WATER COLORS

IN THE

SCHOOLROOM

BY
MILTON BRADLEY

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INTRODUCTION.

This little book is chiefly an attempt to give some simple but much-needed instructions in the use of water colors, but before proceeding to that task it may not be amiss to present a brief account of the steps taken by the child in color education, before this point is reached.

A child should know something about the principles of color and have some training in color combinations before water colors are put into his hands, but these things can be taught to very young children, and it is surprising to find how early, under the modern methods of instruction, pupils will make an intelligent use of water colors. In many primary schools the children are taught the use of the brush in free-hand painting without previous sketching with the pencil.

The Kindergarten is the birthplace of the new interest in color, which is bringing such an element of brightness and beauty into our schools. Froebel used colored papers among the earliest of his appliances, and ever since his day they have been of the greatest benefit to the Kindergartner, owing to their

convenience in handling, to their economy, and to the amount of training in both color and form to be derived from their use.

For many years after the Kindergarten was started no satisfactory supply could be procured, either in Europe or in this country. The variety of colors was limited and uncertain, so much so that one could never be sure of duplicating any given color from the miscellaneous stocks in the market.

There were so many complaints from the American Kindergartners, who greatly appreciated the value of the papers in their work, that, finally, Milton Bradley Company began the manufacture of colored papers expressly for educational purposes. They soon found they had undertaken a perplexing task, for there was no system nor scheme of color by which to be governed, no standards with which to make comparisons, and no authority of any kind among the Kindergartners, nor in fact elsewhere, except the aesthetic and fallible judgment of each individual.

This unsettled condition, accompanying a growing demand for the papers, soon demonstrated the importance of some radical action in the matter, and after much studious consideration, they decided to try to establish a set of standards, which should have a definite and permanent character and about which all other colors could be grouped.

The solar spectrum seemed to be the natural place to find color standards, and from this source a committee of competent experts selected six

colors, which seemed to stand out more distinctly than all others, namely; red, orange, yellow, green, blue and violet.

There are a countless number of color rays in the spectrum, from the dark red at one end to the dark violet at the opposite end. According to the undulatory theory, these rays are transmitted through an extremely rare medium called ether. The vibrations or waves move with almost incredible rapidity and are of various lengths, and as the wave length of each particular ray can be accurately determined, it becomes possible to choose any desirable locations in the spectrum and distinguish them in such a manner that they can be refound at any time.

The committee having the matter in charge accordingly selected, with great unanimity of judgment, the reddest spot in the red section, the bluest spot in the blue portion, and so on with the four others. Each of these locations was then accurately designated by its wave length, and now, in this system, when red is spoken of it means just that particular red which is found in that particular spot in the spectrum.

This had never been done before in any system, but having been done now, we are furnished with six definite, unchangeable standards, by the use of which in combinations, all other colors can be closely imitated. Any larger number than six would be unnecessary, making a more complex nomenclature and not being needed for the production of other

colors. On the other hand, there could not be less than six standards in any practical color system, because it is not possible to make either of the six prominent colors, in anything like its spectrum purity, by the mingling of other colors.

A scheme, for instance, founded on the exploded theory of Sir David Brewster, can have no value in color education. We use the word "exploded" advisedly, because all the recent scientific writers bear us out in it. This so-called three-color theory names red, yellow and blue as the primary colors, and claims that by combining them in pairs the other principal colors are produced. That is, red and yellow will make orange, yellow and blue will make green and blue and red will make violet.

The simplest experiments with modern appliances prove how false these claims are. The fact that, on the color wheel and by all methods of mingling light-rays, yellow and blue make white or neutral gray without a suspicion of green, ought to be enough to condemn the theory at once. But it lives on account of the further fact that, *in pigments*, yellow and blue do make certain kinds of green. This is called by modern investigators an accidental effect, because, in all experiments with the colored light of the spectrum, yellow and blue act as complimentaries and produce practically white light, as when thrown together upon a screen.

But even in pigments, no satisfactory results can be obtained by such combinations as are called for by this theory. Nothing like the brilliant orange

of the spectrum can be made with red and yellow, and the greens and violets produced by mixing yellow and blue, and blue and red, are dull, broken colors.

Having secured the six permanent standards, the originators of the Bradley system next selected two intermediate spectrum hues between each pair of standards, and, instead of scouring the fields of literature for fanciful and arbitrary names, they adopted the simplest and most easily remembered nomenclature imaginable. Between the standard red and the standard orange for example, there is a wide strip of color running all the way from red to orange. In this strip two locations were chosen. That nearer the red was red with a tinge of orange, and this was called orange-red. The other was nearer the orange, and, being orange with a tinge of red, was called red-orange. All the other intermediate hues were named in the same way, giving, with the six standards, a list of eighteen spectrum colors, all named without using a word except the old, familiar names that everybody knows.

It may be explained that there is no red-violet nor violet-red in the spectrum itself, as the red at one end and the violet at the other fade away into darkness. But if we imagine a spectrum made into a circle, with the ends joined, we can see that the red and violet if mingled as the other adjacent standards are would make the missing colors. And as red-violet and violet-red are found in nature, they are added to complete the spectrum circuit.

In order to increase the variety of colors in the papers a scale of five tones is made in each of the eighteen spectrum colors. The normal color forms the center of the scale with tint No. 1 and tint No. 2 on the left, while on the right are shade No. 1 and shade No. 2.

We have now eighteen scales of five tones each or ninety colors, and it will be seen that the nomenclature is still simple enough for the youngest pupils to grasp and remember. The ninety colors are all named without using a single unfamiliar word.

All these intermediate colors and an infinite number of others can be made with the color top or on the "color wheel." The well-known Maxwell rotating disks have introduced another really fascinating feature into color education, inferior only to work with the glass prism and water colors.

Many interesting and valuable experiments are performed with these disks, and, moreover, by their use, there has been devised the only method ever proposed for giving a name to every possible color.

The device is as follows: There is placed first on the wheel a disk larger than the colored ones and with its circumference divided into a hundred parts. Then when the colored disks are put on over the graduated disk, being slitted and so adjusted that part of one is exposed to view and part of another, it is a simple thing to tell just how much of each color is used. For example, if the disks are arranged so as to show red 18 parts, violet 14, white 5 and black 63, and rapidly rotated, the re-

sult will be a color that has been called "raisin."

This name is about as distinctive and sensible as "elephant's breath," "prairie," "absinthe," "dove color," etc., scores of such meaningless names being used. But they are not much less useful, after all, than names which attempt to be distinctive, such as light blue, dark blue, deep blue, navy blue, sky blue, baby blue, and the like.

By the use of the old methods of naming it would not be possible for a man to telegraph or write the description of a color so that his correspondent would be able to match it. There is not language enough to do it. The only thing for him to do would be to send a sample. But if both were provided with color tops and disks in the standard colors, one man could set up the color he wanted on the top and telegraph a few words, by which the other man, with his top, could reproduce the color exactly. Suppose the telegram should read simply, "Blue 75, black 25," the color would be a shade of blue, or dark blue, and the correspondent would be able to match it. But if he had merely been told that a dark blue was wanted he would have been obliged to answer, "How dark a blue? Send a sample."

In speaking of the Brewster theory, above, the fact was brought out that the results obtained by the mingling of colored lights do not always coincide with the effects produced by mixing the same colors in pigments. The subject is so interesting that it will be worth while to enlarge on it a little.

In our experiments with the rotating disks we get practically the same effects as are found in nature, as when the variously colored autumn leaves on a distant tree send back to us flashes of solid color, which an artist could never make by combining the colors of the individual leaves in pigments. As another example, let a piece of yellow lace be laid upon a blue surface, and what is the effect when looked at from a little distance? Not green, as might rightly be expected by one who never experimented in anything but pigments, but a good gray. In the same manner, the backgrounds of colored prints are sometimes modified by mingling dots of yellow and blue without allowing them to overlap each other, and a beautiful, almost transparent gray results. If printed out of register so that the dots cover each other the color would be green.

