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A RESULT IN VISUAL AESTHETICS

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Subjects were given eight forms and asked to sort them in a number of ways on the basis of overall similarity; they were also asked to state the order of their preferences among the forms. From the data generated, four tentative results emerged:

(1) By giving ourselves an appropriate verbal set, we can make ourselves see (and categorize) a group of forms in many different ways. It appears, however, that there is a natural way of categorizing them which is independent of any verbal set, and which depends on the formation of visual non-verbal concepts.

(2) Preference for the forms is dependent on the way the forms are seen—on the visual similarity dimensions. But the dependence is incomplete. It might perhaps be better called a linkage—comparable to the linkage between hue and brightness.

(3) The peculiarly weak nature of this linkage suggests the hypothesis that the beauty of a form cannot be explained in terms of any visible qualities or attributes that it has, but only in terms of the operations performed in the brain of the observer.

(4) Aesthetic discrimination is independent of all other kinds of perceptual discrimination.

I. Introduction

The way in which we look at things lies at the heart of visual aesthetics.

It is possible to look at a form in many different ways. We look at different aspects of the form—or we look for different things in the form. We may notice its plasticity, its movement, its simplicity, or any of a hundred other characteristics—characteristics that we can concentrate on one at a time.

To look at a form in a certain 'way' is to pay attention to (or to look at) a particular characteristic of the form. Now, we can set ourselves to look at any characteristic we wish. But what if we do not set ourselves deliberately at all? How do we look then? This is the problem we are interested in. We wish to find out:

(1) the 'ways' in which a subject naturally looks at forms;

(2) whether there is a connexion between his liking for the forms and the ways in which he looks at them;

(3) if there is such a connexion, its nature.

For the vague notion of a 'way' we shall substitute one more suitable for operational definition and analysis: the two-ended dimension. The situations where a subject pays attention to the plasticity, the movement, the simplicity of a form, we shall describe by saying that he is using the dimensions 'plastic-flat', 'dynamic-static', 'simple-complex'.

The first problem, then, is to find out which dimensions best describe the way a subject looks at forms. We could try several techniques.

(1) We might ask him to say which characteristics of the forms he paid attention to. And this would involve his stating, *in words*, the dimensions he believed himself to use. We could call them his introspective dimensions.

(2) We might present him with a long list of dimensions (plastic-flat, dynamic-static, simple-complex, open-closed, and many others), and ask him to place a number of forms on each of them (according to their plasticity, their movement, their sim-

plicity, their degree of closure, and so on). The semantic space set up by these dimensions could be factored and redefined in terms of a minimal set of dimensions (Osgood *et al.*, 1957; Tucker, 1955), which might then be said to describe the way the subject looked at the forms.

(3) More subtly still, we might use the following procedure, known as the method of triads. Three forms are shown to the subject, and he is asked which two are most alike. He is then asked to say in what respects the two are alike, and how the third one differs from them (Kelly, 1955). After he has given such answers for a number of triads we can see which aspects of the forms he pays most attention to when making his judgements, so we can construct (using, if possible, words that the subject himself has used) a set of dimensions that describe the way he looks at things (Henderson, Kates & Rohwer, 1959).

Yet all these methods are verbal ones—attempts made to fit verbal categories to visual phenomena. And while this is by no means impossible (it has been done with some success by critics, after all), there is a good deal of evidence to show that such attempts cannot get to the 'heart' of visual aesthetics.

Before we see why this is so, in full, let us consider a single incident that occurred during a triad experiment. A 12-year old girl was shown a Canaletto view of St Mark's Square, a Guardi view of the Grand Canal, and a line drawing of a single boat by Corot (all on postcards). Immediately she put the Venetians together as the two that were most alike—they were in fact extremely similar. But suddenly she remembered that she had to explain why or in what respects they were alike. And promptly she changed her mind, put the Guardi and the Corot together, and said, 'Those two, they've both got boats on them'. Visually this pairing was ridiculous. She had been forced by the demands of the experiment to group them in a way she had a word for. The distinguishing quality of the Venetian paintings was too hard for her to explain, though she could see it very well.

It is held by some psychologists that all our seeing is based on verbal categories (Brown, 1956; Whorf, 1941). That we only see what we have words for, that there is no visual concept formation, only verbal. And such a psychologist would say of the child, 'She actually saw like that; she saw in terms of the words she knew'.

We shall be able to show later that this view is false. That we can see independently of the words we know. For the present we shall simply remember that the child's *first* instinct was to put the Venetian paintings together.

Every experiment in visual aesthetics that deals with words is handicapped. People will not respond according to what they see, but according to the hopelessly inadequate vocabulary they have. And the results will be, just as the above one was, quite valueless from the point of view of visual aesthetics. If we are to achieve interesting results, we must let the subjects use their eyes. We must collect data which reflect only visual behaviour: we must find out the ways in which someone sees without letting him consider even, the words that described his ways of seeing.

