

FACTORS DETERMINING AESTHETIC PREFERENCES FOR GEOMETRICAL DESIGNS AND DEVICES*

H. J. Eysenck

I. INTRODUCTION

IT IS well known that even quite simple stimuli can give rise to aesthetic judgements of 'like' and 'dislike', and a good deal of research has been done on, for instance, preference judgements for polygonal figures (Eysenck, 1941a; Birkhoff, 1932). The formal elements involved, such as proportions, repetition, complexity, are certainly similar to those involved in proper works of art, and when Fechner (1897) inaugurated the experimental study of aesthetics he specifically illustrated his generalizations by reference to polygons. One line of research in this field has been the attempt to study the various factors which determine aesthetic preferences for polygonal figures, and Eysenck (1968; Eysenck & Castle, 1970) has shown that similar factors emerge from the analysis of preference judgements for 90 polygons made by art-trained and non-trained subjects. Typically, such factors emerge from similarities between sets of polygons based on features such as simplicity, rotational symmetry, apparent three-dimensionality, or on the polygons being variants on a common theme, such as that of the cross or the triangle or the star. These factors are objectively derived from the observed inter-correlations between subjects' ratings through factor analysis, and several replications have shown that identical or at least similar factors can be recovered from ratings made by quite divergent and different samples of subjects.

* I am indebted to the Social Science Research Council for the support of this study, and to Mr. G. Eastings for collecting the data.

2. DESCRIPTION OF STUDY

The present study is concerned with an attempt to find factors determining aesthetic preferences for geometrical designs and devices other than polygonal figures. The stimuli used were copied from Hornung's *Handbook of Designs and Devices* (1932), which contains 1,836 such designs, illustrating all the major variants which have been distinguished in the history of the subject (Circle, Line and Band, Triangle, Square, Diamond, Cross, Swastica, Pentagon, Hexagon, Octagon, Star, Scroll, Interlacement, Fret and Shield). A selection was made of 131 of these designs, roughly speaking by obtaining samples of most of the categories represented, but without being able to claim that the choice was a random sample in any realistic way; these were then photographed and put on to slides. A total group of 179 subjects was tested, in small groups; these were all students of education, without any special training in visual arts. Subjects were instructed to rate each slide on a 5-point scale: Don't like = 1; Like a little bit = 2; Like = 3; Like a lot = 4; Like very much indeed = 5. Slides were shown at a rate which made rating comfortable, giving roughly 10 to 15 seconds for each slide, but not continuing until all the subjects had made their rating.

Ratings for the individual slides ranged from a low of 1.40 to a high of 3.96, *i.e.* roughly from 'Don't like' to 'Like a lot'. This range indicates a considerable amount of agreement between subjects; if they had responded at random, *i.e.* in the complete absence of agreement, ratings would have averaged around 3, without much deviation. The actual mean response for all the items was 2.58, indicating that on the whole subjects found the slides acceptable. Ratings were intercorrelated by product-moment correlation, and factor-analysed by principal components; factors were rotated by Promax. Fifteen factors were extracted, although the eigenvalues did not drop below unity until the 34th factor was reached; however, most of the later factors were simply doublets, or uninterpretable. We are here interested, in the main, in the interpretable factors which emerged, and these will now be described and illustrated; illustrations were chosen by taking 5 items with the highest factor loadings on each factor. The naming and interpretation of these factors are of course subjective; the reader will be able to judge how far he feels that both are reasonable.

3. RESULTS

Factor 1 is illustrated in Figure 1. This may be labelled 'rectangular

FACTORS DETERMINING AESTHETIC PREFERENCES

variant'; all the examples given are squares or diamonds (squares rotated through an angle of 45°). This is one of the clearest factors to emerge from our analysis.

Factor 2 is illustrated in Figure 2. It may reasonably be called 'circular variant', as the designs emphasize circularity, either complete or partial. Here too there does not seem to be much doubt about the interpretation.

Factor 3 is illustrated in Figure 3. It might be called 'ring' or 'cyclic variant', and there are some obvious similarities between this factor and Factor 2. The differences between these factors are not obvious to the eye, and speculation at this stage of analysis would be futile. We will return to this problem later.

Factor 4 is illustrated in Figure 4. It is clearly a 'star variant' factor, and replicates a similar factor found in our polygon studies.