The three-color theory, which has retarded the study of color a score or more of years, makes not the least account of the above phenomena, which, to-day, are known by every Kindergarten child who has had the advantage of playing with the color top.

The fact that yellow and blue paints make green causes a good deal of trouble whenever color instruction is attempted with only the three standards, red, yellow and blue. But the difficulty is avoided by the use of six standards in water colors, because the pupils are taught to mix only the pairs of adjacent colors in the spectrum circuit; i. e. the six standards in a circle. Thus yellow and green are combined, also green and blue, but never yellow and blue. If a

shade of green is wanted it is easily made by mixing black with the standard green.

It will take but a few moments to show that it is really true that yellow and blue pigments, combined, make a shade of green, and we will add a pretty little experiment with the color top, to see just how much black this shade contains.

It is to be understood that tints are made by mixing white with a pure color or by thinning the pigments with water, while shades result from the mixture of a pure color with black, or with a black slightly modified for some colors.

It is a well known fact that all pigments lose in luminosity on being mixed with each other. When we have six pigmentary spectrum colors, as red, orange, yellow, green, blue and violet, we get, by combining them in pairs of adjacent colors, very satisfactory intermediate hues, but the new colors thus formed are always slightly less pure and intense than either of the standard colors forming the combination.

Thus, if we mix red and orange, the orange-red or red-orange which is made is not quite as pure as either the red or the orange alone, though pure enough for ordinary purposes. If, however, we jump the orange entirely and mix our red and yellow, we get what we should naturally expect, a shade of orange or broken orange, not at all like the beautiful, pure orange in the spectrum. So it must be, also, with the green, made from yellow and blue, and with the violet or purple, from the red and blue.

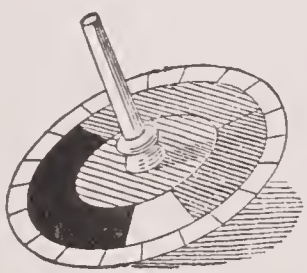
In the three-color system, therefore, the results derived from the full outfit would consist of a good full red, a shade of orange, a full yellow, shade of green, full blue and shade of violet.

Now the experiment; the object of which is to show that a green, for example, made by mixing yellow and blue paints must always be a dull, broken color. We will suppose we have a color top with disks of two sizes and a box of the Bradley standard water colors. Take one of the small disks and paint the back of it with green made by mixing yellow and blue paint from the box. Then paint the back of one of the large disks with green from the box. You will see at once that the small disk is much duller and darker than the large one, but to find the exact difference between the two, take the larger one and combine it with a black disk of the same size so that a little of the black shows, and place them on the top. Now place the small painted disk also on the top and rotate. The small disk will still be the darker. Re-adjust the large disks so as to show more black and rotate again. Continue to do so until the two greens correspond in color when rotated, and you will find that the lower one is by that time nearly half black, which proves that the upper green, made by mixing yellow and blue is also nearly half black.

Surely it is not necessary to use such a color for a principal color when we can imitate so much closer the pure green of the spectrum by a single pigment.

The success of the Bradley Educational colored papers in the kindergarten and primary school has been remarkable, and when the time arrives for the children who have been familiar with these papers to take up water colors, it is of the greatest advantage to them to find that all they have previously learned is to help them in their new work.

The Bradley standard water colors, being made in imitation of the six standard colors of the spectrum, complete the only logical system of color instruction ever devised, and pupils pass from one branch of the system to another with the greatest pleasure. Finding the same number of colors, the same names and the same meaning to all the color terms, they can begin at once to learn how to handle the material found in the color boxes, and this is what we shall undertake to tell them in the remainder of this book.



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The Kindergarten child does not come untrained to the pleasing task of handling water colors. In cutting and mounting the colored papers he has learned to be neat and careful and to use his fingers with some dexterity, while his eyes have been educated to a true perception of color sensations.

These things are of great assistance in his new work, and it is well that he has had this training, for the practice of water color painting, even if followed no further than the primary school, has its own difficulties and perplexities. But these are more than counterbalanced by its great utility in helping to discover the latent aesthetic feeling which dwells in most children.

There are three forms of Water Colors.

IT is first necessary to speak about the selection of materials.

For water color painting, colors are now prepared in three forms, as follows: Dry colors, made in hard cakes; semi-moist, put up in small pans of various sizes and material; and moist colors in collapsible tubes.

In addition to these forms, the only kinds approaching the requirements of true water color painting, there are liquid colors, practically nothing more than colored inks which are used in some sections for freehand outline drawing with the brush, in place of crayon or charcoal exercises. The character of these inks precludes their use in anything like true water color painting in nature work.

Dry colors in cakes were the earliest water colors in use when this style of painting was little more than a pencil sketch, colored in practically flat washes. Although there are still some artists who believe they find finer and purer colors in this form than in any other, the element of convenience will prevail to limit the use of dry colors when other forms can be procured. The labor and time necessary to wash up the dry color, make its use quite tedious, even for small work, and render it entirely impracticable for large and forceful painting.

Semi-moist colors in pans are more readily prepared for use than dry cakes and are every way more convenient, but of course they are only to be preferred when they are of equal quality. For large work, when greater quantities of paint are wanted, the tube colors are required.

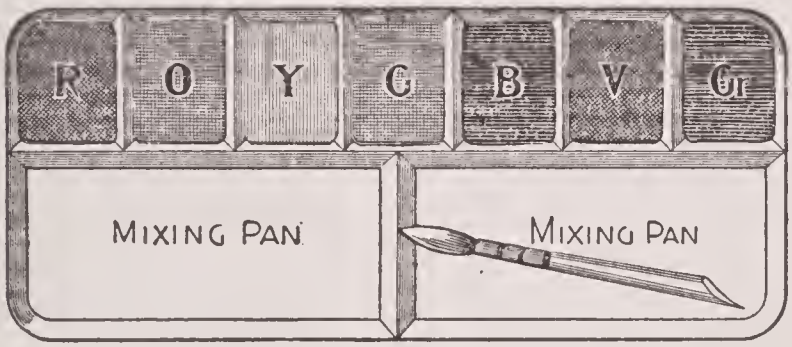
These three forms, dry cakes, semi-moist in pans and moist in tubes furnish a variety of water colors suitable for all grades of work from the primary school to the artist's studio. For school purposes each of these forms will find advocates,

according to the work to be done and the personal preference of the teacher.

If the cakes or pans are used, each pupil should be provided with his own box of colors and be held responsible for its proper care. If the tube colors are used, each child must have a tray or something to serve as a palette, on which the teacher may, from time to time, place a small amount of color from one or more of the tubes as the work of each lesson may require.

The Standard Mixing Palette.

FOR best results with tube colors, each pupil should be provided with a mixing palette similar to the one shown in the accompanying drawing. A convenient size is about seven inches long by three wide. Such trays, made of enameled tin, are in the market.



It will be seen by the illustration that there are seven small compartments along one side, in one or more of which the teacher may place a small

amount of color from the tubes. The other side is divided into two mixing compartments.

For school instruction these pans and the tube colors may be used with great convenience. The teacher may place the color in the pans as it is required, and in such quantities as the lessons in hand may reasonably call for. For example, beginning with a lesson in red and green, a small amount of each of these colors may be put into the compartments indicated by the letters R and G, and possibly some neutral gray in the one at the extreme right end. When it is desirable to add another color the pigment from its tube can be put into its proper pan, in spectrum order. In this way it is easy to avoid wasting color, as it will not be necessary to wash out the color pans. The mixing pans can be cleaned by wiping them out with blotting paper or other soft material.