II. THE EXPERIMENT

(1) *Stimuli*

The stimuli were 3 × 5 in. white filing cards, each with a single form drawn on it in black ink. About fifty forms were drawn quickly and freely; eight were then chosen from them. They were

chosen for their mutual similarity, for their obviously set-like character, for the fact that they were variants on one another 'in several different directions'. The forms were named, at random, A, B, C, D, E, F, G, H (see Fig. 1). At no point of the experiment was the subject told the names of any of the forms—in case the names led him to make decisions on grounds connected with the letters. Subjects sometimes asked to see the forms upside down and from different angles. This was forbidden. If the subjects had seen the forms from several angles they might have noticed new aspects that would have led them to look at the forms in changed ways when it came to the experiment.

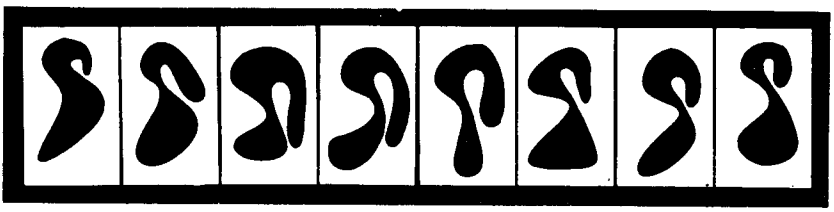

Fig. 1. The stimuli A, B, C, D, E, F, G, H.

(2) *Subjects*

There were six subjects, all well educated, all used to looking at things for pleasure, all between 20 and 30, three men and three women.

(3) *Procedure*

Two of the eight cards were chosen at random by the experimenter. They were laid in front of the subject, on a neutral ground. (The decision as to which card should go to the right and which to the left, was also made at random, and noted. During the repeat of the experiment, 24 hr. later, the pair was presented the opposite way round.) The remaining six cards were given to the subject, with the following instructions:

'Look at the six cards in your hand one by one, comparing them with the two cards on the table. For each one you must decide whether it looks more like the right hand or the left hand of the pair on the table. When you have decided, lay it on the table too, to the right or the left, according to the similarity you have observed.' (As the cards were laid down, they were kept at some distance from the pair already there; so that there should be no effects of visual proximity which might prejudice other decisions.) 'When you have placed all six cards in this way, make a check. If you wish to change your mind about any of them you may do so. You are under no compulsion to split the cards evenly; sometimes you may even want to put all six on the same side. Let it depend only on your feelings about the similarity of the forms.'

It was repeatedly made clear to the subject that he should try to be visually naïve, and should avoid making decisions on intellectual grounds. 'In the more difficult cases you will find yourself thinking hard about the decision. You may even feel that you could put a card on one side according to one criterion and on the other side according to some other criterion. If this does happen, stop thinking about it at once. Look away. When you look back, remember you are doing it on overall similarity, because forms look or feel alike. Forget that you are involved in an experiment, and imagine that an acquaintance has suddenly asked you, quite informally, "Which one does this look more alike?" Decide quickly; just like that.'

The visual interaction of some of the forms, when they were seen close together, seemed to have a disturbing effect also. To avoid it, where X and Y were forms on the table, and O one of the six forms being matched against them, subjects were given this instruction: 'O is to be compared with only one of X and Y at a time. Thus, while you look at O and X, keep Y covered. And when you look at O and Y, cover X. You are thus always looking at a pair, (O, X) or (O, Y). And you are to decide which

makes the "closer" pair, (O, X) or (O, Y).' What was in fact being investigated here was the relation between a number of perceptual distances. If the subject found O more like X than Y, we may express this by saying that, for him, O is nearer to X than it is to Y; the perceptual distance OX is smaller than the distance OY.

As a further precaution the subject was asked never to put two cards really close together, but to keep several inches between them. When cards are very close to one another, the shape of the white between the two black forms becomes very important to the eye—and may upset the judgements made.

After the subject had made his six decisions they were written down like this:

X	Y
O	O
O	O
	O
	O

The subject went through this sorting procedure for each possible pair, i.e. twenty-eight times. The session took between an hour and an hour and a half. Twenty-four hours later all twenty-eight were repeated, in a different order, and with the pairs laid on the table which ever way round they had not been on the first occasion.

Subjects were quite often not consistent. For those cards which were placed in the pile they had been in 24 hr. before, the results were accepted, since here the subject seemed fairly certain, and there was very little doubt about his feelings on the matter. For those cards which were put in the pile they had not been in the first time, however, a closer scrutiny was necessary. Such inconsistency might have been caused in one of three ways.