Figure 5 illustrates Factor 5. This is a 'curved variant'; all the designs are made up of curved figures, but without being circular, as is the case for Factors 2 and 3.

Figure 6 illustrates Factor 6. This factor is, in Hornung's terms, an 'interlacement' factor, with all the high loading items showing this interlacement.

Factor 7 is illustrated in Figure 7. This factor is somewhat difficult to name, although its meaning is perhaps clear enough. Perhaps the term 'shading' or 'shade' factor may be acceptable; the mixture of black and white is arranged in such a way that one might imagine that the object in question had been illuminated from the side, and the artist had painted the strong shadows so created. This effect is particularly strong in the first three figures.

Figure 8 illustrates Factor 8. Here again the effect giving coherence to the examples shown is perhaps clear enough, but finding a proper name for it is not so easy. Possibly '3-dimensional variant' comes closest to it; the interlacing seems to produce a three-dimensional effect which sets this off from Factor 6.

Factor 9 is illustrated in Figure 9. Here we seem to be dealing with a factor of 'order' or simplicity; this again resembles a similar factor found in our analysis of the polygonal figures. It is not surprising that such a factor should emerge; we have found a liking for simple, as opposed to complex figures one of the most pervasive factors in aesthetic judgements (Eysenck, 1941b; Fritsky, 1963; Vitz, 1966).

These nine factors are the only ones which are reasonably easy to interpret; there did not seem much point in discussing other factors, which are likely to be statistical artefacts in any case in view of the limited number of subjects. These nine factors are not independent; by

virtue of the rotational process which emphasizes simple structure rather than orthogonality they are allowed to become oblique if the data decreed that they should be so. Table 1 gives the observed correlations between the nine factors. Most of these are too small for comment, but it will be noted that the highest correlation ($\cdot40$) is between 'interlacement' and '3-dimensional'; we have already commented on the fact that the 3-dimensional effect seems to have been produced by the manipulation of interlacement. It will also be seen that both interlacement and 3-dimensional are correlated with the 'ring' variant ($\cdot32$ and $\cdot33$), but not with the 'circular' variant; this may throw light on the differentiation between the circular and ring variants, which are not themselves intercorrelated. The remaining correlations, although too small to be reliable, make some sense on the whole; thus the simplicity factor is found to correlate negatively with interlacement, which is of all the design factors the most complex.