The form of these pans is such that if every one of the small compartments intended for the paints is filled, the trays may be nested, by reversing each alternate tray and placing it in the one below without causing the bottom of one tray to come in contact with the paint in the one beneath. Thus at the close of each lesson, the trays may be rapidly collected and put away in comparatively small space with each set of colors protected from dust by the palette above it.

These mixing trays or palettes are also put up for market with the small compartments all filled with water colors, representing the six standards and

neutral gray. A good brush is added and the whole inclosed in a neat cardboard case or box for use in the home, and they may be advantageously used in schools where the public officials do not provide material for color instruction, as the few cents necessary for their purchase will readily be contributed by the parents of the pupils. These sets are called the Little Artists' Complete Outfit.

The Standard Colors. IN a box of "Standard" water colors there are eight cakes or pans, one each of the six standard colors and two grays, placed in this order, beginning at the left: Red, orange, yellow, green, blue, violet, warm gray, cool gray. There is also a brush and handle. In the tube colors a neutral gray and Chinese white are added, making ten colors in all. Each tube has a label with the name of the color.

There are great possibilities in this simple palette, for by proper combinations almost any color wanted can be produced. The grays are provided because they are better than black for making delicate shades, the warm gray being used with red, orange and yellow, and the cool gray with green, blue and violet. Tints are made by simply adding more water, or by mixing white pigment with the color.

Popularity of the Moist Colors in Tubes. THE tube colors are exceedingly popular with many artists who have been in the habit of painting in oil, because no time is required to prepare con-

siderable quantities of color. For out-of-door work they are very convenient. This form is also popular in connection with white, prepared in the same style, thus, in a degree imitating oil pigments. Indeed, for sketching, water color work has one advantage over oil, that of drying quickly, thus preventing injury in handling the picture.

But the tube colors are even more practicable than either of the other forms in primary instruction, if each child is furnished with a fairly good brush with wooden handle and a metal palette like the one described above.

The method of using this tray is so simple that perhaps further explanation is unnecessary. But the idea is that each color has its own pan and should always be kept in this order, beginning at the left: Red, orange, yellow, green, blue, violet and black or gray. If a little color is left in the compartments at the end of the lesson it can remain for the next lesson, the trays, when collected, being nested as before described.

The two large pans in the tray are for mixing, when washes of color are prepared for filling in outline forms already printed or drawn; or one or both of these trays may be used for mixing colors, as on a palette, in case thin washes are not required.

The use of Special Colors.

IT is not necessary to describe the several colors, since the children are already familiar with their appearance and their names from the colored papers,

and it has been found by experience that they readily learn to use the brush to good purpose.

When the pupil is far enough advanced to exercise individual choice in pigments, and the color sense is well founded, then it will be perfectly proper to allow the young artist to choose special colors. For example, carmine and crimson lake are both violet-reds, and the carmine is a purer violet-red than can be made by mixing the red and violet standards. Possibly there may be secured sometime a standard red as pure for a red as carmine is for a violet-red, but even then the carmine will be purer than a combination.

Artists must always have for special uses colors which are not necessary nor desirable in the elementary work of the schools. But a too limited palette and a too varied selection of colors are both to be avoided in early instruction, before the truths of color are firmly fixed in the mind. When this is once accomplished and the principles of color combinations in a logical order fully developed, the palette may be enlarged at pleasure, but by that time the education will have reached such a stage that a dozen colors, all told, will comprise the outfit for nine-tenths of all the work attempted.

If a very limited palette seems necessary, red, yellow and blue will suffice to imitate all colors in nature and the arts *better than any other three.* Without a neutral gray or black, however, no shades of red, yellow and blue can be simply secured, so that with no gray the production of a shade of red,

for example, can only be obtained by the addition of both yellow and blue in exactly the proper proportion. It is true that red, yellow and blue paints, combined in the right proportions, will produce a black, so that there is a point where all three will make a broken shade of either of them. But all such work in mixing is far too complex for elementary instruction, and the red, yellow and blue box of water colors is a weak makeshift, put both on the false *plea* of economy, for as already stated, there is no economy, as it will take just so much paint to cover a given space, no matter whether it comes from three cakes or seven.

A very effective argument against the three color system is found in the fact that not only do we find that when two of the pigments are combined the disks of the color top show that the result is nearly half black, but also we find, as noted above, that with the three pigments, red, yellow and blue, combined in certain proportions, an exceedingly good black is the result.

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About the Paper for Water Color Painting.

THE quality of the paper to be used in water color painting is of great importance, and it is well for beginners to know good paper from poor, even if they cannot always have the best. To show how much depends upon the paper in the making of a picture, it may be stated that so much care is expended on its manufacture and finish, that some kinds are sold at retail for from one to two dollars a sheet.

In oil painting the tints and high lights are secured by the use of white pigments, but in water colors the paper itself is more commonly made to serve that purpose, especially in elementary instruction, the white surface of the paper showing the transparent washes of color.

The paper therefore should be pure white so that the various tints put upon it may not be modified by any color in the paper. The surface should be rough but not with a regular geometrical grain. The unevenness should consist of slight, rounded inequalities irregular in size and form, which break up the light falling upon the painting and cause it to reflect a variety of tint and shade. Very thin paper must be avoided as it is too much affected by the water used in thin washes.

For the convenience of beginners, paper of fair quality is put up in pads of various sizes. If these are well glued on four sides and provided with good, stiff backs so that the paper will not warp, they will serve the purpose for elementary work. But it is absolutely necessary to satisfactory work of any kind that the paper be flat and laid on a flat surface.

The surface of the paper should not be too rough, and yet should have sufficient texture to take and retain the color. If too fine and smooth an inartistic flatness and want of brilliancy is the result. But if too rough, the effect is often harsh and course, and the details cannot be executed with sufficient clearness. For simple sketches, however, a rough surface is often very favorable, the pro-

jections of the material causing sparkling lights and shadows, which is very pleasing, and effective. If a paper is slack sized, the whole appearance is poor and dead, but if too strongly sized the color will not wash well on it, and will be streaky.

All smooth paper should be discarded.

It must be noted that there is a right side and a wrong side to all paper. If there is a water mark of the maker's name or other device, the right side is that from which the words can be read in their proper order, when the sheet is held to the light.

The paper must be selected with relation to the subject to be executed. If it is a landscape, or still life on a large scale, in a broad style, the heavy, large sheets of Whatman paper or some other similar in character, are desirable. But if the drawing is smaller or with much detail, a surface not too rough is more suitable and a lighter paper may be employed.

If a machine-made paper is used, the difference in texture of face and back is seen by the impression of the woven wire of the paper machine which gives a regular fine netting appearance, on the back, while the face shows no such regularity of figure, which is undesirable in water color work.

How to Mount a Sheet of Paper.

IF a single sheet is used it should be dampened and stretched on a board. To do this properly cut your sheet one inch larger all around than the size of the board; then lay it on the board, work-

ing side up, and thoroughly sponge it with cold water and a soft sponge, but do not bear with any unnecessary force on the paper, as even with extra quality paper, it is possible to permanently injure the texture of the surface. If a piece of paper not larger than the board is to be mounted, the margin must, of course, be glued to the top surface of the board.

The paper should be sponged just the same, and it will be useful to turn the edges up about half an inch all around, so that the part of the paper to receive the glue will not get very wet.

First apply the glue to one of the longer sides of the paper and at once rub down that edge to its place along one side of the board. Then glue the opposite edge of the sheet, and, drawing the paper with a firm hold, quickly rub the glued margin down with a paper knife or other instrument. Care must be observed to draw the paper equally at all points, and better results are secured if the center of each edge is first glued in place and rubbed down each way to the corners, observing that no wrinkles are drawn into the sheet. The two long sides having been secured, glue each end in a similar manner. Do not attempt to dry rapidly, but put the board away until another lesson, standing it on its edge in a protected place, not near unusual heat.