(1) The most important cause, undoubtedly, lay in the very way the similarity judgements were made. It may be more likely that a subject puts O with X than that he puts it with Y. But if the decision is a hard one, as it often was, we shall at best observe this greater likelihood as a greater frequency. He will put O with X more often than with Y. And this can lead us to say that OX is smaller than OY by a narrow margin. (If the frequency turned out to be 50–50, we should have to call these two perceptual distances equal.) So if the subject put a card first in one pile, and then in the other, he was asked to sort it yet again—at once; and then again. Until it was clear which pile better pictured his feelings on the matter. (Each time he resorted it, the cards were rearranged so that he should not remember what he had done before.)

(2) The second possible reason for a subject's inconsistency lies in the arrangement on the table. The subject may be inclined to put cards to one side of his body rather than the other. Normally this factor will cancel out in the end, under the constant rearrangement. But if there is a card which he puts always to the same side, regardless of which pile lies on that side, one must assume him to be indifferent to the choice between piles and governed only by his left–right preference; and the perceptual distances will have to be taken as equal. (In all the experiments conducted, this happened only twice.)

(3) Thirdly, he may appear inconsistent because during the first time through he was unfamiliar with the cards, and has changed his mind now that he knows them better. This seemed to be the case a good deal of the time; during the second session

the subject was much surer of his attitude towards the cards than during the first. Where this was so, further sorting tended to support the subject's second decision rather than his first.

It is interesting to note that while subjects disagreed widely in their sorting on the first time through, there was strong agreement about the final versions. This suggests that the subject settled down gradually to his balanced judgement; and, what is more, it suggests that this balanced judgement corresponds only to stimulus characteristics, and independent of the particular subject whose judgement it is. Perhaps, if one were to stretch the experiment out even further, and let subjects settle down to their opinions still more slowly, we should find still greater agreement.

During the second session the subject was given a further task. Each time he finished with a pair, he was asked which member of the pair he preferred. Every subject thus made twenty-eight paired comparisons—which generated an order of preference over the eight cards. It was done during the second session only, so that the subject should be thoroughly familiar with the forms by the time he came to state his preferences. (In every case but one these paired comparisons were quite consistent and led to no intransitivities. The one subject (no. 7) who did produce intransitive results also produced very odd similarity data. He found all the tasks difficult, and said he could only do them on a consciously intellectual basis. His data have therefore not been included in the results of the experiment.)

Subjects were asked to make their preference judgements on grounds of shape alone —not to pay attention to associative overtones, but to judge the shape purely as a shape. Of course, they were not able to do this. The considerable disagreement illustrates this quite clearly. One always reads forms in a certain way. But they were trying to do it *this* way; and their judgements were governed by the feeling for form as much as possible.

Finally, when the whole experiment was over, the concept of a dimension was explained to the subject (though no specific cards were mentioned as illustrations, in case they biased his answer). The cards were now laid out in front of him, in random order, and he was asked what he thought he had been using as the bases for his similarity decisions, in spite of the fact that, at the time, he had been asked expressly to use no bases, principles, or criteria.

Each basis he gave—like longnose–shortnose—he was asked to illustrate with the most extreme examples. Thus he would be asked to point to the form with the longest nose and to that with the shortest. He was giving here his introspective dimensions; and most subjects gave three or four.

III. Tabulation and analysis of data

For each subject we now have the following data:

(1) Twenty-eight tables of the form

C	E
D	A
F	B
	G
	H

(2) A preference order generated by paired comparisons.

(3) A list of introspective dimensions given by the subject to account for his sorting behaviour.

Each table like

C	E
D	A
F	B
	G
	H

is in fact a condensed statement of six inequalities among the perceptual distances: for since F is put under C rather than under E, the table indicates that CF < EF; and five other facts of the same kind. Similarly the tables

C	F
B	A
D	G
E	H

and

E	F
C	A
D	B
G	H

tell us that CE < EF and CE < CF. We may combine the three inequalities to give CE < CF < EF. (When it happened—as it did about once for every subject—that the three inequalities were inconsistent, then one of them was reversed; whichever one the subject had been most uncertain of, whichever one he had changed his mind about most often.) The statement CE < CF < EF tells us that in the triad CEF the perceptual distance EF is the greatest of the three, so we write the triad ECF. The position of C between E and F is most important and will be referred to as this triad's betweenness.

Our data give us betweenness information of this kind for every one of the fifty-six triads; and for every subject (see Fig. 2). As has been shown in a recent paper (Hays, 1959; summarized in Coombs, 1958), this information as to betweenness may be used to generate orders which are closely similar to the dimensions obtained in factor analysis. (Factor analysis itself is not possible since there are no cardinal data available.) The following is a brief outline of the procedure used to generate these 'dimensions'. It is to be found, in full, together with its mathematical justification, in the papers mentioned. It is of course carried out separately for each subject's data.