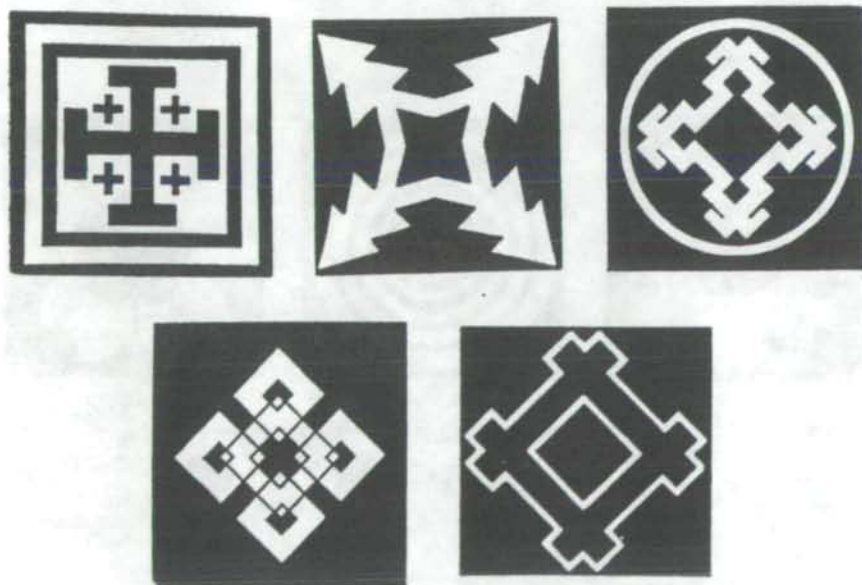


FIG. 1. Rectangular variant

FACTORS DETERMINING AESTHETIC PREFERENCES

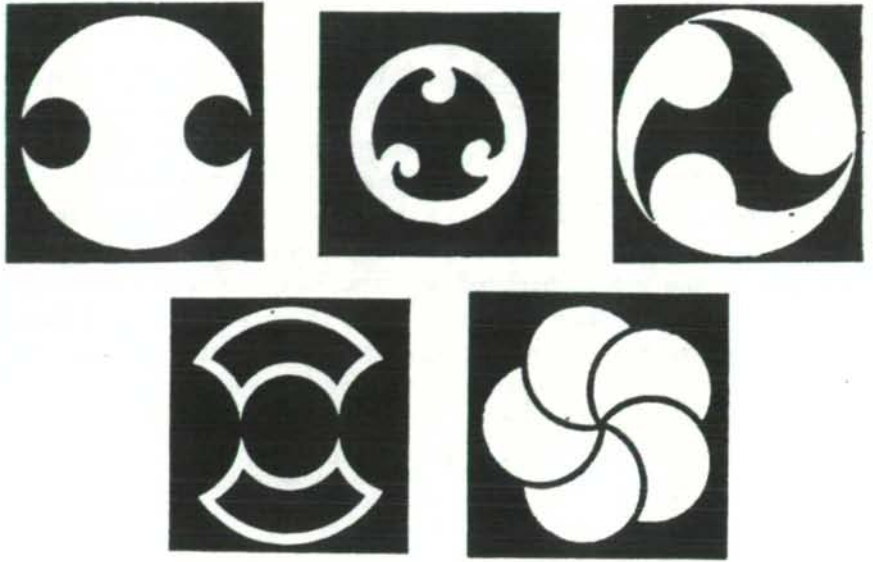


FIG. 2. Circular variant

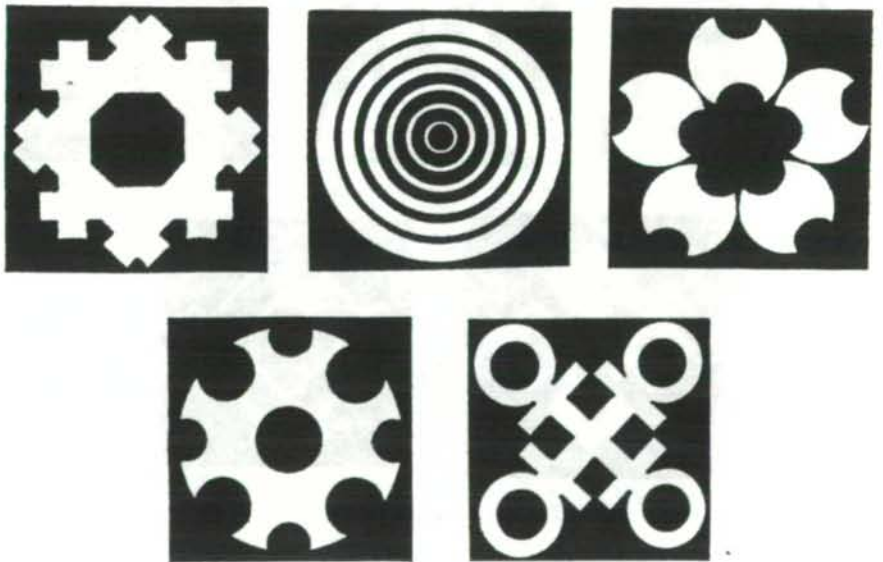


FIG. 3. Ring variant

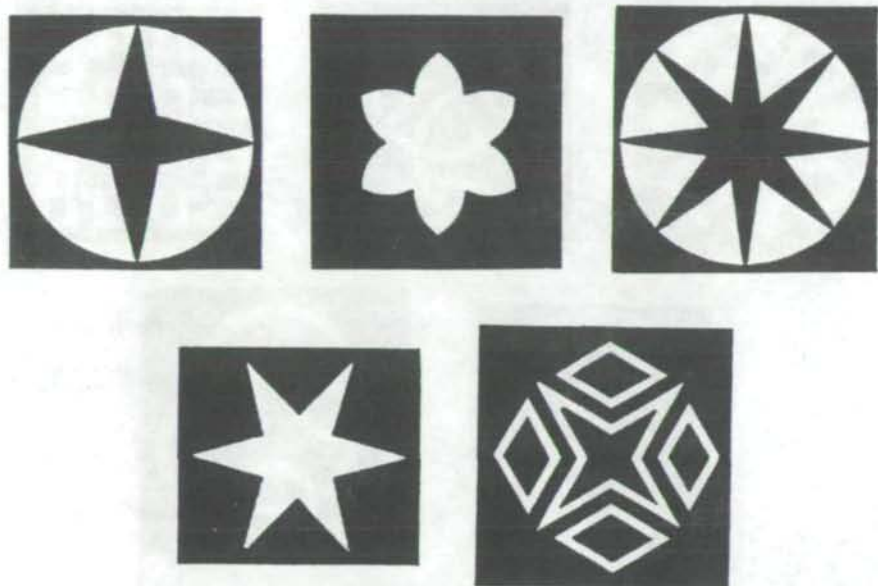


FIG. 4. Star variant

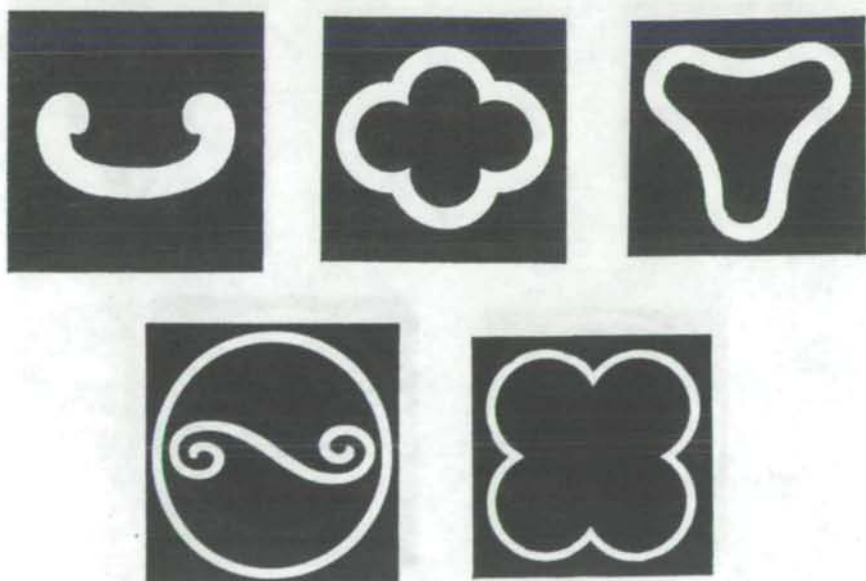


FIG. 5. Curved variant

FACTORS DETERMINING AESTHETIC PREFERENCES

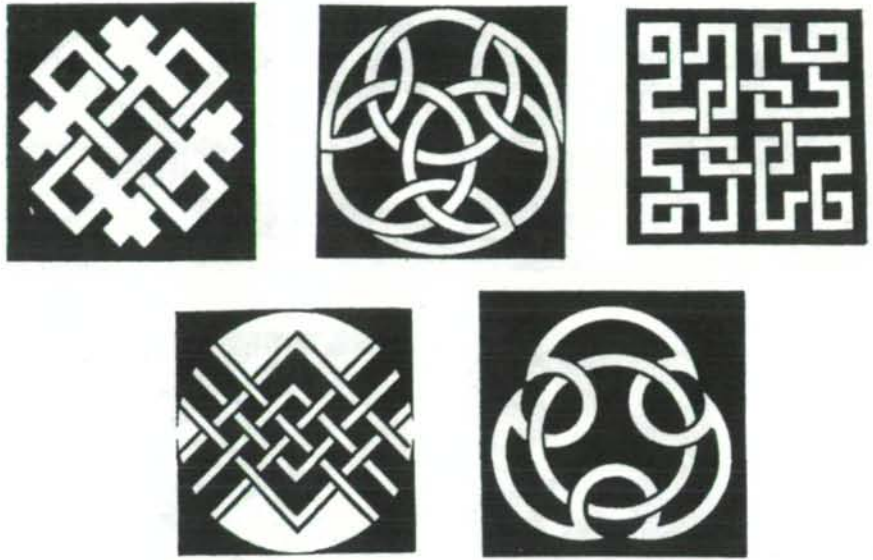


FIG. 6. Interlacement variant

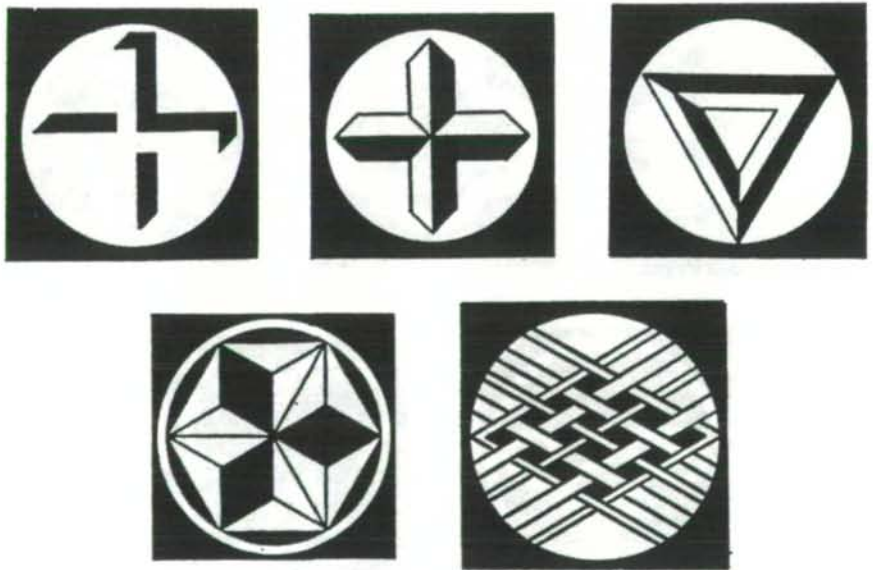


FIG. 7. Shading variant

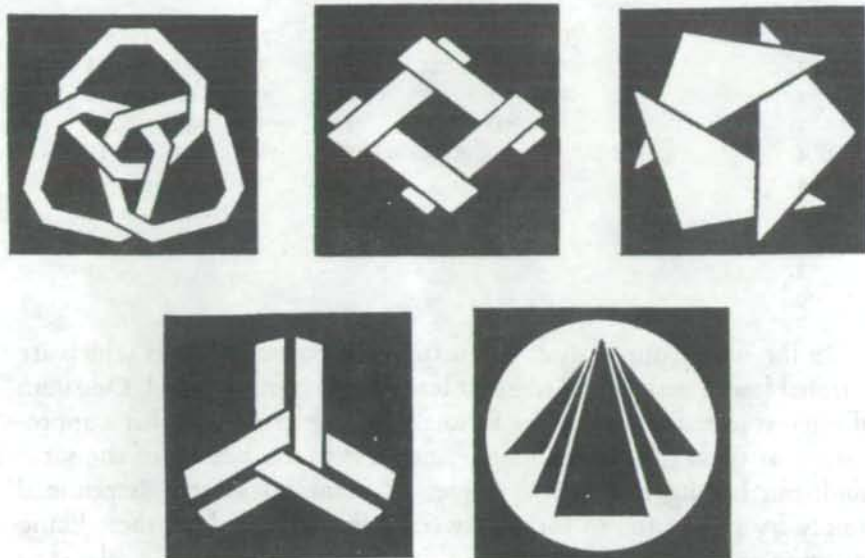


FIG. 8. Three-dimensional variant

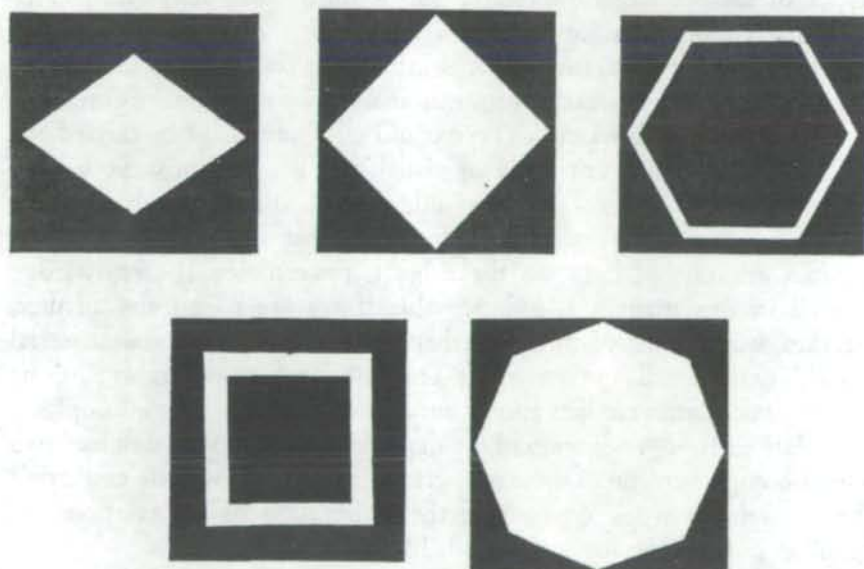


FIG. 9. Order or simplicity factor

FACTORS DETERMINING AESTHETIC PREFERENCES

TABLE I

1	2	3	4	5	6	7	8	9
1.	-.04	.00	.24	.21	.23	.27	.25	-.12
2.		.08	.23	.17	.21	.04	.08	.09
3.			.00	.09	.32	-.11	.33	.03
4.				.15	.12	-.05	.11	-.18
5.					-.01	.18	.08	.26
6.						.07	.40	-.14
7.							.00	.29
8.								.01
9.								