LePage's or other fish glue is the most convenient substance to use as it has consistency enough to hold the paper in place until the glue "sets" and when not used too freely, this glue will set before

the paper will dry sufficiently to draw itself away from the board.

In mounting a sheet of paper, whatever its size or quality may be, rapidity of action is desirable in order that the four sides may be entirely fastened before the paper dries sufficiently to produce much tension at any part.

It is well to cut a slit diagonally at each corner, or cut out the entire corner of the paper. If a large sheet of heavy paper is to be mounted it may be expedient to leave a margin wide enough to double entirely around the edge of the board on four sides, and glue to the back of the board. In this way practically no strain can be brought on the glue. In fact in such cases, glue is not absolutely necessary, because with the double turn over the two edges of the board, large headed carpet tacks inserted every one or two inches on the back side of the board, and driven down firmly, will hold a heavy paper, because the bulk of the strain is taken up by the fold over the edges of the board, but this method of mounting is not recommended unless it seems necessary from lack of a good glue on special occasions.

Paper for Special Work.

IN introductory work in sketching from models or from nature any well-sized, fairly thick paper, not heavily calendered will be satisfactory. But as soon as a pupil shows ability to handle the color material and to draw from nature with a reasonable degree

of correctness, it is desirable that the paper be of such quality as to allow of an artistic use of the colors, because of the encouragement and enthusiasm which will be inspired by successful working.

The value of the Whatman brand of paper is found in its strength and its ability to stand wetting and washing to almost any extent, the uniformity of texture and the care with which those sheets which are sold as first quality are selected by experts before putting on the market. Thus one using this grade of paper does not take the risk of discovering, when a good start has been made on a painting, that an imperfection in the paper causes a blotch that at best can be corrected or overcome only by technical experience and careful handling.

While all this is allowed for this paper which is hand made and has the maker's name in every sheet, it is too costly to be used in elementary educational work, and there are now in the market very good substitutes for all grades of water color instruction. But an intelligent buyer for school uses will not attempt to furnish the same grade of drawing paper, and especially water color paper, for all schools.

Not only should the quality of the paper be improved as the ability of the pupils is advanced, but the thickness should be increased as the size of sheet is enlarged. Otherwise a sheet even though stretched on the drawing board will be liable to become disagreeably cockled in working rapidly, especially with the wet process which at times is necessary to some extent in any method of working.

Something about Brushes. FOR water color painting the chief requisites of a good brush are elasticity and form. Whether the brush be large or small, it should have a good body and a good point. That is, it must not run out to a very long point but be rounded out from the quill or ferrule to the center and then gracefully curve to a good point, not only when wet with water or paint but also when dry. The brush must also be elastic enough to fly back to its shape when pressed.

As good a point may be had on a large brush as on a small one, and it is particularly desirable that the brush be not too small for the work in hand. Two or three brushes, including a wide one for large washes, are convenient.

A good brush deserves good treatment, and it should never be put away without first being thoroughly cleaned. When put into the box or tray, care should be taken that the point is not left resting against any surface which will bend or twist it as it dries.

Use a large brush rather than a small one, because everything can be accomplished with a large brush if of good point, that can be done with a small one, and one brush is saved.

Camel's hair or red sable brushes in quills are good enough for beginners.

If semi-moist paints are used the wet brush is to be lightly rubbed on the surface of the paint and the color transferred to the palette.

The importance of a good Brush.

THE selection of brushes for water color painting in the elementary schools is a matter of importance next to, if not equal to, the choice of the colors themselves.

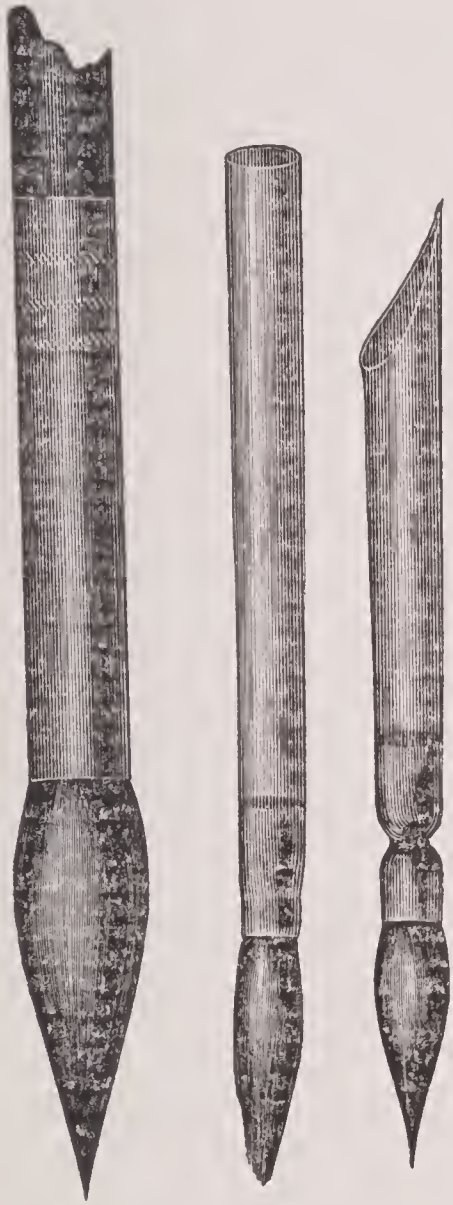

FIG. 3. FIG. 2. FIG. 1.

Unfortunately the low price which must be offered on paints and brushes to secure their introduction into some schools by those who must authorize the expense, often results in the use of the cheapest goods that can be found, and in many cases very little attention is given to the brushes, even though the influence of intelligent teachers may have fortunately secured satisfactory colors. The accompanying illustrations show three brushes of typical sizes and grades.

Figure 1 is a good quality quill brush of a small size, called "Goose quill" but capable of affording good service when the surface of the paper to be covered at one time is not too large.

This brush when provided with a wood handle and used with a fairly good line of paints is capable of producing very satisfactory work, if the subjects to be colored are not larger than primary grades should be asked to undertake.

Figure 2 is a fair representation of the cheap brush found in toy paints, and even furnished to some schools. It is *a brush*, and that is the best that can be said of it. The hairs cannot be brought to a fine point, and the only recommendation for it is its cheapness.

Figure 3 is a medium size known as No. 3 in brown or red sable with metal mounting and wood handle. Such a brush may be used for all kinds and sizes of work, embracing both moderately large washes and fine details. Figure 1, provided with a handle, and Figure 3 furnish an outfit of brushes sufficient for even serious and valuable art work. The only other kind of brush necessary is a good size flat one in red sable or camel's hair, for such washes as skies, and foreground, in advanced work of large size. For elementary work this is not required.

Brown sable furnishes the best all-round brush for water color painting. In some cases, however, in advanced work the red sable is most valuable; for example, when a rather stiff foreground color is used in large work. It is stronger and firmer but does not retain so good a point; especially useful when body white is used.

Cleanliness a prime Necessity.

IT is not the aim of this little book to deal with mere abstract art conditions, but rather to afford aid to the Kindergartners and other teachers who desire to give children the benefit of water color work and yet have not received the practical instruction in the art necessary to inspire confidence.

In an occupation where careless habits are so fatal to success, one of the first things to teach is cleanliness.

Clean water, clean paper, and a clean brush and palette are essentials, and it is not such a difficult matter to have them as might be supposed. The palette and brushes should be thoroughly cleaned before they are put away after having been used, as it can then be done so much more easily and perfectly, than after the paint has dried on them. This applies with special force to the brushes, because a first-class brush can be practically ruined for good work by want of care in washing and neglect in laying away. A water color brush of good quality may be nearly as good as new after years of use, or it may be ruined in the opinion of an artist, by being carelessly left charged with color, and possibly the point bent out of shape by contact with the box.

