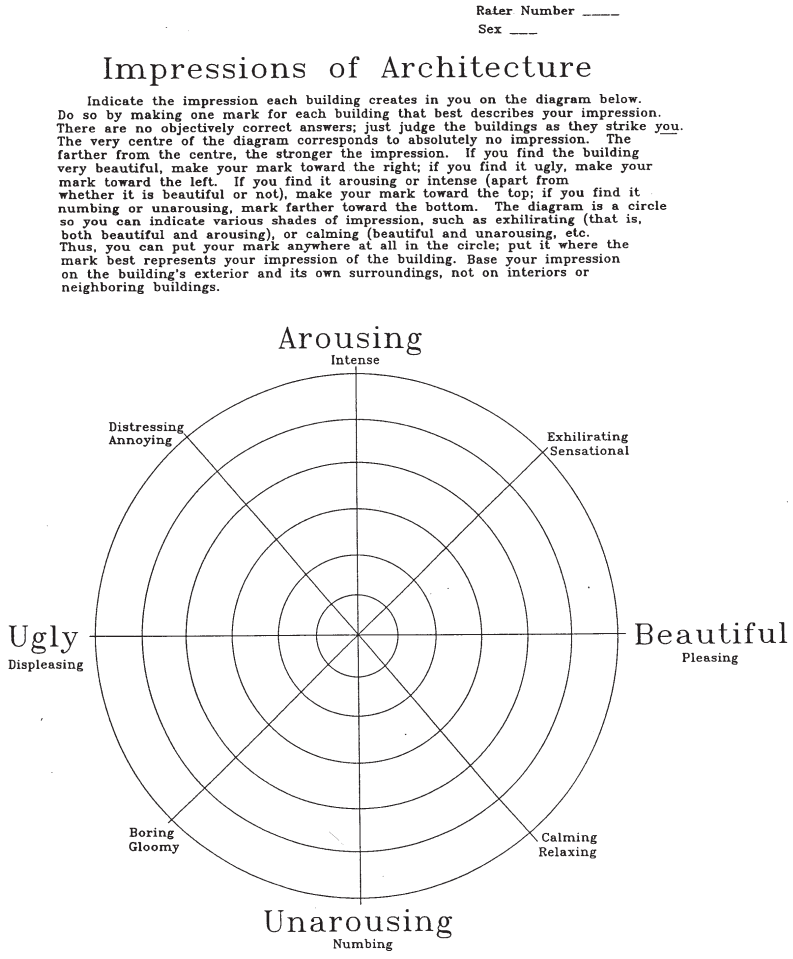

Figure 2: The Emotion Circumplex Used by Participants to Indicate the Degrees of Pleasure and Arousal Elicited in Them by Each Building

ornaments, and context. The goal in every case was to ensure that the building feature in question was an observable physical element of the facade that could be counted or accurately estimated.

These 59 cues were scored by a fifth (separate) group of judges who were trained in the TACS method. Two judges scored every cue for all 42 buildings (a total of 2,478 ratings). This proved very taxing for the judges, so the authors engaged and trained another 11 judges to score portions of the whole. This was planned so that each cue for each building was rated three times by different judges; thus, including the ratings from the original two raters, each of the 59 building cues was rated five times for each building.

RESULTS

RELIABILITIES

Interjudge agreement for the emotion, overall aesthetic, and building feature (TACS) ratings was computed as intraclass correlations (Shrout & Fleiss, 1979, formula ICC 3, k). The lay ratings of pleasure, arousal, and global impression had intraclass correlations of .69, .75, and .85, respectively. The architects' intraclass correlations for the same three judgments were .72, .62, and .83.

Not all of the 59 TACS cues could be reliably rated; 25 met the minimum criterion for interrater agreement of .70. Those that did not reach adequate reliability tended to have little variability across buildings or simply were unclear (at least in this set of building photographs) to the raters. Only the 25 cues that were rated with acceptable levels of reliability were used in the analyses that follow.

MEANS AND STANDARD DEVIATIONS

The means, standard deviations, and interrater reliabilities of the lay and architects' pleasure, arousal, and global ratings and those for the 25 physical cues are reported in Table 1.