On the whole our analysis seems to have produced results which are reasonable and make good sense, at least on the intuitive level. One item of interest seems to be that the factors which determine aesthetic appreciation of these geometric designs and devices are not all of the same kind, but belong to different universes. Some are clearly determined simply by similarities in form between one design and another; liking for one rectangle or one star or one circle is not unexpectedly related to liking for another rectangle or another star or another circle. But not all factors are of this stimulus-bound kind; shading, or 3-dimensional, or interlacement, are factors not related to the shape of the stimulus but rather to higher-order properties affecting its presentation. To these two types of factors we must clearly add a third; simplicity-complexity differs from both the kinds of factor previously mentioned. Thus we have three types of factor, and it is interesting to note that these three types emerge just as clearly from our analyses of polygonal figures.

It seems that analyses of this type could with advantage be carried out on many more different types of visual stimuli; we know very little about the bases of our aesthetic judgements, and although a purely descriptive type of investigation like the present one can only throw a limited amount of light on the subject, nevertheless the knowledge gained in this manner is indispensable if we are to go any further. Studies with more complex, perhaps even representational material would undoubtedly advance our understanding considerably; at the moment aesthetics consists almost entirely of unsupported philosophical speculation. It does not seem likely that added speculations will lead to a better comprehension of these mysterious judgements we call 'aesthetic'; only empirical work devoted to the elaboration of the relationships implied in the judgement process is likely to do that.

4. GENERAL PREFERENCE FACTORS

The factors looked at so far suggest that aesthetic preferences for de-

signs are in part determined by various properties of the stimuli. Such an analysis does not deal with one of the most interesting properties of the score matrix, namely the fact that there is overall agreement between individuals in their ratings (Eysenck, 1940). In the paper quoted I suggested that one might actually use the agreement a person showed with the rest of the judges as his 'score'; alternatively, one might correlate his ratings with the average of all the other raters and thus obtain a score indicative of his 'conformity'. (These two methods of analysis are for most purposes statistically equivalent.) Going one step further, I suggested that possibly this 'conformity' might transcend the limitations of one particular test, and that people who showed this trait on one test might also show it on another, using quite different types of stimuli. The results of testing this hypothesis empirically supported it quite strongly, and I suggested that possibly we might here be dealing with some underlying aesthetic ability, or 'good taste', demonstrated in all sorts of visual preference judgements and independent of intelligence, training and other external factors. I have discussed the evidence for this notion elsewhere, as well as the precautions which have to be taken before an experiment can be assumed to furnish us with relevant evidence on this point (Eysenck, 1957).

