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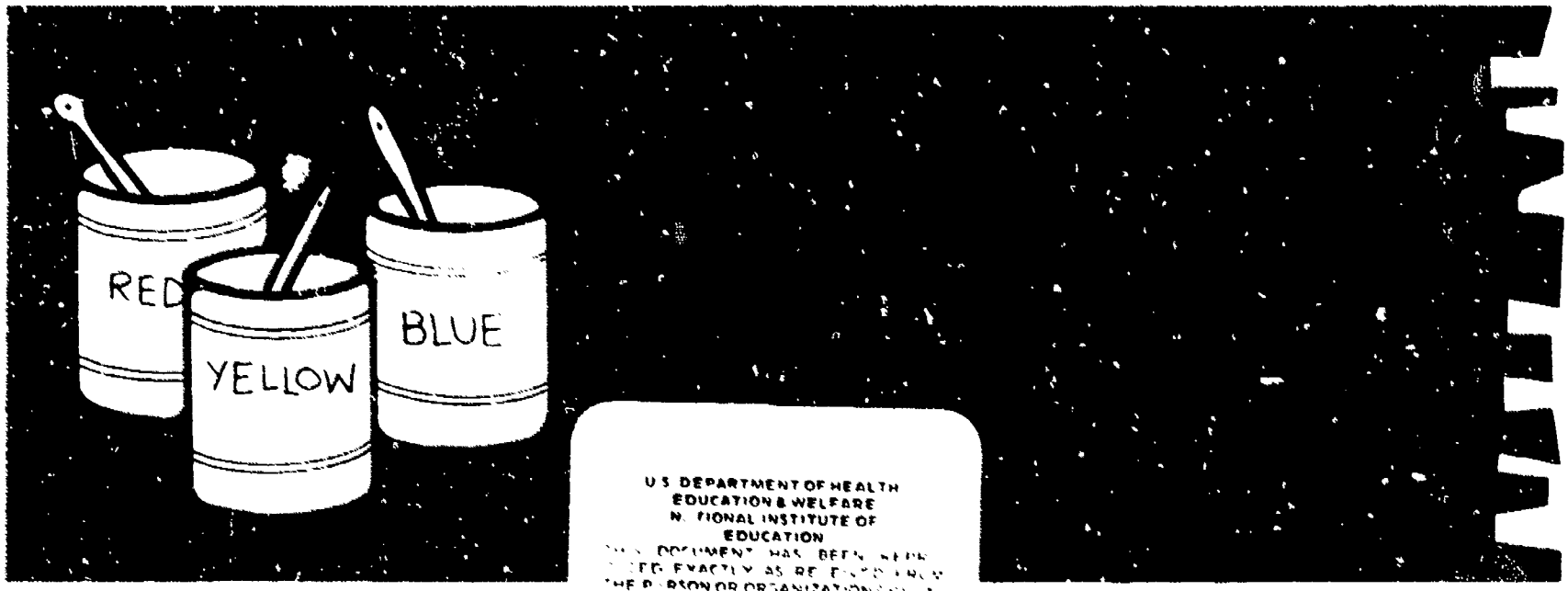