(1) Select, by inspection of the data, that pair which seems to be most dissimilar (where the perceptual distance is the greatest), and use this pair as end-points of the first dimension.

(2) Order the remaining six letters between these end-points so as to accommodate as many of the fifty-six triads as possible. That is to say, construct that order which preserves betweenness for as many of the triads as possible.

(3) Repeat the above procedure for those triads not accommodated by the first dimension. If these are not enough to define a second dimension uniquely, construct that one which overlaps the first as little as possible. (It is inevitable, in spite of this, that there will be some triads whose betweenness is satisfied on both dimensions.)

In principle the extraction of dimensions should go on in this way until all the triads have been accommodated. But, in fact, no more than two dimensions were ever needed. All the triads, bar one or two, were accommodated by the first two

Triad	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Subject 6
ABC	ABC	ABC	ABC	ABC	ABC	ABC
ABD	ABD	ABD	ABD	ABD	ABD	ABD
ABE	ABE	ABE	ABE	ABE	ABE	ABE
ABF	AFB	ABF	AFB	ABF	AFB	ABF
ABG	ABG	AGB	AGB	AGB	AGB	AGB
ABH	ABH	ABH	ABH	ABH	AHB	ABH
ACD	ADC	ADC	ADC	ADC	ACD	ADC
ACE	AEC	ACE	ACE	AEC	AEC	AEC
ACF	AFC	AFC	AFC	AFC	AFC	AFC
ACG	AGC	AGC	AGC	AGC	AGC	AGC
ACH	AHC	AHC	AHC	AHC	AHC	AHC
ADE	ADE	ADE	ADE	ADE	AED	ADE
ADF	ADF	ADF	AFD	AFD	AFD	AFD
ADG	AGD	AGD	AGD	AGD	AGD	AGD
ADH	ADH	AHD	AHD	AHD	AHD	AHD
AEF	AFE	EAF	AFE	AFE	AFE	AFE
AEG	AGE	AGE	AGE	AGE	AGE	AGE
AEH	AHE	AHE	AHE	AHE	AHE	AHE
AFG	AGF	AGF	AGF	AGF	AFG	AGF
AFH	AHF	AHF	AHF	AFH	AFH	AFH
AGH	AGH	AGH	AHG	AGH	AHG	AGH
BCD	BDC	BCD	BDC	BDC	BCD	BDC
BCE	BEC	BCE	BEC	BEC	BEC	BEC
BCF	BFC	BCF	BFC	BFC	CBF	BFC
BCG	BGC	CBG	CBG	BGC	BGC	CBG
BCH	BHC	BCH	CBH	BHC	CBH	CBH
BDE	BDE	BDE	BDE	BED	BED	BDE
BDF	BDF	DBF	DBF	DBF	DBF	DBF
BDG	BDG	BGD	DBG	BGD	DBG	BDG
BDH	DBH	DBH	DBH	DBH	DBH	BDH
BEF	BFE	EBF	EBF	EBF	EBF	BFE
BEG	BGE	BGE	EBG	EBG	EBG	BGE
BEH	BHE	EBH	EBH	BHE	EBH	BHE
BFG	BGF	FBG	BGF	BGF	FBG	BGF
BFH	BFH	BHF	BHF	BHF	FBH	BFH
BGH	GBH	BHG	BGH	BGH	BHG	BHG
CDE	CED	DCE	CDE	CDE	CDE	DCE
CDF	DCF	DCF	DCF	DCF	DCF	DCF
CDG	CDG	CDG	DCG	CDG	CDG	CDG
CDH	DCH	DCH	CDH	CDH	DCH	DCH
CEF	CEF	ECF	ECF	ECF	ECF	ECF
CEG	CEG	ECG	ECG	CEG	CEG	CEG
CEH	CEH	ECH	ECH	ECH	CEH	CEH
CFG	CFG	FCG	CFG	CFG	CFG	CFG
CFH	FCH	CHF	CFH	CFH	CHF	CHF
CGH	CHG	CHG	CGH	CHG	CGH	CGH
DEF	DEF	EDF	EDF	EDF	DEF	EDF
DEG	EDG	EDG	EDG	EDG	DEG	DGE
DEH	EDH	EDH	EDH	DEH	DEH	DEH
DFG	DGF	DGF	DGF	DGF	DGF	DGF
DFH	DFH	DHF	DHF	DFH	DHF	DHF
DGH	GDH	DGH	DGH	DGH	DGH	DGH
EFG	EFG	EGF	EGF	EGF	EGF	EGF
EFH	EFH	EHF	EFH	EHF	EHF	EHF
EGH	EHG	EGH	EGH	EHG	EGH	EHG
FGH	GFH	FHG	FGH	FGH	FHG	FHG

Fig. 2

dimensions extracted.* The dimensions are tabulated in Fig. 3. In Figs. 4*a* and 4*b* we have a visual presentation of the same material. Fig. 4*a* contains the six subjects' first dimensions, and 4*b* their second ones.