LENS MODEL ANALYSES

Each of the 25 cues was correlated with the lay and architect ratings of pleasure and arousal; the latter were in turn correlated with the global aesthetic evaluations. The lens model for these results is shown in Figure 3. Only significant links ($p < .05$) are shown.

The curved lines represent the degree of agreement between the architects and the laypersons on the arousal, pleasure, and global assessment ratings.

TABLE 1
Means and Standard Deviations of Key Variables

	N	*Mean*	*Standard Deviation*	*Interrater Reliability*
Global impressions				
Architects	8	4.11	1.44	.83
Laypersons	27	5.55	.93	.85
Pleasure				
Architects	9	–.38	1.54	.72
Laypersons	19	–.39	1.01	.69
Arousal				
Architects	9	.24	1.39	.62
Laypersons	19	.84	.99	.75
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
Fancy		2.94	.78	.71
Color uniformity		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	.87	.73
Balconies/porches		1.96	.97	.79

(continued)

The affective basis of preference. For both architects and laypersons, global assessments are very strongly and positively related to building-elicited pleasure (*r*s = .51 and .86, respectively). Surprisingly, arousal is not significantly correlated with global impression either for the architects' or the laypersons' global impressions. Incidentally, as Mehrabian and Russell (1974) predicted, across the set of 42 buildings, elicited pleasure and arousal are not significantly related to each other either for the architects or the laypersons; pleasure and arousal are, in general, orthogonal dimensions of affect. Thus, laypersons and architects agree that a better overall building is one that gives them pleasure but that elicited arousal is unrelated to their global assessment.

TABLE 1 Continued

	N	*Mean*	*Standard Deviation*	*Interrater Reliability*
Sculpture		1.37	.80	.85
Triangles		1.64	.76	.88
People in evidence		1.93	1.21	.95
Landscaping		2.46	1.19	.94
Roads		1.75	.54	.87

NOTE: Global assessments could range from 1 (*terrible architecture*) to 10 (*excellent architecture*). Pleasure and arousal ratings could range from –6 (*ugly, unarousing*) to 6 (*pleasing, arousing*). Brief definitions of and codings for the 25 reliably measured The Architectural Coding System (TACS) scales:

Size: relative to this sample, from 1 (smallest 20%) to 5 (largest 20%)
Number of sides: number of major vertical exterior walls (e.g., 4 for a 4-sided building)
Number of stories: from ground to roof
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 more than 75% (5) is shiny
Glass cladding: zero (0) to more than 80% (5) of the exterior walls are glass
Metal cladding: zero (0) to more than 80% (5) of the exterior walls are metal
Brick/stone cladding: zero (0) to more than 80% (5) of the exterior walls are brick or stone
Roof pitch: run twice rise (1) to rise twice run (3)
Rounded: Corners and edges sharp (1) to rounded (5)
Fancy: overall simple exterior (1) to many amenities (5) (e.g., arches, sculptural elements, and ornamentation)
Color uniformity: all one color (1) to four or more (5)
Articulation: surfaces flat (1) to heavily articulated (4)
Columns: none (1) to many (5)
Arches: none (1) to many (5)
Railings: exterior, from none (1) to many (5)
Canopies: none (1) to many (5)
Balconies and porches: none (1) to many (5)
Sculpture: carved elements, from none (1) to many (5)
Triangles: triangular elements, from none (1) to many (5)
People in evidence: human presence such as plants, toys, tools, and so on from none (1) to many (5)
Landscaping in view: none (1) to much (5)

Architect-layperson agreement. Further inspection of Figure 3 reveals that agreement between the two groups about the pleasure-eliciting qualities of the buildings and their global assessments is small. Across the 42 buildings, global assessments (r = .14) and rated pleasure (r = –.08) are virtually unrelated. When global ratings are uncorrelated, one can expect both groups to like some buildings, both to dislike some buildings, one group to like certain buildings that the other dislikes, and vice versa. Figures 4 through 9 show photographs of buildings in each of these four categories.