In some colors a cake left quite moist after using with the brush will, if the practice be too often repeated, crack and crumble, and thus be wasted. It is better to wipe off the moist color when leaving it. When not in use the color box should always

be closed, no matter what form of color is used. The protection from dust, especially in the semi-moist colors, is of sufficient importance to insure careful attention on this point. If "moist in tubes" is used, always return the screw cap to its place after carefully removing any surplus paint which may have flowed over onto the screw. Otherwise the cap may become cemented to the tube, so that in order to get at the color the other end of the tube must be cut off, which will necessarily result in exposing the paint to the air to some extent and consequently the drying of the color if not frequently in use.

How to begin Work.

IF work is being done on a level table the drawing board or pad containing the paper on which the water colors are to be used, should be so arranged as to incline toward the front at an angle about the same as a school desk. An outline must first be drawn in pencil of every object which is to be painted, and the colors should follow the outline as closely as possible. For the outlines use a fine, pointed pencil, making the lines so light that they will not show in the painting.

Having prepared what is thought to be a suitable amount of paint for the work in hand, either in one of the large compartments of the mixing palette or on some other dish, thoroughly saturate the brush in the color, being careful to see that all sediment, if

any, is well mixed each time new color is taken into the brush.

At first it may seem difficult to lay the color on smoothly, but practice and patience with a steady hand will accomplish much. Begin to apply the color at the top left hand corner of such part of the design as is to receive it. If the brush is properly charged with color, a small puddle will be formed under and following it, and if this begins to disappear before the required surface is covered, the brush must again be charged, and the color must be stirred up each time any is taken from the pan in order to insure a uniformity of color. The recharging of the brush must be done as rapidly as possible, and before the edge of the color already applied has become dry at any point. If this is not observed a spot or streak will appear where the new color joins the old. When changing pigments the brush must be thoroughly cleaned in order to secure pure colors.

Laying flat Washes. HAVING begun to color at the upper left hand corner of the design, work toward the lower right hand corner, painting accurately to the outline all around. Never allow the color in the brush to become nearly exhausted until the surface to be treated with that wash is almost covered. Work with a fairly full brush, nearly to the finish and then, having partly cleaned the brush on blotting or other waste paper,

take up with the brush the puddle of color left on the paper before the end or final corner is quite reached. If these precautions are not observed one of two things will be likely to occur; either there will be a small puddle left in the corner which, when dry, will be too strong in color, or else, the brush having run too dry, the last corner of the wash will be lighter than the general surface.

In coloring a large surface always let the paper be inclined toward the front sufficiently to cause the color to flow in that direction and to follow the brush readily. When a large surface is to be covered with a flat wash dampen the paper beforehand within the outline with a large brush, so that, during the process, the edges of color may not dry too quickly, and thus produce the unsightly lines of deeper color where not intended, but coloring must not be begun until all surface water has disappeared.

Practice making washes perfectly flat from top to bottom and from corner to corner.

Always allow one wash of color to dry before laying another over it.

If possible each pupil should be seated so that the light will come from the left.

Do not in any case turn your paper to accommodate your stroke, but turn your arm instead.

Some brief Directions. A few more simple things to be observed by teacher or pupil may be noted, even at the risk of a little repetition.

Never scrub the brush about at random.

Never go back into wet paint to retouch.

Do not allow the color in the brush to be too nearly exhausted before replenishing it.

Stir the paint with the brush every time new color is taken; otherwise the wash will not be uniform.

Use judgment in taking up color with the brush, taking all the brush will hold for large surfaces, but less for small surfaces.

In mixing a wash for a definite purpose it is safe to try it on a bit of paper and allow it to dry before using, as it will be much lighter than it appears in the mixing pan or when wet on the paper.

Not only clean the brush at the end of each lesson, but take care that it is drawn to a point on blotting paper or other absorbing substance.

When dampening the paper before applying a wash, do not leave visible water on the surface.

In taking color for a large wash, the brush should be well filled, and when half emptied refilled and applied at once to the edge of the wash already begun before it has dried, thus avoiding an unsightly line where the two washes are joined. For smaller surfaces, the brush being not so full of color, a better point can be kept for the smaller details of outline.

Some special Styles of Treatment.

FOR texture of stones, ground or other rough surfaces such as bushes in foreground, etc., the brush may be used nearly dry with heavy color and

passed over the paper, catching only the projections of the rough surface. One writer, referring to such practice, says:

"This mode of working, judiciously applied, is very successful. The best way of handling the brush for this is to use it spread out flat, like a fan, so as to divide it into many portions, resembling a narrow, irregular comb. In this state, being charged slightly with color, it may be used to give some of the finishing treatment for trees, grass and bushes. By this means much detail may be rapidly given with pleasing effect."

There is danger, however, that the beginner may resort too much to these or similar artifices, which demand much judgment and discrimination.

A full brush will often be of great advantage in blotting in deep shadows of small size, and where a sharpness of touch is desired.

In beginning a landscape the sky, with the clouds if any, should be laid on in full strength as nearly as can be judged, and softened away where necessary with clean water, but still retaining the forms. The various objects in the composition should next be located, beginning with the most distant and ending with the foreground.

The smaller lights too numerous to be left out may be secured by touching them in with water and blotting out with the blotting paper or smartly wiping them with a bit of cloth if a slight tint remains after blotting out. Or if there is still lacking the intense brilliancy required, touches of Chinese

white, slightly tinted, if necessary, will give the desired result.

In the wet process of water color painting, distinguished from the work done on dry paper, the peculiar effects of the mingling of colors on the paper which give this class of work its popularity, are obtained by rapid working with various colors while the entire surface of the picture is more or less wet. By this device a blending or mixing of colors is secured, one running into another and producing a series of beautifully soft effects which cannot be obtained in any other way.

There is practically no definite dividing line between the several methods and oftentimes various methods may be adopted in one sketch or painting.

The Pupil must follow certain Rules.

IN the study of form, which includes the art of drawing, there are certain definitely established facts which cannot be ignored, and must not be violated; but a strict observance of all such requirements will not make an artist; and yet no one can hope to be an artist who violates these rules. So it is with color; as yet there may not be such definitely accepted laws of color, as there are of form, but without the knowledge of certain truths the production of artistic work cannot be guaranteed nor even expected.

In the first place the young pupil must be able to draw the outlines within which to confine the color

or else these outlines must be furnished ready printed. In either case the work of painting must be done carefully, so that the color may flow up to the line at every point and not overrun it. In elementary work aimless daubing of colors, singly or in combinations, can be of very little educational value, and such practice is demoralizing in that it develops a slovenly habit. But a child who has had the training afforded by a modern Kindergarten, in the use of logically classified color material, will easily and naturally fall into line in the useful methods of water color work.

Persistent Practice Required.

THERE may be little art education in applying color washes to plain geometrical or other outline forms, whether they are printed on the paper or drawn by the pupil. But in such work there is the best kind of practice, attempting to lay a smooth wash, rapidly and neatly, and working closely to given outlines. Drawing paper ruled in one inch squares is of much use for such early practice in handling the brush and mixing paints.

When one can accurately and rapidly lay a flat wash within definite outlines an important feature of water color work has been accomplished. The fact that there must often be rapidity of execution, accompanied by accuracy of form, determines the necessity for that preparation which can be secured only by persistent practice. For school work the

outlines may be drawn mechanically or free hand, or paper ruled in one or two inch squares will do, if it is of sufficient weight and not too smooth.

Painting Autumn Leaves.

FOR practical work involving small surfaces and the blending of colors, autumn leaves furnish useful subjects, and the maple, especially, gives pleasing variety in form and color. By the aid of these, early attempts to practice the wet process may be made.

First, let the pupil lay a leaf on the paper and outline the form by marking around it. Then with a clean brush he may apply water to the surface inside the outline so as to dampen the paper uniformly. The leaf having thus been traced and the paper dampened, after the water has disappeard the color should be put on rapidly, the paints being applied in succession and allowed to flow into each other, assisted by the point of the brush here and there, to imitate the general appearance of the leaf.