It seemed worth while to investigate this point in relation to the data collected in this experiment. In addition to the results from the ratings for the designs, the same subjects had also rated, in the same manner, 135 polygons, specially drawn for the purpose; the mean liking for the polygons was 2.16, which is significantly lower than the liking for the designs (2.58). (These polygons are similar to, but not identical with, those published in Birkhoff's book (1932) and experimented with by the writer on previous occasions, *e.g.* 1968). A mean order of rating was determined for both polygons and designs, and individual sets of ratings correlated with these mean ratings, thus giving for each subject two scores, representing his agreement with the mean order of polygons (score 1) and with the mean order of designs (score 2). These scores, being made up of correlations, require to be transformed into their inverse hyperbolic tangents in order to make them properly comparable, and this transformation was carried out. The transformed scores showed a distribution not deviating markedly from a Gaussian one, and justified the calculation of a product-moment correlation between them; this was found to amount to $r = 0.525$. This figure demonstrates at a high level of statistical significance that a person showing 'conformity' or 'taste' on one test does so also on the other, while a person lacking in this quality on one test is also found lacking on the other. The results thus seem to support our hypothesis, although of course the interpretation of the

FACTORS DETERMINING AESTHETIC PREFERENCES

results in terms of aesthetic sensitivity is open to objections discussed in some detail elsewhere (Eysenck, 1957).

It may be interesting to contrast the 12 most liked designs and the 12 least liked; in this way certain generalizations might be suggested regarding the formal properties of visually pleasing figures. Figures 10 and 11 show the two sets of designs. They may be used to test the two major quantitative hypotheses proposed for an 'aesthetic formula'. Birkhoff (1932) suggested the formula: $M = O/C$, *i.e.* the aesthetic pleasure derived from a visual percept (M) is a direct function of its order elements (symmetry, right angles, equal sides, etc.) and an inverse function of its complexity (number of sides, number of re-entrant angles, etc.). Eysenck (1941a) suggested that the formula: $M = O \times C$ would represent experimental results better, as well as being in better agreement with aesthetic theory. No exact test can be made of these two formulations as far as our two figures are concerned, but it will be clear from simple inspection that the better-liked designs are much more complex, thus giving a direct, and not an inverse relationship between M and C , as required by my own formula. This is in good agreement with results obtained with other types of stimuli on previous occasions.