As we can see, the subject to subject agreement as to these dimensions is very high. The coefficient of concordance (Kendall, 1948) is 0·81 for the first dimension, and 0·65 for the second. Both these are above the 0·1 % level of significance. Since the agreement is so good, the modal dimensions are illustrated, for interest's sake, in Fig. 5. These are the principal 'ways' in which the average subject looked at the eight forms shown to him.

Subject	Dimension 1	Dimension 2	Introspective dimensions (in the order they were given)	Preference order
Subject 1	ABGDHFEC	EDGCBFH*	F–B Balanced—likely to topple F–H Sharp—round F–A Masculine—feminine B–A With weight—without weight F–D Pointing left—pointing right	CADGEBFH
Subject 2	ABFGHDCE	EADGBCHF	D–F Thin, linear—fat, solid H–F Round—angular C–A Long nose—short nose	HGAFEBDC
Subject 3	AHGFBCDE	ABDEGHFC	E–A Open—closed A–F Bird—snake F–E Solid—tottery	BGHFDCEA
Subject 4	ABGHFEDC	EDBGACHF	A–H Angular—round H–F Vertical—slanted G–A Indented—not indented	GCAHDEBF
Subject 5	AFHGBECD	ECDFBHG*	B–A Round—angular H–E Shaped—straight tail A–D Can't give it a name E–B Linear—triangular	DBCEGHFA
Subject 6	AGBFHDEC	BDCGEHF*	D–F Moving—massive base F–E Indented on the left—not indented E–F Unstable—stable	HDCBFGEA

* For three subjects the first dimension accommodated all triads containing A. In these cases the second dimension does not contain A.

Fig. 3

The thing that strikes us immediately about them is that they are almost impossible to name. We can describe them laboriously, of course, e.g. saying of the first one that the nose becomes less tiny and grows stronger, that the tail becomes less sharp and better formed, that the body becomes less slanted and more vertical, and of the second that there is a change from hanging to standing, that the form becomes less long and thin, and fuller-bodied, that there is a progressive change from instability to stability. But although we can *see* what is happening, as though a piece of rubber were being deformed, step by step, our words are hardly adequate.

The fact that we have only imprecise words for what we see here, is most important, since it brings us back to the point first mentioned in the introduction: that people

* Among the very few triads not accommodated by the first two dimensions, one or two are even inconsistent—Subject 1's AFB, for instance. Probably these minor vagaries are the result of the subject's indecision already discussed, and would be smoothed out if the subject were given still longer opportunity to reach consistent choices.

do not see only in terms of the words they have for a situation. Compare the introspective dimensions offered by the subjects, with the similarity dimensions we have extracted to describe what they actually did (Fig. 3). As we see, the degree to which subjects were verbally aware of what they were doing with their eyes and hands, is very limited. Moreover, while, as we have just seen, one subject's behaviour was