When the surface has been dried sufficiently a few of the more definite lines of stem and veins may be added in stronger color.

Brush Drawing.

IN water color painting there are two distinctly different methods of using the colors and the brush. The more elementary of these, which may be more correctly called brush-drawing, consists in the use of one color only, which perhaps may preferably be one of the grays,

warm, cool or neutral, rather than a definite color, although for variety any color may be chosen. The exercises in this work are entirely free hand, with the brush, without any outline guides. One stroke of the brush may represent a leaf, or several strokes grouped a compound leaf. This kind of touch often produces in each stroke of the brush a delicately shaded effect of leaf or flower. This peculiar method of work has been very popular abroad if we may judge from the illustrated matter published. But in this country the work has more generally taken the form of free hand silhouette painting of leaf, spray, flower, branch with foliage, etc., without attempt at shading in each separate touch of the brush.

The Pleasures of Painting. A competent writer says regarding water color painting: "In the expression of light, air and vapor, the transparent, delicate tones of water colors are peculiarly truthful. The hazy radiance of the summer day, the glowing glories of the evening sky, the unearthly loveliness of the moonlight, may be depicted in this better than in any other medium!" "Though perfection is hardly within the reach of the amateur he may attain a very high degree of proficiency, and the pursuit itself, besides elevating his taste and developing his perceptions, will afford a refined pleasure peculiarly its own." The excursionist who can sketch from nature in water colors enjoys a

great advantage; for whether he visits the mossy ruins of some historic castle, or gazes on the wild array of volcanic rocks, or stands at the margin of some mountain lake, he can, if he pleases, sit down and record in water-color much of the beauty and grandeur of the scene; enough at least to recall the reality most vividly to his mind, and with that, much of the enjoyment of the time." The truth of this will be vouched for by every individual who has made even the most elementary efforts in this direction. There is a personality that does not attach to a photograph and the pleasure of referring to such records increases as the time passes, and the date in the corner or the memory carries one back to associations possibly with those friends who have gone on before or have been lost in the changes and fortunes of years.

Pupils must Learn to see Correctly.

SKETCHING from nature is vastly different from copying other pictures, chiefly because it is so difficult to see and interpret correctly the colors of natural objects, while in a picture the colors are easily recognized. When we are able to see truly the forms of objects, notwithstanding their perspective distortions, it is comparatively easy to make a good drawing, and so when our eyes have been trained to see color as it really is, both in its hues and its tones, then it is quite a simple thing to paint.

Therefore, all the work in color comparisons,

which tends to the training of true color perceptions, is most valuable, whether it is done with the colored papers of the Kindergarten or by the study of water colors, either in the advanced grades or in the studio.

In nature work you must never choose a particular pigment because you know that such is the color of the object under normal conditions. The light and shade and surroundings modify everything that has color, and hence, before painting correctly one must learn to see correctly, after which a knowledge of pigments will determine which one to use to produce the effect wanted. If a green shrub is illuminated by a red sunset there will be relatively little green in a correct interpretation of the shrub, because there is practically no green in the high light reflected from the object, and but little from the shadows.

The colors are modified by the atmosphere, whether clear or hazy. When a student has learned to see the true conditions and to imitate them, he may still fall far short of highest art, but he has overcome a great part of the obstacles in his way.

Never Retouch an Original Sketch.

NEVER make a sketch from nature and then attempt to finish it up at home. If you think you can improve on it, take another sheet of paper and repaint it as you think it ought to be. Then take it out and compare it with the natural

scene, and in all probability you will be greatly disappointed, and perhaps more or less instructed. Many a student has thrown aside a first sketch and later been surprised to find that it was far superior to a finished copy.

On this point a competent artist and writer has well said: "Lastly, never touch your original sketch after you leave the spot. A sketch on the spot possesses a reality and freshness that you will seek in vain to give it afterwards. You will have to be taught by it, though it is your own work, for you were learning, when you made the sketch, of the great teacher, Nature. What you then put down was Nature's lesson to you; and if you touch it when away from her influence, you may obliterate the result of her valuable instructions."

The Brewster Theory of Color.

IT may not be out of the way to reiterate a word of warning about the three color theory, which has been incidentally referred to on a previous page, as there are some teachers and school officers who still seem to think that just as good work can be done with only red, yellow and blue as with the six standards, and that there is great economy in the use of the three colors. We have already shown that there can be no saving of material, and as to the other point, it is singular that every individual at all acquainted with color effects cannot see at once that the result of mixing colors is

always a loss of brilliancy. It would seem to be no longer necessary to argue the point that the three colors, orange, green and violet, made from red, yellow and blue, will necessarily be impure and, hence, that all of their combinations will be impure.

Even with six standards there is considerable loss in the union of two adjacent colors, as red and orange for example, and much more when the orange is skipped and the red and yellow combined.

The following has been published as the statement of a prominent teacher of drawing, and expresses the opinion of many good artists and teachers who have received their education in color through professional artists without giving the subject careful and broad examination, based on modern methods of color analysis.

"The advantage to children in being furnished with only these primary colors and allowed to combine them for the secondary and tertiary colors, tints and tones, I consider most valuable from an educational standpoint."

What would be the professional standing of a teacher of music who, from some fancied economy, should accept a musical instrument for the schoolroom in which every second note was very much lower in tone than it ought to be, while the other half retained their correct pitch! Such a question raises a smile, and the suggestion is received as a joke, but it is a very serious question when we consider that in color, just this fearful mistake is being perpetrated, to the permanent injury of every child

brought under such influence. It is a fact not to be disputed, that when only red, yellow and blue water color paints are used, every color made by their combinations is a more or less broken color, as will be seen by comparison with the original three as standards. And, further, without the addition to the equipment of some gray pigment, there is no provision whatever for producing true shades of red, yellow and blue.

It is thus evident that too much is sacrificed when the number of paints is reduced to three, and that instead of being more simple the processes become more complicated and beyond the easy comprehension of young children. The result is the spreading of false instruction without a saving in money or labor, while six colors in close imitation of the M. B. Co., spectrum standards, and two or three grays, provide the most satisfactory outfit of colors ever devised for elementary instruction.

Yellow and Blue Light do not make Green.

A prominent writer on landscape painting says, "The yellow tinge given to the atmosphere by the sun's rays does not turn, as might be expected, its blue tints into green, because the pearly gray still left in the shadows untouched by the yellow light interposes a neutral tint, which from its opacity prevents the mingling of the colors."

This extract from a valuable hand book on sketching from nature, in color, is but one illustration of

the effect produced by the popular error that yellow light and blue light when mingled produce green, because yellow paint and blue paint when combined produce *a* green; and the quotation is here introduced to enforce the danger involved in the use of only the three paints, red, yellow and blue in elementary instruction in color. By the use of colored papers based on six spectrum colors, the child of the Kindergarten or our modern primary school learns much of color which is truthful and may be of the greatest value in the later use of paints, provided such paints correspond with the colors already familiar in the papers which he has used. But if at this stage water colors in red, yellow and blue are introduced and the green must be made from yellow and blue or the orange from red and yellow, the very error is perpetuated which caused this writer to publish an explanation of a scientific *fact* which does not exist, when he stated that yellow and blue light ought to make green were it not for the imagined fact that "*the pearly gray still left in the shadows untouched by the yellow light interposes a neutral tint, which from its opacity prevents the mingling of the colors.*" Not only is this explanation untruthful but it is an unnecessary and ambiguous attempt to explain a phenomenon which does not exist, but is one of the untruths which must, in fact if not in words, be taught to every child whose color instruction is based on the Brewster error of red, yellow and blue primaries, orange,

green and purple secondaries, and russet, citrine and olive tertiaries.

This point is here reiterated because it seems almost a hopeless task to disabuse the present generation of this false idea of Sir David Brewster which has so long passed as truth without contradiction outside of scientific writings.