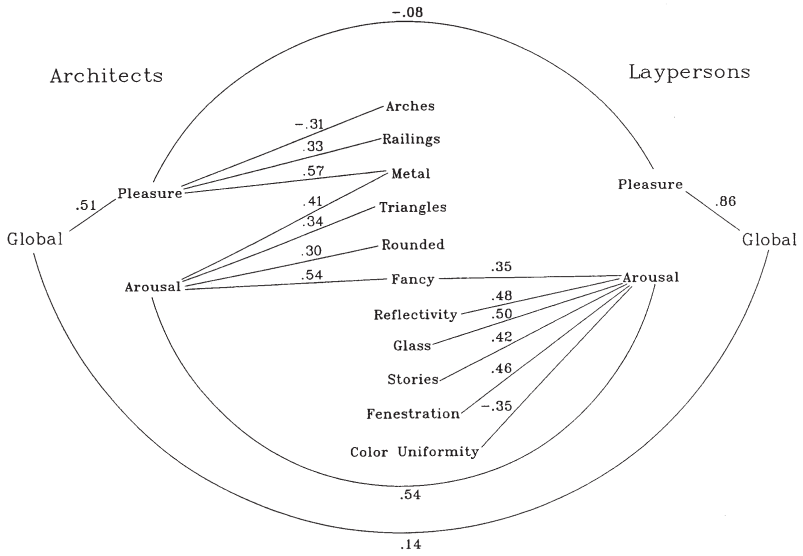

Figure 3: The Lens Model, Showing the Significant ($p < .05$) Links Between Physical (distal) Cues, Emotional Responses, and Global Impressions of the Buildings

In contrast to the pleasure and global rating results, the architects and laypersons did significantly agree about the arousal-eliciting qualities of the 42 buildings ($r = .54$). However, arousal was not related to global assessment either for architects or laypersons.[2] Based on Mehrabian and Russell's (1974) ideas, it is not surprising that arousal itself was unrelated to preference: It can include positive arousal (pleasure-tinted arousal) or negative arousal (arousal colored with displeasure) so that in a representative sample of buildings that includes some that are pleasure eliciting and some that are displeasure eliciting, no overall relation between arousal and global assessment should be expected.

The physical basis of nonagreement. In general, the lens model predicts that more agreement between groups will be observed when both groups use the same physical cues in the same way to reach their conclusions. The extent to which this is so in this study is shown in the links between the physical cues and the affective ratings in Figure 3.

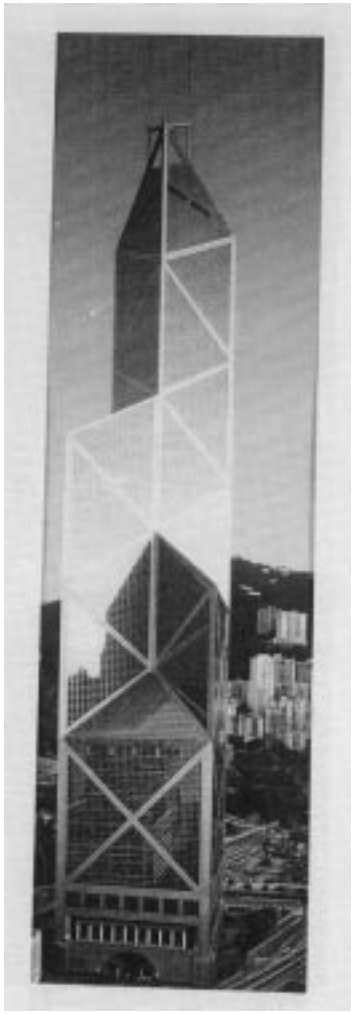

Figure 4: Bank of China Tower: An Example of Buildings That Were Liked and Disliked by Laypersons and Architects (see Table 2 and the appendix for more details)

NOTE: Raters saw color slides. The Bank of China Tower was rated high by both groups. Photo ©1991 Paul Warchol.

Pleasure was significantly related for architects to the presence in facades of more metal cladding ($r = .57$), fewer arches ($r = -.31$), and more railings ($r = .33$). Together, these three physical cues have a multiple correlation of .63

Figure 5: Bürogebäude Münchensteiner Strasse: An Example of Buildings That Were Liked and Disliked by Laypersons and Architects (see Table 2 and the appendix for more details)

NOTE: Raters saw color slides. The Bürogebäude Münchensteiner Strasse was rated high by both groups. Photo by Rheinzink GMBH, Postfach 1452, D-45705 Datteln; Bahnhofstr, 90, D-45711 Datteln; phone: 02363/605-0; fax: 02363/605.209.