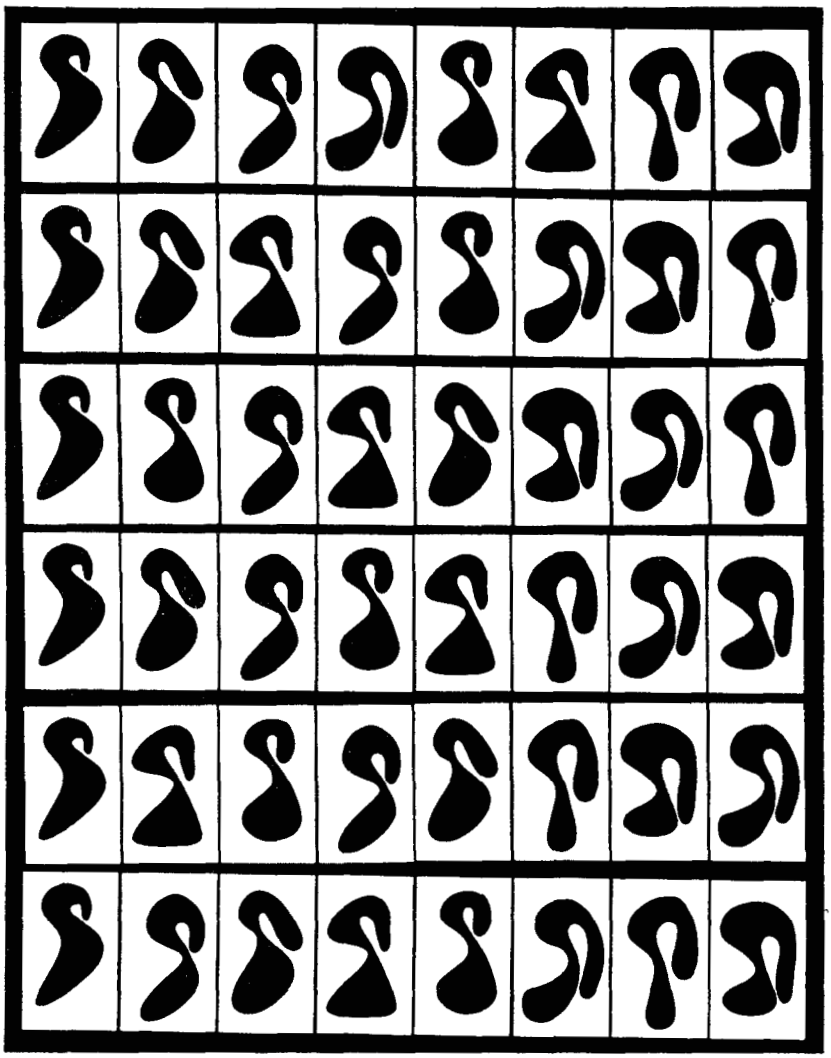

Fig. 4*a*. Dimension I for the six subjects.

much the same as another's, there is no such agreement from one subject to the next in the introspective dimensions offered. Indeed, these introspective dimensions seem to be irrelevant to the behaviour they were supposed to describe, They are connected, very certainly, with the subject's education, but unconnected, to any significant degree, with his visual behaviour.

Now for the central issue: to discover whether there is a connexion between a subject's liking for the forms and the ways in which he looks at them.

Preference orders generated by paired comparisons (the subjects' liking for the forms) are given in Fig. 3. Similarity dimensions (the subjects' ways of looking at the forms) are also given in Fig. 3. We shall test the possibility of a connexion in two different ways.

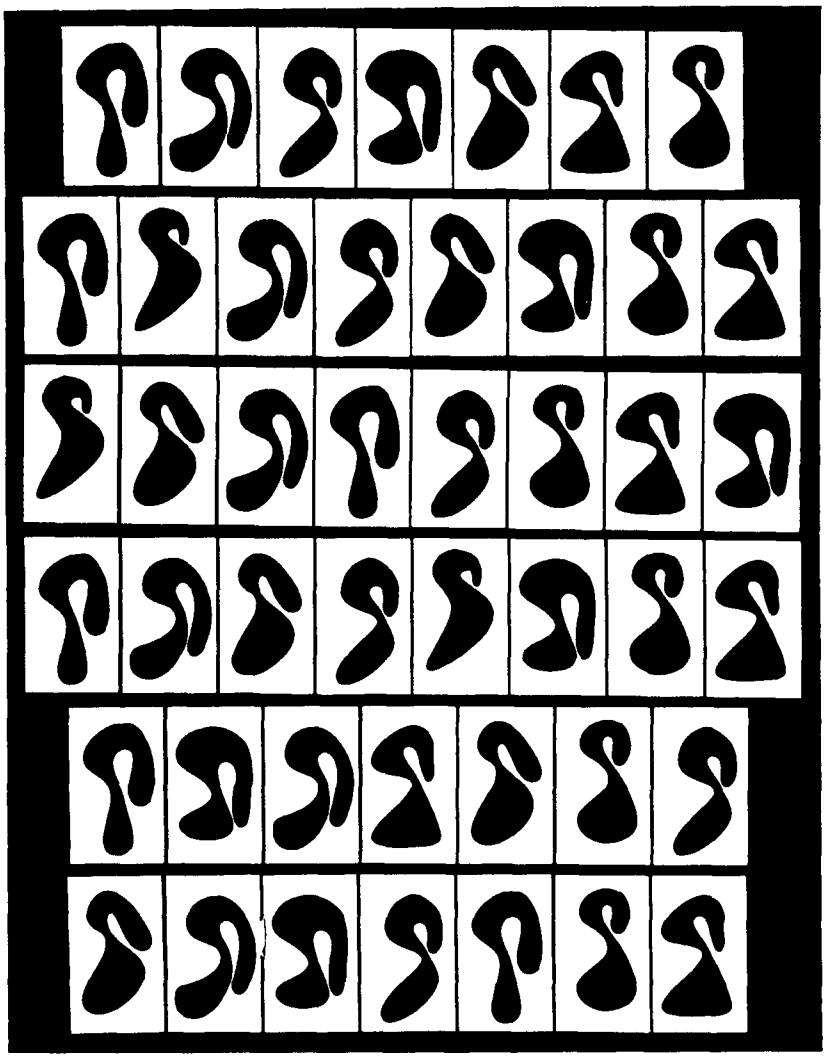

Fig. 4*b*. Dimension 2 for the six subjects.