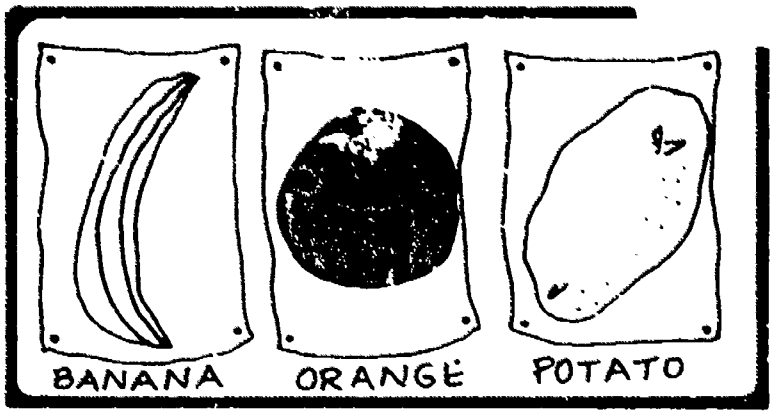
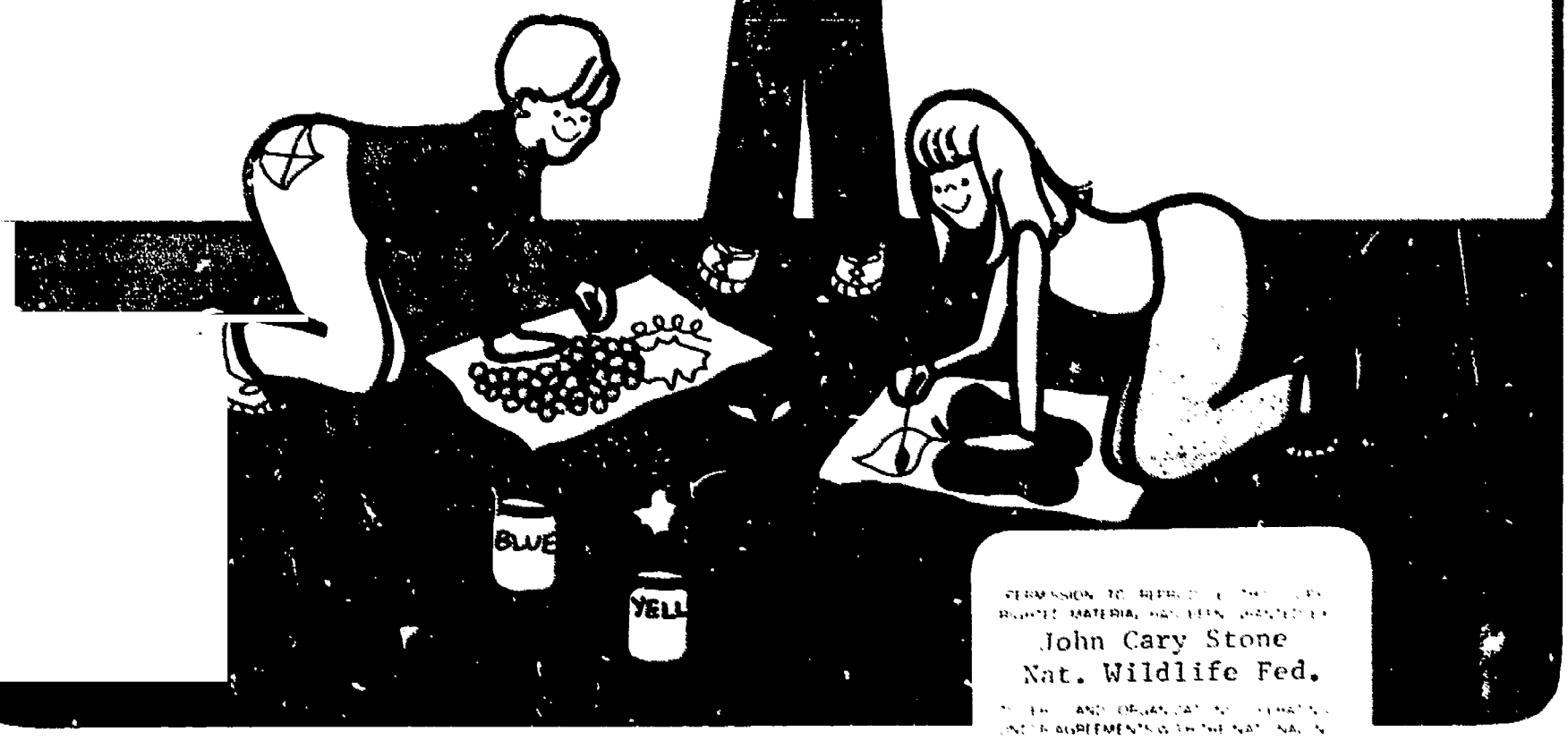
ABSTRACT