Figure 6: Ministry of Social Welfare Headquarters: An Example of Buildings That Were Liked and Disliked by Laypersons and Architects (see Table 2 and the appendix for more details)

NOTE: Raters saw color slides. The Ministry of Social Welfare Headquarters was rated high by architects and low by laypersons. Photo by Ger van der Vlugt.

Figure 7: Disney Headquarters: An Example of Buildings That Were Liked and Disliked by Laypersons and Architects (see Table 2 and the appendix for more details)

NOTE: Raters saw color slides. The Disney Headquarters was rated low by architects and high by laypersons.

with the architects' rated pleasure; that is, they account for 40%, a very large chunk of the variance in architects' ratings of pleasure.

The situation for laypersons was quite different: Rated pleasure was not significantly related to any of the 25 building cues. Of course, they probably derive pleasure from some building cues because their ratings were (as a group) reasonably reliable. Thus, at least in terms of the cues examined in this study, architects and laypersons base their pleasure ratings on entirely different sets of physical cues, which probably is why the pleasure agreement index for the two groups across the 42 buildings is so low ($r = –.08$).

Architects and laypersons agree more about which buildings are emotionally arousing ($r = .54$). Ordinarily, this would occur because both groups significantly used several cues in the same way. However, the two groups shared only a single physical cue as a basis for their arousal appraisals: fancy ($r = .54$ for architects and $r = .35$ for laypersons). A likely reason for this is that both groups use certain cues in the same way, but these cues were not among the 25 investigated in this study.

Figure 8: Liberty Center: An Example of Buildings That Were Liked and Disliked by Laypersons and Architects (see Table 2 and the appendix for more details)

NOTE: Raters saw color slides. The Liberty Center was rated low by both groups. Photo by Carol M. Highsmith.

On the positive side, the 25 cues did explain very important amounts of variance in both groups' arousal ratings. Almost 60% of the architects' ratings (multiple $R = .77$; $R^2 = .59$) are related (in addition to fancy, as noted earlier) to the presence of more metal cladding ($r = .41$), more rounded corners and edges ($r = .30$), and the presence of triangular elements in the facade ($r = .34$); each of these is a significant correlation.

Figure 9: 1150 18th Street NW: An Example of Buildings That Were Liked and Disliked by Laypersons and Architects (see Table 2 and the appendix for more details)

NOTE: Raters saw color slides. 1150 18th Street NW was rated low by both groups. Photo ©Alan Karchmer.

More than half the variance in lay ratings (multiple $R = .71$; $R^2 = .51$) was related (in addition to fanciness, as noted earlier) to the presence of more glass ($r = .50$), greater reflectivity ($r = .48$), less color uniformity ($r = –.35$), more fenestration ($r = .46$), and height (more stories) ($r = .42$); each of these is a significant correlation.

TABLE 2
Global Evaluations: Similarities and Differences Between Architects and Laypersons

	Architects' Rank[a] *(N = 8)*	*Laypersons' Rank*[a] *(N = 27)*
High evaluation by both groups (smallest sums of ranks)		
36. Bank of China Tower	2	1
34. 2401 Pennsylvania Avenue NW	5	10
35. Bürogebäude Münchensteiner Strasse	12.5	8
Architects high, laypersons low (largest rank discrepancies)		
39. Ministry of Social Welfare Headquarters	6.5	40
5. Stockley's Park Building B-3	4	33
25. 100 Avenue Road	14.5	38.5
Architects low, laypersons high (largest rank discrepancies)		
2. Disney Headquarters	41	3
33. 20 Old Bailey	37	2
12. Northwestern Atrium Center	40	7
Low evaluation by both groups (largest sums of ranks)		
26. 1150 18th Street NW	30.5	42
7. Liberty Center	37	32
28. Chicago Bar Association Building	35	34

a. Ranks are global evaluation rank scores where 1 was the best liked building and 42 was the least liked building. Sums and discrepancies in ranks refer to sums and discrepancies across the two groups. See the appendix for more details about each building.

DISCUSSION

Long ago, Vitruvius suggested three goals for architecture: firmness, commodity, and delight. The latter quality is closest to the topic of this investigation. Both research and everyday experience have long shown that architects and nonarchitects often disagree about the aesthetics of modern buildings. This study first replicates this, showing once more that the two groups do not agree.