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Popularity of Water Color Painting.

WITHOUT doubt water color painting in all its varieties has made wonderful progress in popularity and value during the past half century. Fifty years ago it consisted of but little more than the application of pale washes of color to pencil outlines, but now it is making rapid strides in competition with the best work in oil. True each has its own field, and comparison is unnecessary, but one thing is evident, that the relative simplicity of materials and processes, together with the possible rapidity of execution, renders the work of much more value as an education in form and color than any other process.

The great charm of water color painting lies in the beauty and truthfulness of its aerial tones, and hence arises its peculiar adaptation to the representation of skies and distances.

The production of these beautiful effects is due largely to the granulous surface of the paper which presents small hollows and corresponding projections. This surface , receiving the semi-trans-

parent washes of color, shows alternations of light on the higher parts and half lights in the hollows.

This feature is so valuable in water color painting that the artist should be careful not to lose the effect, which gives an atmosphere to the water color not produced by body paint in oil or pastel or in fact by body water colors. Much depends on aerial effects, and the water colors of an artist who understands his material and is in sympathy with Nature need fear no competition with body colors of any kind.

Not many years ago, the ability to paint flowers of a stereotyped pattern, in faint washes on pencil outlines, was a fashionable accomplishment for young women, and comprised all that was popularly known of this branch of art, but to-day the facinating work of painting in water colors is making its way into all the lines of art where the supremacy was formerly held by oil.

The improvement made in water color pigments, within the knowledge of the present generation has been a large factor in the popularity attained by this class of work. For quick work it far excels all the possibilities of oil, and in many cases an effect can be caught which would be impossible with any other medium.

This popularity is not confined to America as is witnessed by this extract from an English book: "The art of painting in water colors has attained in this country so high a state of perfection as to

be undoubtedly placed in successful competition with the time honored sister art of oil painting."

The Six Spectrum Colors and two Grays.

A modern writer on Water Color painting truthfully says: "It is difficult enough to learn to handle color when the paints are of the best quality, even in tone, finely ground, clear, and free from lumps and impurities; but when the student has to contend with not only his own ignorance and clumsiness, but with defects of material which would irritate a skillful artist, he has need of an exceptional amount of patience to enable him to persist in the effort to learn."

There is of course no occasion for buying the most expensive colors for school use with small children. Permanency in colors is a very difficult quality to secure, and the best artist is often forced to use pigments which are not altogether satisfactory in hue or working qualities because they must have a very good degree of permanency. This is not as important in school colors as the free and smooth working qualities, and the close match of the pigments to the standard colors with which the pupils have become familiar, and which they know will produce certain other colors when mixed with each other. With six spectrum colors and two grays the combinations of pigments are practically the same as have been familiar to the pupils in the color disks of the school color wheel or the top. With these

six spectrum colors a better line of combination colors as seen in nature and the arts can be made than with any other equal number of colors that can be selected. Even with this high praise there remain a few colors which cannot be perfectly imitated. Carmine furnishes a very pure slightly violet red which cannot be equaled in purity and brilliancy by standard red modified with violet.

In primary school work with water colors the chief qualities are truth in color, ready mixing and smooth flowing. The essential thing is to save the time of teacher and pupil, and for this purpose the moist and semi-most paints are best, on account of their ready-mixing quality. The moist colors keep their semi-fluid state a long time if kept close in the tubes. Ordinarily a small quantity left on the mixing pan will wash up readily within two or three days. There are some colors which are naturally of such drying nature that it is difficult to combine in them free-flowing qualities and also to secure ready washing or mixing if left exposed to the air several days.

Interesting Color Harmonies.

THE phenomena of complementary colors are of great importance in the study of color harmonies, and the more the effects are examined the more beautiful and interesting this phase of color investigation becomes, even to the youngest pupil, but much more so to the art student, especially in nature study.

Criticism is often made of the use of certain blue and purple effects in the shadows of landscape painting. For example, suppose we have a moss-covered boulder or the gray trunk of a tree, in shadow, and, near by, some green and yellow foliage, brightly illuminated by the sun. Now if the shadows on the boulder and tree trunk are painted a decided blue or purple, rather than a neutral gray, modified by the natural color of the objects, such treatment will be apt to be criticised as untruthful, although the same critics may admit that the effect is pleasing but, as they believe, unnatural.

And yet this treatment, in certain cases, may be perfectly legitimate, and possibly a homely experiment or two in color vision may demonstrate its usefulness.

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An Experiment in Complementary Contrast.

THERE is one simple experiment which can be tried in any room where the Wellsbach gas burner, now so generally introduced, has been put on the same fixture with one or more of the old style of burners. The Wellsbach flame is a near approach to white light when compared with the ordinary coal gas flame, which is practically an orange yellow light. These are so different that we may, for the present purpose, call one white and the other yellow or orange yellow.

Now suppose one each of these lights is burning in a room and that the walls or ceilings are of light gray or dull white. Place an opaque object so as

to cast a shadow from the coal gas light upon the gray walls. We shall then have the ceiling illuminated by both lights except in this shadow which is relatively neutral gray, because illuminated only by the Wellsbach burner. Now, for the experiment, fix your eyes on the part of the ceiling where the shadow from the coal gas light is located, but not too constantly or entirely on the shadow, but rather moving back and forth across it. Very soon this surface, which does not seem to be a shadow at all, begins to look blue, and after a few moments of close attention, the result will be a very decided blue shadow on the ceiling.

This is the complementary contrast to the yellow gas light which illuminates the ceiling, and from this simple experience, which is so common that few have ever noticed it, we have a key to the beauties in the landscapes which are so pleasing, but which we are seldom able to analize.

Referring again to our green trees and their gray trunks beside the boulder, what may we expect to see? The mass of green foliage in the bright sunlight is brilliant and strongly impresses the retina of thc eye when it is fixed on it for an instant, and then when it is turned to the gray stone, back and forth, there comes to the boulder and tree trunk, in the shadow, a very decided impression of purples, from violet red to violet blue, because of the complementary to the yellow greens of various hues.

The effect of the sunlight and shadow in nature is so much more intense than any pigments can produce,

that in order to secure the same impressions, they must be to some extent put into the painting. How far it is desirable to carry out this illusion, is for artists and connoisseurs to say, but the fact that such treatment is accepted as pleasing warrants its practice, and it is well to know the reasons for it, even though it is not practicable in most elementary work.

The Study of Tints and Shades.

THE use of pigments brings out many peculiar facts which seem to be outside of known laws, and which are hardly recognized by those unacquainted with the various phenomena connected with this fascinating subject.

Among such facts are the interesting results obtained from the study of tints and shades. There are several methods of producing these results. One natural method is by increasing and decreasing the amount of illumination on an object. If we suppose the normal color to be represented by the object illuminated by the ordinary daylight at noon with the sun obscured by white clouds, then the extreme limits of tint and shade would be shown by full sunlight on the one hand and deep shadow on the other.

For imitating these effects in art, as for example in painting a landscape or other subject, it is necessary to produce the color effects by the use of pigments, and the natural statement would be that for tints of red or yellow, for example, we should

mix white pigment with the color, and for shades, black pigment. But it is only necessary to make a few critical experiments to demonstrate that the tones so produced will not agree in hue with the corresponding tones of nature under similar conditions.

In water color painting the above method is more generally modified by using thin washes of color on white paper for all tints, or tones lighter than the normal color of the pigment, by which we mean its most effective strength to show its color. In some cases the pigment selected for producing shades must be a *modification* of black in order to produce the true results. For example, black mixed with yellow gives a color far too green for a true shade of yellow.