This environmental unit is one of a series designed for integration within an existing curriculum. The unit is self-contained and requires very little teacher preparation. The philosophy of the series is based on an experience-oriented process that encourages students to work independently and at their own speeds. This particular unit is designed to develop the skill of observation in young children. The activities have been drawn from Science - A Process Approach and the MINNEMAST Elementary Science and Mathematics project. Students are asked to make observations of color and color changes in natural objects, particularly plants. Some works is done with extracted plant pigments. Teacher information concerning materials, background information, and additional topics is given. A short bibliography is included. (MA)







edited and published by
NATIONAL WILDLIFE FEDERATION
written by
MINNESOTA ENVIRONMENTAL SCIENCES FOUNDATION, INC.

THE ENVIRONMENTAL UNITS

This is one of a group of Environmental Units written by the Environmental Science Center and published by the National Wildlife Federation.

In both theory and practice education is the essential base for long-range local, regional and national programs to improve and maintain the quality of environment necessary for man's welfare and survival. Citizens must be aware of ecological relationships in order to recognize, appreciate and fulfill constructive roles in society. This awareness should be launched through the existing educational process—in classroom and related school activities. No special courses on ecology can replace the need to integrate ecological learning throughout the existing curricula of our school systems. Furthermore, the life-styles and value-systems necessary for rational environmental decisions can best be acquired through repeated exposure to ecological learning which pervades the total educational experience.

It was with these thoughts that we developed these curriculum materials. They were designed for the classroom teacher to use with a minimal amount of preparation. They are meant to be part of the existing curriculum—to complement and enhance what students are already experiencing. Each unit is complete in itself, containing easy-to-follow descriptions of objectives and methods, as well as lists of simple materials.

The underlying philosophy throughout these units is that learning about the environment is not a memorization process, but rather an experience-oriented, experiment-observation-conclusion sort of learning. We are confident that students at all levels will arrive at intelligent ecological conclusions if given the proper opportunities to do so, and if not forced into "right" answers and precisely "accurate" names for their observations. If followed in principle by the teacher, these units will result in meaningful environmental education.

In the process of development, these units have been used and tested by classroom teachers, after which they have undergone evaluations, revisions and adaptations. Further constructive comments from classroom teachers are encouraged in the hope that we may make even more improvements.

A list of units in this group appears on the inside back cover.

About the National Wildlife Federation—1412 Sixteenth Street, N.W., Washington, D.C. 20036

Founded in 1936, the National Wildlife Federation has the largest membership of any conservation organization in the world and has affiliated groups in each of the 50 states, Guam, and the Virgin Islands. It is a non-profit, non-governmental organization devoted to the improvement of the environment and proper use of all natural resources. NWF distributes almost one million copies of free and inexpensive educational materials each year to youngsters, educators and concerned citizens. Educational activities are financed through contributions for Wildlife Conservation Stamps.

About the Environmental Science Center—5400 Glenwood Avenue, Minneapolis, Minnesota 55422

The Environmental Science Center, established in 1967 under Title III of the Elementary and Secondary Education Act is now the environmental education unit of the Minnesota Environmental Sciences Foundation, Inc. The Center works toward the establishment of environmental equilibrium through education—education in a fashion that will develop a conscience which guides man in making rational judgments regarding the environmental consequences of his actions. To this end the Environmental Science Center is continuing to develop and test a wide variety of instructional materials and programs for adults who work with youngsters.

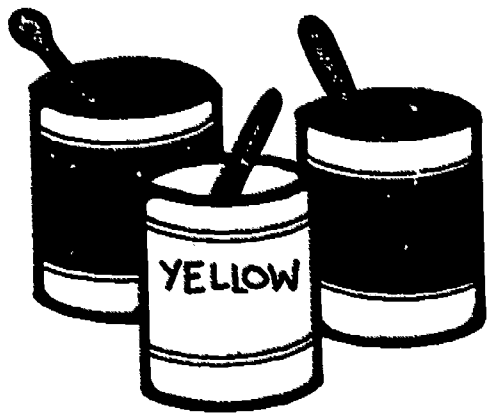
Color and Change

an Environmental Investigation

BY

NATIONAL WILDLIFE FEDERATION

MINNESOTA ENVIRONMENTAL SCIENCES FOUNDATION, INC.



Design and Illustrations by

JAN BLYLER

Children are naturally curious. Sometimes there is a gap between their innate curiosity and the type of inquiry-behavior which teachers seek to foster. This gap is unnecessary. We can direct and channel curiosity without stifling it by helping children use their curiosity to develop definite skills. Perhaps the most important of these skills, in terms of developing inquiry-behavior, is that of **observation.**

Children spend a lot of time exploring their environment—watching, listening to and touching those things which attract their attention. **Color and Change** tries to help children bridge the gap between "seeing" and "observing." To do that, children are asked to observe certain objects carefully. Their attention is then directed toward one physical property of the objects—**color.**

Color is an important property of natural materials. Often, color change is an indication that a significant reaction has taken place within an object. The brown of bruised apples or bananas is evidence of injury; the color of ripening fruit indicates maturation. One of the goals of this unit is to help children become aware of events in their environment and interested in protecting the objects they have learned about.

The activities of this unit have been drawn from *Science —A Process Approach,* an elementary science curriculum developed by the American Association for the Advancement of Science, and the MINNEMAST Elementary Science and Mathematics project.