However, its purpose was to move beyond this now commonplace outcome to investigate the physical and emotional bases of the disagreement. The lens model approach to this problem is based on the notion that agreement at the global level will be greater if groups use the same physical cues in the same way. The laypersons and architects (as a whole) used 12 physical cues to form their emotional responses, but only 1 cue (fanciness) was used in the same way by both groups. Moreover, that cue predicted their arousal ratings, which were unimportant as a basis for the global assessments. On the main line to global assessment, that is, from the physical cues through

elicited pleasure to the global assessments, the two groups used no physical cues in the same way.

However, at least more is known about which building cues are important for each group. Architects found that buildings elicited more pleasure if they included more railings, fewer arches, and most strongly, more metal cladding. Architects were more aroused by buildings that had more rounded edges and corners, more triangular elements, and particularly by fancier and more metal-clad buildings. One cue independently signals both pleasure and arousal for architects: metal cladding. Given that in Mehrabian and Russell's (1974) system the combination of pleasure and arousal is excitement (see Figure 2), it appears that metal-clad buildings excite architects.

These elemental physical cues that predict the assessments of architects are important because they probably signify for architects more complex ideas such as prototypicality of style and richness of materials. For example, a building with a molded shape that is clad in metal may lead to the inference that this is a more expensive design or perhaps it signifies the essence of modernity for architects. Whether these suppositions are correct requires further research; at this point, one at least understands how certain physical cues relate to the affective impact on and global assessments of architects.

The next steps in research may be to connect the approach employed in this study with the hypothesis that layperson-architect differences are related to their different conceptualizations of buildings at a more abstract level. For example, certain combinations of physical cues may signal different prototypes (e.g., Purcell & Nasar, 1992; Whitfield, 1983) or discrepancies from these prototypes to the two groups. An analogy might be drawn to the way that a given set of design elements says Art Deco or Italianate to the educated design professional.

The laypersons derived their pleasure from none of the 25 building cues that were examined in this study. Presumably there are cues (not measured in this study) that elicit pleasure in laypersons, but the issue may be one of greater within-group individual differences. As might be expected, lay ratings are less cohesive; 19 lay raters were needed to attain a degree of interrater reliability (.69) similar to the interrater reliability for the architects (.72), which required only 8 raters to attain. This indicates that laypersons produce more heterogeneous ratings (as a group) than architects. Given the selection and training of architects as a group, which tends to focus their aesthetic standards, this seems likely. Laypersons' ratings of architecture are known to be subject to various influences, which makes their ratings more diffuse. For example, Gifford (1980) showed that building interiors appealed significantly differently to lay judges depending on their age, sex, educational level, and mood.

In contrast to the lack of significant pleasure cues, however, six cues were significantly related to arousal among the laypersons. They report more arousal from more buildings that are more reflective or shiny, have more glass, are taller, more multicolored, and fancier.

TACS includes a number of context variables that allows for a test of whether nonbuilding aspects of the scene influence observers' assessments. Three such variables (amount of landscaping visible, number of roads visible, and evidence of human presence or activity) were reliably rated by the independent judges. None of these significantly influenced any of the lay or architect ratings of pleasure, arousal, or overall impression. The authors have this much assurance, then, that nonbuilding context had little impact on the assessments in this study.

In general, the lens approach seems to offer a promising avenue toward understanding layperson-architect differences of aesthetic opinion. It offers a wealth of analytic possibilities toward the further explication of these differences (Cooksey, 1997). One of the main criticisms of research in environmental psychology has been the lack of attention to physical attributes of settings (Groat, 1994), and the lens model certainly grounds this line of research in specific physical attributes of buildings. Nevertheless, one cannot escape the supposition that observers, lay or architect, create from the elemental physical attributes of buildings categories and prototypes that also, in turn, influence aesthetic assessments. Therefore, linking the present approach to one that considers the meaning of buildings in a more abstract sense, such as what various styles, prototypes, or schemas buildings represent to their observers, is an obvious next step.

APPENDIX
Details of the Buildings

Building 1: Walnut Building, Cincinnati, OH. Architect: Hoover & Furr. Reference: *Architecture*, May 1991, p. 14.

Building 2: Disney Headquarters, Burbank, CA. Architect: Michael Graves. Reference: *Post-Modernism on Trial* (A. C. Papadakis, Ed., London: Architectural Design, 1990, p. 27, right photo).

