DESIGN IN THEORY AND PRACTICE: A SERIES OF LESSONS: BY ERNEST A. BACHTLDER: NUMBER V

"Not all the mechanical or gaseous forces of the world or all the law of the universe will enable you either to see a color or draw a line without that singular force anciently called the soul."—Ruskin.

In the first problem of this series it was shown that the "spotting" or blocking in of a design, through contrasts of lights and darks, was a matter of first importance. It was made apparent that the darks were the result of a concentration of lines in certain portions of the design, and that the tone of these areas of dark could be lowered by bringing the lines into closer association or by increasing the widths of the lines. A graphic illustration of this is furnished in Fig. 23, three renderings of the same motif varying in tone. At the right is a little scale or ladder of five steps from black to white inclusive. From the middle step downward the blacks dominate; from the middle step upward the whites dominate. If you will examine this scale from a distance it will be noted that the effect is the same as if it were rendered in flat washes of gray paint.

This scale leads us to a definite discussion of the first questions involved in a study of tone relations. In the color box recommended for use will be found a neutral pigment commonly known as "charcoal gray." With this pigment and varying amounts of water it will be found that a gradation of tone can be made from the white of the paper to the deep black of the solid paint. It is necessary first of all to render this gradation of tone in a series of orderly steps. The distinct notes which the eye can discriminate will be found surprisingly few in number, probably not over twenty-five. It will simplify mat-
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ters, however, and will serve our purpose, to render a scale of five distinct notes.

Problem: In five circles or squares equally far apart, one above another, paint at the bottom a black note; leave the white of the paper for the top note. Then see if you can strike a third note just half-way in tone between these two extremes. This middle note is the keynote of the scale to which the other notes must be tuned. It must be properly adjusted in its relation to black and white before proceeding. Its exact tone calls for careful consideration. One who possesses clear discrimination in a comparison of tone relations will experience little difficulty in striking this note. The novice may find repeated trials necessary. In a later discussion of color the importance of this middle note will be apparent. Now see if you can strike another note halfway between this middle note and white, and another half-way between the middle note and black. The result (Plate 20-i) is an orderly scale of neutrals from black to white, in which the intervals of contrast are equal. For example, there is the same interval of contrast when black and dark are placed in juxtaposition as would occur through the use of middle tone and light.

This scale will be referred to hereafter as the neutral or value scale. By the value of any tone, whatever its color may be, is meant the position of that tone in such a scale as this. The number of notes in our scale might be increased by the insertion of intermediates between each pair here shown; but we shall find these five, keyed to the middle note, well adapted to a discussion of tone relations. In this invariable scale of values is the backbone of an intelligible color unit.

With this value scale as a first step in the direction of tone adjustment let us now seek, in a purely elementary and abstract way, several different manifestations of two important principles. These principles have already been given an elementary application in our problems; but for a clear understanding of the problems to follow it is necessary to discuss these principles more carefully and to compare the different ways in which they will enter into the composition of the details of designs.

Rhythm was defined last month as "joint action or movement." With this reciprocal relation of details in a joint action there must also be present a feeling of rest or repose through a balance of the various attractive forces employed; mere movement is not enough.

We have found that rhythm may occur through the regular repetition of an unique shape (Plate 20-i). Here, there is no sense of movement in any particular direction; nor is direction necessarily implied by the term rhythm as it will be used. It means no more than that in a regular sequence of shapes the eye is able to "find an orderly way through the details of a design." It was shown that this movement might be strengthened and given direction by establishing line connections to bind the units of repeat together (ii). We may also secure a rhythmic interrelation of parts through an increasing ratio of measures from small to large (iii). It is this manifestation of rhythm that forms the basic principle of nearly every campanile in Italy, and gives beauty to the Infinite Curve. And now we have another method of creating a distinct movement in a design—a gradation of values from light to dark. In Plate 19 the movement is downward from the light attractive force of the higher values to the strong attractive force of the lower values.
Thus it will be seen that the principle of rhythm is one over which the designer must have intelligent and complete control in the orderly adjustment of the many attractive forces with which he is working. He may emphasize the movement, check it, or subordinate it to other demands, divert it to or concentrate it in any portion of the design to which it may seem desirable to give dominant interest. The movement may be so apparent that even a casual observer will note its presence; or it may be so subtle that it baffles analysis.

In Plate 21-1 is a rhythmic motif. Its rhythm is due partly to the increase of measure from bottom to top, and partly to the reciprocal relations of the contour lines. It is what may be termed a dynamic shape, in which all forces combine to pull the eye upward.

The Italian campanile is dynamic in character; the Egyptian pyramids are static; the one suggests an upward aspiration; the other immovability.