(1) In the first test we shall examine each subject's preference order for its dependence on the similarity dimensions which describe that subject's behaviour. To do this we calculate the correlation between preference order and similarity dimensions. using the rank correlation coefficient τ (Kendall, 1948). These coefficients are presented in Fig. 6.

As we see, they are evenly distributed about zero, and only one (marked with a star) is above the 5 % level of significance. Since among twelve coefficients we should

expect about one to reach this level, the test, points to no connexion whatever between the preference orders and the similarity dimensions.

(2) The second test is a more stringent one. For each subject there are certain triads which satisfy betweenness on both his similarity dimensions. These are listed in Fig. 7. Consider any such triad XOY (attached to a specific subject). O lies between X and Y on both his similarity dimensions. That is to say, in whichever of the two ways (or in whatever combination of them) he looks at the three forms, O will be intermediate between X and Y.

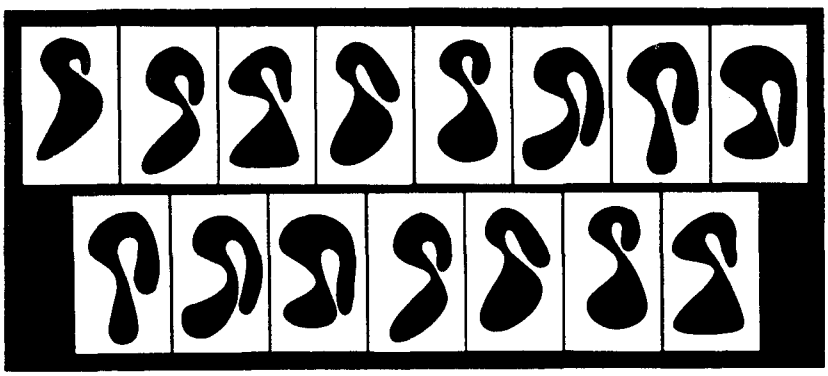

Fig. 5. Dimension 1 (modal); dimension 2 (modal).

Subject	Correlation of preference order with dimension 1	Correlation of preference order with dimension 2
Subject 1	0·00	+0·52
Subject 2	+0·29	−0·07
Subject 3	+0·14	0·00
Subject 4	0·00	0·00
Subject 5	−0·86*	+0·14
Subject 6	−0·36	+0·14

Fig. 6

If his preference order is positively connected with these dimensions, then, whatever the nature of the connexion, O should lie between X and Y on the preference order too.

In Fig. 7 we see how many of these triads do in fact satisfy betweenness on the preference orders: in all, ten out of fifty-nine. Now even if the triads were chosen at random we should expect a third of them to satisfy it; twenty out of fifty-nine, that is. So what do we make of our result? Certainly there is no positive connexion of the kind were were looking for. To establish that there would need to be twenty-seven out of fifty-nine for the 5% level of significance. We have a situation which is quite the reverse, since the number quoted is significantly *less* than random (chi-square indicates a 0·7% level of significance). This is a fact which demands explanation.

Subject	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Subject 6	
Triads satisfying betweenness on both similarity dimensions	BDE BGE CED EFH*	ABC* ABF ABH ADC AGC AGH* BDE BGD BGE ECF ECH CHF EDF EDG EDH DGF DHF EGF EHF	ABC ABD ABE AFC AGC AHC ADE AGF AHF BDE* BGH* CFG* CFH* DGH EGH	ABD ABE AGD AGE BGC BGF BHF BGH CDE*	CBH DBG* DBH* EBG EBH FHG*	BDC BDE CEH CHF DHF EHF	
Number of such triads	4	19	15	9	6	6	Total 59
Number of these triads satisfying betweenness on the preference dimension (marked above with an *)	1	2	4	1	3	0	10

Fig. 7

IV. DISCUSSION AND CONCLUSIONS

There are eight forms in the experiment. To account for a subject's sorting behaviour we therefore might need as many as seven dimensions—if his 'looking' were rich enough to involve seven ways at once. But we find that in every case two dimensions are enough to account for his entire behaviour. When asked to *say* how they looked at the forms, subjects all put forward more than two ways, it is true. But this belief in the subtlety of their looking must have been largely wishful thinking—for what they actually *did* could be described with only two dimensions.

There must be no misunderstanding at this point. The introspective dimensions offered by the subject are not meaningless. If he wants to, he can look at the forms in these ways—indeed, he *can* look at the forms in any way he pleases, for whatever verbal dimensions we make up he can set himself to place the forms along them (Osgood *et al.*, 1957). But what is essential is what he actually *did*. And what he did can be described with only two dimensions. If some third 'say' had been important to him, this fact would have been reflected in his sorting behaviour; and we should need a third dimension to account for it. (Very likely, if there had been more than eight forms, we should have needed more than two dimensions to describe his behaviour.) What is clear at any rate is that looking, as a process of categorization, is simpler than we think.