Building 3: The Haas House, Vienna, Austria. Architect: Hans Hollein. Reference: *Post-Modernism on Trial* (A. C. Papadakis, Ed., London: Architectural Design, 1990, p. 69).

Building 4: Walt Disney World Casting Center, Lake Buena Vista, FL. Architect: Robert A. M. Stern. Reference: *Architectural Record*, September 1989, p. 67.

Building 5: Stockley Park's Building B-3, London. Architect: Foster Associates. Reference: *Architectural Record*, September 1989, p. 81, top photo.

Building 6: Third National Bank Headquarters, Nashville, TN. Architect: Kohn, Pedersen, Fox Associates. Reference: *Architectural Record*, December 1989, p. 46, left photo.

Building 7: Liberty Center, Pittsburgh, PA. Architect: UDA Architects, Burt Hill Kosar & Rittelmann (BHKR), and The Architects Collaborative Inc. (TAC). Reference: *Architecture*, January 1988, p. 111.

Building 8: St. Luke's Medical Tower, Houston, TX. Architect: Cesar Pelli & Associates. Reference: *Architecture*, July 1991, p. 42.

Building 9: Procter & Gamble Headquarters, Cincinnati, OH. Architect: Kohn, Pedersen, Fox Associates. Reference: *The Language of Post-Modern Architecture* (C. A. Jencks, London: Academy Editions, 1987, p. 167, photo No. 327).

Building 10: Fenchurch Street Bank, London. Architect: Terry Farrell Partnership. Reference: *The Language of Post-Modern Architecture* (C. A. Jencks, London: Academy Editions, 1987, p. 170, photo No. 334).

Building 11: Office Building, Lugano, Switzerland. Architect: Mario Botta. Reference: *The Language of Post-Modern Architecture* (C. A. Jencks, London: Academy Editions, 1987, p. 175, photo No. 342).

Building 12: Northwestern Atrium Center, Chicago. Architect: Murphy/Jahn Architects. Reference: *Architectural Record*, October 1990, p. 88, photo No. 3.

Building 13: George W. and Edwina S. Tarry Research and Education Building, Northwestern University, Chicago. Architect: Perkins & Will. Reference: *Architectural Record*, January 1991, p. 96.

Building 14: The Humana Building, Louisville, KY. Architect: Michael Graves. Reference: *Architectural Record*, February 1991, p. 69.

Building 15: Promenade Tower, Atlanta, GA. Architect: Ray Hoover of Thompson, Ventulett, Stainback & Associates. Reference: *Architectural Record Lighting*, February 1991, p. 52.

Building 16: Fleet House, London. Architect: Richard Seifert Ltd. Reference: *Post-Modern Triumphs* (A. C. Papadakis, Ed., London: Architectural Design, 1991, p. 80, photo C3).

Building 17: Broadwalk House, London. Architect: Bruce Graham of SOM Chicago. Reference: *Architecture*, September 1990, p. 69, top left photo.

Building 18: Banker's Trust Headquarters, London. Architect: Bruce Graham of SOM Chicago. Reference: *Architecture*, September 1990, p. 69, top right photo.

Building 19: Bishopsgate, London. Architect: Bruce Graham of SOM Chicago. Reference: *Architecture*, September 1990, p. 70, top left photo.

Building 20: Exchange House, London. Architect: Bruce Graham of SOM Chicago. Reference: *Architecture*, September 1990, p. 109.

Building 21: Lincoln Center, Minneapolis, MN. Architect: Kohn, Pedersen, Fox Associates. Reference: *Architecture*, May 1988, p. 128.

Building 22: Point West Place, Framingham, MA. Architect: Robert Stern. Reference: *The History of Postmodern Architecture* (H. Klotz, Cambridge, MA: MIT Press, 1988, p. 192, photo No. 245).

Building 23: Mississauga City Hall, Mississauga, Ontario, Canada. Architect: Jones & Kirkland. Reference: *The Canadian Architect*, June 1987, p. 25, photo No. 5.

Building 24: 151 Marylebone Road, London. Architect: Izslot Malden of Hamilton Associates. Reference: *Post-Modern Triumphs* (A. C. Papadakis, Ed., London: Architectural Design, 1991, p. 76, photo B30).