In Plate 21-i, the upward movement of the spot is emphasized and hastened by a repetition with gradation of measures. In Plate 20-v, the regular repetition of this rhythmic unit furnishes an instance in which movement, for its own sake, is made the dominant feature of the result. But this little design serves to illustrate the assertion that rhythm alone is not enough. The need is felt for rest and repose in the result. In Plate 21-iii, still further emphasis is given to the dynamic character of the unit by the addition of a tone gradation; but here there is a restraint imposed upon the restless activity of the attractive forces composing the unit.

In this balance of two
equal forces the eye unconsciously seeks a point or line of equilibrium between them. It will be found then, that in iv, while the forces counting for movement are stronger than in Plate 20-v, there is a counteracting influence at work to impart some element of repose to the result. In this symmetrical adjustment of attractive forces we have the simplest and most obvious manifestation of balance, an arrangement in which equal forces are opposed on a line or point of equilibrium. This type of balance is so generally understood and recognized that it has seemed unnecessary heretofore to give it definition. But now, in a more complete definition of the principle of balance, it is well to consider symmetry as its simplest manifestation.

In the earliest extant artistic remains of the human race, symmetry appears as a basis of ornament. In his conscious efforts toward an art expression, man endeavored to arrange or dispose his ideas in an orderly way. The first manifestations of order appear through regular sequence, or alternation, and through symmetry. And in the entire development of primitive art, from the least important productions to the carving of an idol, there is ever present a sense of keen appreciation of the beauty of symmetry. In nature symmetry appears as the constructive basis in organic and inorganic life, from the crystal to the human figure.

But in nature, as well as in a more finely organized system of design, actual symmetry often gives place to a more subtle type of balance. In any discussion of balance in design it is desirable to revert to the laws of physical balance; the underlying principles are the same. In symmetry the opposing attractive forces are the same in line, form, and tone (Plate 20-vi). Now, how may we balance oppositions which exert unequal attractive forces? In vii the actual symmetry is destroyed by doubling one of the measures of the opposition. If these were physical forces they would be balanced by drawing a line to connect their centers. Then we would seek on this line the point of equilibrium. The attractive forces of the two spots may be expressed by the formula one-two. Hence, we would divide the line connecting centers into three equal parts, the sum of the forces exerted, and reversing the ratio give to the larger spot one-third of the line and to the smaller spot two-thirds. In viii are three spots exerting attractive forces which may be expressed by the formula one-, one-two. The point of equilibrium may be found by balancing two of the spots, then by balancing these
two with the third, as indicated. In ix, another factor enters into the problem; the tone of one of the spots has been changed, and in consequence its attractive force is decreased. There may be a mathematical formula for determining the point of equilibrium; but its complications are so many and its results of such doubtful value that it is unwise to pursue the mathematics of it further. It is readily seen that the principle is the same, but that mathematics gives way to judgment. In x are attractive forces differing in tone, in measure and in shape. Here we are thrown still more upon judgment and sensitive feeling in establishing a point of equilibrium. If we were to enclose these varied attractive forces within a rectangle we would see to it that the balance point of the attractive forces coincides with the center of the enclosing form.

Now we have to consider still another type of balance, related only indirectly to the definition above,—a balance of the values of our scale. In balancing lines and forms we were concerned chiefly with the physical law of balance; but in balancing contrasts of values and colors we pass beyond any possible assistance from mathematics to questions decided only by careful discrimination and sensitive feeling.

We sometimes speak of a balance of two tones, as in Plate 22-i, having in mind the distribution and the approximately equal quantities of the tones. In the same way we sometimes speak of a balance of several tones, referring to their relative measures and distribution. But this is, in reality, the same idea that was discussed in a preceding paragraph. In a more direct sense quantity is not an essential factor in a tone balance. It is purely a question of contrasts. In ii of this same plate is a balance of value contrasts. The two ends of the scale have equal contrasts on a middle ground. The white is just as much lighter than that ground as the black is darker. In Plate 23-i, is another balance of values. The contrast of dark on the middle ground is balanced by the contrast of light on the same ground. In ii, the balance is deliberately upset in order to give dominant interest to the flowers. Their attractive force is materially increased by giving them a much stronger contrast on the background.
Plate 21-v, there is a pleasing adjustment of the tones of the design, gained through a rhythmic interrelation of the details and a balance of values on a middle ground. This combination of rhythm and balance gives the most satisfactory rendering shown of the little motif indicated in i of this plate.

Balance, then, like rhythm, should be thoroughly understood by the student in order that he may work with definite aim and purpose, with a complete command over the terms in which he essays to express himself.