Fortunately, we are not limited to black pigment for determining true shades. As we have seen, the disks of the color top furnish a series of shades practically like the natural shadow, but in making tints, the white disk does not as perfectly serve our purpose as does the black disk in making shades, and therefore we must rely more directly on the study of natural tints made by increased illumination up to full or concentrated sunlight. Unfortunately, in this line of investigation, there is no method as simple and definite for tints as we find in the black disks for making true shades. But while the white disk with a color disk does not give a tint of the color as pure and truthful as is the shade produced by the black disk, still there is no doubt much of value to be secured from experiments with

the white disk, because in its use we have a mathematical approximation to the tones, although they lack purity, in fact are too gray. But the tints caused by increased illumination must be considered the true tints because it is nature's method, and art, at its best, can only imitate nature and is never good art if it violates natural laws.

All artificial tints seem to differ from those of nature, and as yet there appear to be no means for systematic comparison by which to obtain standards. Even if it were possible to obtain true tints in pure white light, the variable atmospheric conditions would quite materially modify the results.

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Some Difficulties in Color Study.

IT is a fact that two pigments which in their fullest expression are not to be distinguished from each other, are often very unlike when diluted and applied to white paper. Why ?

It must be the first aim in the solution of such problems to determine the variations of these so-called tints from true daylight or sunlight tints. No doubt some simple apparatus may be devised to accomplish this, and in fact the writer has made several suggestions and a few crude experiments in this direction and nothing can be more interesting to a student in color whether definite results are immediately accomplished or not.

No true white or black disk is possible, but the same may be said of the spectrum colors, whether

in disks or pigments. Therefore the result of their combinations cannot be higher than the standards.

Because of these difficulties in color investigation, it has seemed to many that there is nothing to be definitely known about color and therefore they have been satisfied to leave it in the condition in which it exists in a majority of minds. What is good art in color, can never be determined until there is an accepted popular language in which to discuss it. In form and sound we have such a language, as has been said, but in color we have not even in theory a universally accepted alphabet, much less the results which might be expressed with such an alphabet in common use.

In many of the conditions attending the investigations relating to tints and shades, the effects when studied logically and closely are very interesting, and so little has been done in a systematic way that any experimenter along modern lines may have the pleasure of discovering for himself color truths never before recorded and classified. For example in the popular water color known as Windsor & Newton's Payne's gray, three tones from deep to light analyzed by the top are as follows: No. 1, deep, V.5.–N.95, which is a very dark *violet shade.* No. 2, medium, B.7–W.4–N.89, *a broken blue*, much lighter than No. 1. No. 3, light, G.2–B. 10–W. 5–N. 83, which is still lighter in tone and a *greenish blue.* These three formulae are from the same pigments used in different degrees of dilution, and it will be seen that as the tone

changes, the hue is different; the first a violet shade, the second a broken blue, and the third a broken green-blue.

Yellow ochre in a strong mixture applied full strength gives O.43–Y.36–N.21 and a lighter broken color is O.22–Y.55–W.14–N. 9. In the first we have a dark broken yellow-orange, and in the second a light broken orange-yellow. This change in hue with change in tone or depth or intensity of color furnishes a subject for investigation. Do the same or similar changes occur in nature as the light is increased or diminished? If so, important phenomena in color are involved and should be definitely investigated. To those who have the leisure there can be no more interesting subject for study than color, and it is only by such work that the needed knowledge of color phenomena can be increased.

If these phases of the subject are due to pigmentary effects or characteristics, without any direct relation to the phenomena of light and shade, then most surely the whole subject is of great importance to artists who attempt to imitate nature truthfully. If certain pigments assume false hues as they are changed to produce required tones, the artist must correct the hue at every change in tone. If one pigment retains its true hues with change of tone, while another assumes false hues, then such facts should be made a matter of record and the necessary corrections made if, because of certain qualities, the pigment is required in the subject or composition.

Analysis of Popular Broken Colors.

IN addition to the colors above named, there are several popular water colors which are so broken that a close analysis is necessary to determine the true color of each. But with the simple color top this analysis can be made and the name very easily determined.

In the formulae given the initials R. O. Y. G. B. and V. represent the standards, red, orange, yellow, green, blue and violet, while W. stands for white. As B. has already been adopted for blue, black is represented by N. from the word niger.

Burnt Sienna, { A deep mixture, O.32–N.68.
Medium, O.45–Y.11–W.7–N.37.

Burnt Umber, { Deep, O.12–W.1-N. 87.
Medium, O.25–Y.13–W.8–N.54.

Vandyke Brown, { Deep, O.11–Y.2–W.4–N.83.
Medium,O.12–Y.15–W.17–N.56

Brown Madder, { Deep, R.20–O.12–W.2–N.66.
Medium, R.30–O.25–W.20–N.25

Raw Sienna, { Deep, O.34–Y.15–N.51.
Medium, O.26–Y.42–W.15–N.17.

Sepia { Very deep, O.1–Y.1–N.98.
Medium, O.3–Y.5–W.10–N.82.

Neutral Tint, { Deep, V.8–W.5–N.87.
Medium, B.2–V.8–W.13–N.77.

In several of these analyses, the change in hue from the deeper to the lighter is indicated.

Burnt sienna, deep, is a dark shade of orange, while the medium tone is a broken shade of yellow-orange.

In burnt umber, there is a similar effect.

In Vandyke brown, the deep tone is a broken, slightly yellow, orange, while the medium tone is an orange-yellow.

In brown madder, each tone is a broken orange-red, but the lighter tone is a more orange hue than the other.

For raw sienna, we have in the deep tone, a yellow-orange and in the lighter an orange-yellow.

Sepia, in the deeper tone shows equal parts of orange and yellow, but in the medium, it is quite decidedly an orange-red.

Neutral tint is not neutral at all, but in the deeper tone is a broken violet, while in the medium it is a blue violet.

The difference in the pigments of two manufacturers is seen in the following examples of another prominent firm, compared with the same names in the foregoing list.

Burnt Umber. { Deep, O.4-Y.2-N.94
Medium, O.15–Y.12–W.9–N.64.

Vandyke Brown, { Deep, O.3–Y.4–W.2½–N.90½.
Medium, O.7–Y.8–W.7–N.78.

Sepia, { Deep, O.2–Y.1–W.2–N.95.
Medium, O.3–Y.2–W.10–N.85.

These examples are given here merely to show the value of the simple color analysis which the color top renders available to every primary school pupil or art student.

The claim is not put forth that with the top the accurate analysis can be made which is possible with

the larger disks of the school color wheels, but with even this little toy a color nomenclature and analysis never before dreamed of is made simple and popular, even with the children.

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Showing the Lamentable State of Color Language.

EXAMPLES of what has actually been done in the effort to describe colors may often do more than argument, to call attention to the great need of a more accurate color nomenclature. The following extracts are from an elegant and sober publication on needle work.

"The ground is a low toned oatmeal color, approaching brown paper."

What could be more intelligent and definite than that, for a description of color?

"The ground is an ivory-colored satin; the cross and outer band are oyster-gray satin."

This is just as clear as the other, although the simile is transferred from the vegetable to the animal kingdom.

Some of the designs are described as being "outlined with pale string-colored cord."

It seems hardly possible that such definitions could be used seriously in any publication of merit and value, such as this little book certainly is. But the following is little better than the last, because there is nearly as much variety in biscuits as in strings: "The ground is a pale, ecru linen and the work a darker, biscuit shade."

The fact that such a series of extracts can be made from one small volume leaves no question as to the necessity for strenuous efforts on the part of all educators to reform or rather entirely reconstruct, the nomenclature of one of the most interesting phenomena of nature.

The Bradley system provides for a method of naming colors which is as simple as it is natural, of which a brief explanation is given on pages 11 and 12 of this book. It will there be seen that such absurd and meaningless terms as "string-color" and "biscuit shade," are entirely unnecessary. All these colors, which are so mysterious that they have baffled the world to give them distinguishing names, are now analysed by the color top and named in terms as definite as those which describe the dimensions of material objects or the tones of the musical scale.