Building 25: 100 Avenue Road, London. Architect: Ike Horvitch for Architectural Design Associates. Reference: *Post-Modern Triumphs* (A. C. Papadakis, Ed., London: Architectural Design, 1991, p. 77, photo B33).

Building 26: 1150 18th Street NW, Washington, DC. Architect: Hisaka & Associates. Reference: *Architecture*, April 1991, p. 56, photo No. 1.
Building 27: Franklin Square, Washington, DC. Architect: John Burgee Architects. Reference: *Architecture*, April 1991, p. 56, photo No. 3.
Building 28: Chicago Bar Association Building, Chicago. Architect: Tigerman McCurry Architects. Reference: *Architecture*, June 1991, p. 72, top photo.
Building 29: Marti Office Building, Zurich, Switzerland. Architect: Theo Hotz and Franz Romero. Reference: *Architectural Review*, January 1991, p. 31, bottom photo.
Building 30: Besso House, London. Architect: CZWG. Reference: *Post-Modern Triumphs* (A. C. Papadakis, Ed., London: Architectural Design, 1991, p. 28, photo A18).
Building 31: 350 North LaSalle, Chicago. Architect: Loebl, Schlossman, & Hackl, Inc. Reference: *Architecture*, May 1991, "Bricks in Architecture Awards Issue 48-2" [Insert], p. 7).
Building 32: Allied Irish Bank, London. Architect: Terry Farrell Partnership. Reference: *Post-Modern Triumphs* (A. C. Papadakis, Ed., London: Architectural Design, 1991, p. 22, photo A9).
Building 33: 20 Old Bailey, London. Architect: Renton, Howard, Wood, Levin. Reference: *Post-Modern Triumphs* (A. C. Papadakis, Ed., London: Architectural Design, 1991, p. 84, photo C11).
Building 34: 2401 Pennsylvania Avenue NW, Washington, DC. Architect: Keyes, Condon, Florance. Reference: *Architecture*, April 1991, p. 68.
Building 35: Bürogebäude Münchensteiner Strasse, Basle, Switzerland. Architect: Dorenbach A. G. Architects. Reference: *Architectural Review*, January 1991, p. 72.
Building 36: Bank of China Tower, Hong Kong, China. Architect: I. M. Pei & Partners. Reference: *Architectural Record*, January 1991, p. 79.
Building 37: Ismaili Centre, London. Architect: Casson Condor Architects. Reference: *Post-Modern Triumphs* (A. C. Papadakis, Ed., London: Architectural Design, 1991, p. 83, photo C9).
Building 38: Republic Place, Washington, DC. Architect: Keyes, Condon, Florance. Reference: *Architecture*, April 1991, p. 67, top left photo.
Building 39: Ministry of Social Welfare Headquarters, The Hague, the Netherlands. Architect: Herman Hertzberger. Reference: *Architectural Review*, March 1991, p. 29, photo No. 2.
Building 40: Bexar County Justice Center, San Antonio, TX. Architect: Jones & Kell Architects; Ford, Powell & Carson, Inc.; Humberto Saldana & Associates, Inc. Reference: *Architecture*, February 1991, p. 65, bottom photo.
Building 41: The Fitzpatrick Building, London. Architect: Chassay Architects. Reference: *Post-Modern Triumphs* (A. C. Papadakis, Ed., London: Architectural Design, 1991, photo B19).
Building 42: 518 C Street, Capitol Hill, Washington, DC. Architect: Weinstein Associates. Reference: *Architecture*, April 1991, p. 84, top photo.

NOTES

1. The study was designed to include as many observers as necessary to reach a very good level of agreement among observers; if a relatively small group reaches a sufficient level of agreement, adding more observers of the same type will not alter the results.

2. Mehrabian and Russell (1974) postulated that arousal may be related to certain behaviors, such as the tendency to approach a place, in an inverted U-shaped manner. This possibility may

be revealed by examining the quadratic function of arousal. Thus, the authors computed the quadratic for arousal by squaring it and correlated the quadratic with architects' and laypersons' global ratings. No relation was found for the architects, but the correlation for laypersons changed from .20 (*ns*) for first-order arousal to .33 ($p < .05$) for the quadratic form of arousal. In sum, second-order (quadratic) arousal is mildly related to global assessment among laypersons.

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