Now it may be pertinent to remark that, however thoroughly one may study the abstract demonstrations which occupy so much of our space this month, there must enter into any design a quality which is beyond analysis and which can be imparted only in an indirect way. That is the touch of individuality, the personal quality that clothes dry bones with life, vitality, and interest. To understand the essential principles of design is one thing; but this understanding is merely a means to an end. In any work that is worth while there must enter a live and vigorous imagination, a freedom and spontaneity, without which a design becomes formal and deadly uninteresting. We may call it the play impulse, if we choose, an evidence of pleasure and joy in the work that comes from under one’s hand. In nearly all primitive work, and in the work of the mediaeval craftsman, there is ample evidence of this play impulse. In the work of these men there appears a quaint and whimsical grotesque quality that is irresistible in its appeal. We come upon it in the most unexpected places, in the basket or on the carved idol, on the front of the altar or on the carving of the choir screen; no place is entirely free from it. There seems no good reason why a design should not entertain us, even amuse us, and yet be as serious in its aim and purpose as if we were to approach the subject in a spirit of goggle-eyed wisdom.

Problem: Our problem may seem, at first glance, to be one of amusement only; yet if it had no other claim than that of mental discipline involved in its solution, it would be sufficiently valuable to justify itself. Experience proves that it is very difficult for a student to work from nature in terms of design. It is one thing to be able to draw; but quite another thing to be able to design. A well drawn insect, animal or flower may be commendable on its own account, but to translate any motif into terms of design it must always undergo a process of conventionalization adapted to the tools and materials of execution, and organically related to the space which it is to occupy. We have seen from primitive work, and from our own geometric
problems, that the beauty of a design is primarily a question of related lines, forms and tones. Nature is necessary to the designer, but not to the design. It is our purpose to seek a happy medium between the geometric basis on which our work has been developing, and the motif derived from nature. In the present problem let us venture into animal life. Accepting the conditions imposed by the squared paper, with a limitation to the vertical, horizontal and forty-five degree oblique lines, you are to devise an unique and animal-like symbol.

A reasonable knowledge of animal anatomy is of course essential; and with such knowledge, together with a spice of imagination, and a sense of humor, the conditions of the problem will be found more interesting than if greater liberty were allowed. As with nearly every problem which the designer is called upon to solve, the possibilities are most fully realized in a frank acceptance of all the limitations imposed. Fig. 24 indicates the general character of the results that might be expected from a little practice with the pencil over the squared paper. Figs. 25, 26, 27 show the completion of the problem. It calls for a balance of attractive forces in symmetry within an enclosing form. Three points should be kept carefully in mind: the figures must be related organically to the enclosing form; the shapes and measures of the areas of black and white must be given equal attention; the two parts of the unit should be bound together by as many rhythmic connections as possible. In Fig. 27 is a line analysis showing the connections which serve to bind the two parts of the unit together. Figs. 28, 29, 30 are from primitive work, quite in line with our problem, showing three different degrees of conventionalization of nature-derived elements.

Let us now attempt a constructive application of a motif such as we have been using,—a match-safe to hang upon the wall (Plate 24). The essential elements are of first importance (Plate 25). There must be a receptacle for the matches. It may be vertical (i), or horizontal (ii), its inside dimensions to be determined by the length of a match. If in a vertical position the dimensions of the box should be so planned that a single match will not fall too far below the top. There should be a piece of sandpaper, a back piece with a hole at the top for the nail or hook on which the match safe is to be hung. These structural elements must form the basis for the design; they are demanded by utility. The material employed might be copper or wood. Two combative black cats seem appropriate as a decorative motif. Our problem is now clear.
in its development. We must first define the positions and relative proportions of the essential elements. The sand paper may be on the box (iii), or below (iv), but not above it (v), because the matches within the box would be in danger of ignition. The scheme may be planned horizontally (vi), in which case two holes at the top would seem advisable. We have now to attempt a refinement of the structural elements, and such an adaptation of the decorative motif that it shall be organically related in line and form to those elements in a unity of effect. For the sake of simplicity, let us first discuss the steps involved in a refinement of the essential elements. There are several errors which it would be well to anticipate. The first is in vii. Here there is no reciprocal relation between the curved lines of the back piece and the rectangular box. In viii the box is supported by the parallel side lines, but there are three weak points in this arrangement. There is not enough difference between the top and bottom of the design: the curves indicated by the arrows tend to lead the eye away from the center of interest: the division of the top into three equal parts is unfortunate, giving a result which lacks variety in proportions. In ix the second error is corrected—the curves keep the eye within the enclosing form. But there is another criticism here. At the points marked by the crosses the curves should be either continuous or the angles should be more acute. In x, xi, xii, xiii are suggestions giving variety with unity in the lines and proportions used. Now with these criticisms in mind, let us return to the point of the problem, the organic relation of the lines of the decorative motif to the structural elements. In xiv-xv are two sketches showing the adjustment of the proportions, and the interrelation of all the lines of the design. These sketches emphasize the necessity of working from the whole to the parts. Ornament should never be added as an afterthought; it must always be developed with, and related to, the constructive elements of a problem.

Papuan

FIGURE THIRTY.