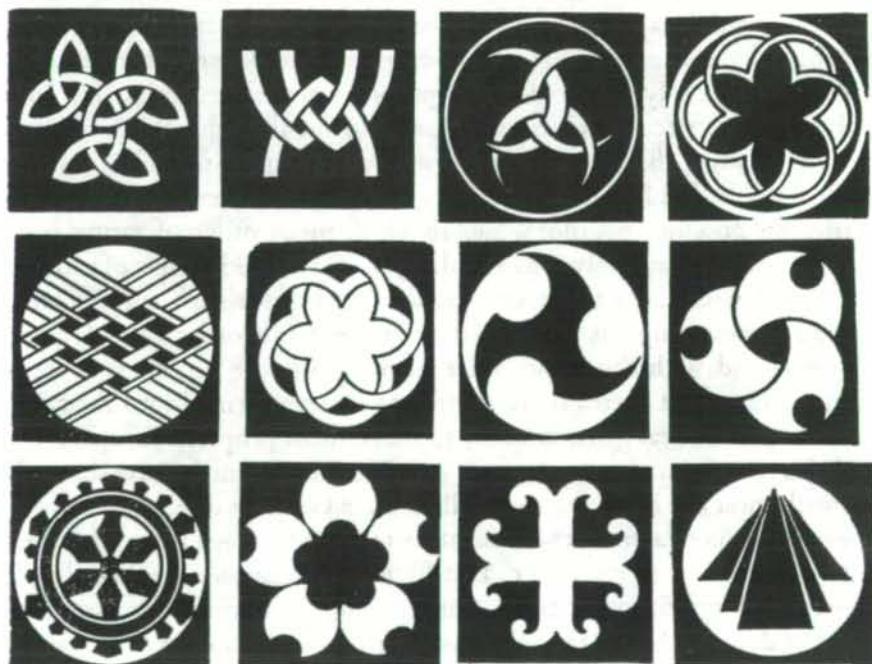


FIG. 10. Best-liked dozen designs

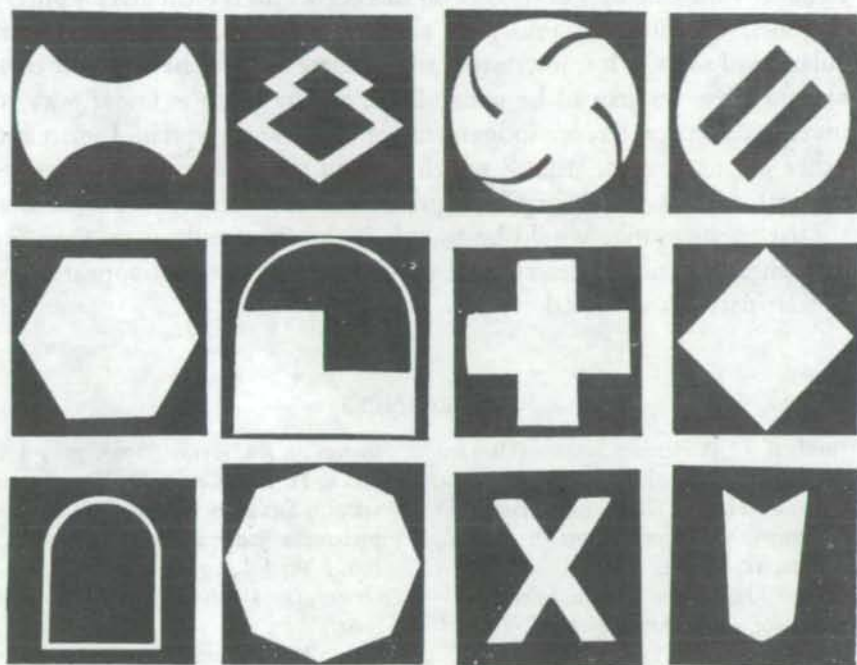


FIG. 11. Least-liked dozen designs

5. DISCUSSION

The data here collected and analysed do not require much discussion; they demonstrate the usefulness of empirical research into the bases of our aesthetic judgements, and illustrate the possibility of formulating tentative hypotheses in this field. Questions will no doubt be raised with respect to such points as the possible differences which artistic training might make to ratings such as those analysed here. Previous work (Eysenck & Castle, 1970) suggest that for the most part training in art makes very little difference for preferences of the kind here studied; the only source of difference was with respect to a small sub-set of stimuli where art-trained subjects preferred the simple, as opposed to the complex figures, while lay subjects showed preferences in the opposite direction. Further work is required to show whether this difference is due to specific teaching received by art students, or whether it is already characteristic of such students before they join art school. With this proviso, aesthetic judgements within our particular culture pattern appear to be governed by certain general rules to which individuals adhere with a greater or lesser degree of conformity. Whether we agree

FACTORS DETERMINING AESTHETIC PREFERENCES

to bestow the title of 'good taste' on this consensus is ultimately a purely linguistic question; obviously no absolute value adheres to any particular set of ratings. It is interesting to speculate how far beyond our own culture these results can be generalized, and research is under way to investigate the preference judgements of Japanese, Egyptian, Indian and other subjects for the stimuli which formed the basis of the present investigation. On the theory here presented, it would be expected that similar mean ratings would be found; if this were indeed so, then the hypothesis of culture-determined judgement bases would appear to be at least partly invalidated.

REFERENCES

- Birkhoff, G. P. *Aesthetic measure* (Harvard Univ. Press, 1932).
- Eysenck, H. J. 'The general factor in aesthetic judgements', *Brit. J. Psychol.*, 1940, 31, 94-102.
- Eysenck, H. J. 'The empirical determination of an aesthetic formula', *Psychol. Rev.*, 1941a, 48, 83-92.
- Eysenck, H. J. '"Type" factors in aesthetic judgements', *Brit. J. Psychol.*, 1941b, 31, 262-270.
- Eysenck, H. J. 'The psychology of aesthetics'. In: *Uses and Abuses in Psychology* (Penguin Books, 1957).
- Eysenck, H. J. 'An experimental study of aesthetic preference for polygonal figures', *J. gen. Psychol.*, 1968, 79, 3-17.
- Eysenck, H. J. & Castle, M. 'Training in art as a factor in the determination of preference judgements for polygons', *Brit. J. Psychol.*, 1970, 61, 65-81.
- Fechner, G. I. *Vorschule der Aesthetik* (1897).
- Fritzky, F. J. 'Aesthetic preference for abstract designs as a function of their perceived complexity', *Educ. Testing Ser. Bull.*, 1963, 27, 1-41.
- Hornung, C. P. *Handbook of designs and devices* (1932).
- Vitz, O. 'Preference for different amounts of visual complexity', *Behav. Sci.*, 1966, 11, 105-114.