The dimensions that we extract are not verbal ones, but visual. They have no names and, directly, we cannot discuss them. But we can see them with our own eyes: we can see that something is changing from one end of the dimensions to the other, but we are hard put to it to give the 'something' a name. Often, in fact,there

are no ready words to describe the ways in which we look at forms. What about the subject's introspective dimensions—the ways in which he *thought* he had been looking at the forms? It turns out that although there is some agreement between these introspective (verbal) dimensions, and the visual ones we have extracted from his sorting behaviour, this agreement is very limited, a phenomenon which reminds us of the little girl and the Venetian paintings, but far more conclusive. We do not see only according to the way we think. On the contrary, we do not have words for what we do with our eyes.

We cannot describe our visual behaviour introspectively; and it seems that it makes good sense to refer to visual concepts which are non-verbal. What is more, while the subjects all have the same visual concepts, they have widely different verbal ones. They differ in their descriptions of their own seeing behaviour, even though the behaviour itself is much the same for all of them, a fact which does not speak well for the view that seeing is based on a learned net of language. On the contrary, the most plausible explanation is that we all share the same sort of perceptual apparatus, but have all been brought up differently, and have different words for similar visual phenomena. Our verbal concepts are largely personal—our visual ones are not.

It is one of the gifts of the great critic that, by coining words or putting old words to new uses, he can name dimensions we all use with our eyes but which we have not yet been able to name for oursleves (Wölfflin, 1915). And the painter's gift is greater still, for he makes us see (use) dimensions that we not only have no word for, but do not even know with our eyes.

Is there a connexion between a subject's liking for the forms, and the ways in which he looks at them? There is no significant correlation between the preference orders and the similarity dimensions. Nor do triads which satisfy betweenness on both similarity dimensions satisfy it on the preference dimensions, as they should if there were a positive connexion of any sort between them. We must say, therefore, that there is no positive connexion. However, the number of such triads satisfying betweenness on the preference dimension is smaller than we should expect from chance. It looks, indeed, as though a triad satisfying betweenness on both similarity dimensions will tend not to satisfy it on the preference dimension—a sort of negative interaction.

Perhaps we can illuminate this by restating it. Forms that lie at the centre of both similarity dimensions tend to lie toward the ends of the preference dimension. When a form lies at the centre of both our similarity dimensions we either like it or dislike it, but are not indifferent to it. We feel strongly about such a form. And conversely, forms at the ends of similarity dimensions tend to be neither especially beautiful, nor especially not so.

It is difficult to make much of this information. Art critics feel something similar, perhaps, when they say that a form containing divergent elements is particularly good if these elements are successfully unified, but if the contrast between them is not resolved, the form is particularly bad. Forms which lie at the centre of similarity dimensions may be said to contain diverging elements (namely, the two ends of the dimension). And the contrast between these elements will be resolved or unresolved, the form good or bad, but not indifferent.

So it appears that there is a connexion after all. Forms which lie at the centre of

both similarity dimensions tend to induce strong feelings in the subject. So much we can say. What we do not know, however, is whether these strong feelings will be favourable or unfavourable; whether the forms will be liked or disliked. While the similarities seen do restrict the preference order, they do not determine it. The preference dimension is dependent on the similarity dimensions—but the dependence is incomplete. It might, perhaps, be better called a linkage—comparable to the linkage between hue and brightness (yellows tend to be brighter than blues or reds, though hue and brightness are independent otherwise). It has been shown that attributes may often be linked to one another in very subtle ways, without being what we should normally call dependent (Stevens, 1934). In this case the weakness of the linkage is twofold:

(1) The connexion is not complete and would better be called a tendency.

(2) There is an ambiguity at the crucial point of the connexion, for we cannot predict whether the strong feeling induced will be liking or dislike.

It is well known that it is difficult to explain the beauty of forms, and that those explanations which *are* offered, are at best partial ones. Perhaps the difference we see between good forms and bad is essentially irreducible to any other differences we see, just as the difference we see between two hues of equal brightness and saturation is irreducible. For what does a successful explanation of visual quality depend upon? That our aesthetic discrimination can be made dependent on the other discriminations of which we are capable. That there is some unambiguous mapping from the other qualities our eyes allow us to pick out, onto the aesthetic one.

Yet the experiment suggests that just this is not the case. The mapping is many-many, or, as we put it, no more than a linkage. The aesthetic explanation it allows can be no more powerful therefore, than explanations of the difference between blue and yellow couched in terms of brightness could be.

This hypothesis puts no restriction on explanations which are possible in terms of experimental psychology or physiology. But it does suggest that explanations in terms of other visible qualities are essentially restricted by the weakness of the linkage.

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