Table of Contents

INTRODUCTION

Color change dramatizes the fact that nature is a dynamic system in a constant state of flux. This phenomenon of change is apparent in North Temperate regions where natural colors appear and disappear, leaves and grasses grow and die, and where life forms undergo mass migration in response to the seasons.

Consider, for example, the deciduous trees in your community. Leaves develop from buds which have been in a resting state during the winter. The breaking of bud dormancy is dependent upon ***change***—the length of the day increases, making more "sun energy" available to the buds; temperature changes occur, making conditions more favorable for water movement within the plant. A series of sophisticated chemical changes occurs because of ***energy relationships*** and ***environmental factors***. The end result is the production of leaves.

Many shades and color combinations are evident in plant structures. Green, red, yellow and blue are the most common. These colors do not necessarily remain constant. The predominance of one or another pigment may shift according to **seasonal change.** Color change may also result from **interaction** within a natural material. For example, changes in fruit coloration can indicate injury or ripeness. The activities of this unit will help children realize the great variety which exists in the natural world, particularly with regard to color. They will also help the children perceive distinguishing characteristics and recognize similarities and differences in living things. In addition, the activities provide good opportunities for the development of communicative skills.

We recommend that the unit be started in early fall, soon after the children begin school. One activity draws upon seasonal changes so it would be a good idea to begin before the leaves turn colors. As an alternative to fall teaching, you might begin in spring as leaves and flowers emerge. If possible, it is best to spread the sections of the unit over the entire year so the children can continue to observe color change throughout different seasons.

The material in the unit is designed for grades K-2. Some of it may be more appropriate for one level than another. We hope you will tailor the activities to best suit your students' interest and to spark their enthusiasm about their surroundings. You might also want to consult **Nature's Part in Art** and **Nature Hunt,** two related units in this series.

MATERIALS

construction paper
paper bags
tagboard
shoe boxes
paint
drawing paper
red cabbage
vinegar
gallon pot
gallon bottle
medicine droppers
tap water
clear ammonia
hot plate
heatproof, transparent dishes
babyfood jars and other transparent containers
paper towels
fruits and vegetables
cellophane tape
insect pins
paper coffee cups
plant tags
notebooks
crayons

Color and Change

Perception of Colors

The activities in this section are intended to help children recognize the primary colors (red, blue, yellow) and secondary colors (purple, green and orange), as well as tints and shades of these colors.* The aim is to get the children acquainted with color in their surroundings.

MATERIALS

construction paper (4 sheets each of primary red, blue, yellow; 4 each of secondary purple, green and orange, plus 4 sheets each of two or three tints and two or three shades of each primary and secondary color)
paper bags
tagboard
shoe boxes (about 12)

When all of your materials are spread out on a table you should have about four sheets *each* of primary red, blue and yellow paper and secondary green, orange and purple. You should also have four sheets each of two or three tints *and* two or three shades of each of the primaries and secondaries.

As a first step, prepare three shoe boxes: on the end or side of one shoe box tape a piece of primary red construction paper; on a second, tape a piece of primary blue construction paper, and on the third, a piece of primary yellow.

*Tint is sometimes referred to as color lightness, shade as color darkness. If you consider a sheet of primary blue paper, then a **lighter blue** would be a **tint** and a **darker blue** would be a **shade** of this primary.

Next, from the remaining pieces of primary paper, cut out 2" x 2" squares—about 50 for each of the three colors. Put all of these squares into one paper bag and shake the bag to mix the colors.

Next, cut out about fifty 2" x 2" squares from each of the three secondary colors and about 50 squares from each of the shades and tints of the secondary and primary colors. Put all of these squares in a second bag. Shake the bag.

Seat the children in a circle on the floor and place the three prepared shoe boxes in the center. Take the first bag containing the pieces of paper in the three primary colors and scatter the pieces around the circle at the feet of the children. Ask the children to place each of the pieces in the shoe box which has the matching color.

When the children have completed this, bring out the second bag full of 2" x 2" pieces of construction paper. This bag should contain the three secondary colors plus tints and shades of the primary and secondary colors. At this point, put all of the primary-colored paper that is in the shoe boxes into the second bag. Mix the bag well. Then scatter all the contents of this second bag around the circle and ask the children to select one piece at a time and place it in one of the three shoe boxes which comes closest to the color of the particular piece. For instance, a green piece might be placed in the blue box while an orange piece might most closely approximate yellow. Tell them that there are no "right" or "wrong" shoe boxes—they should just put each piece where they think it should go.

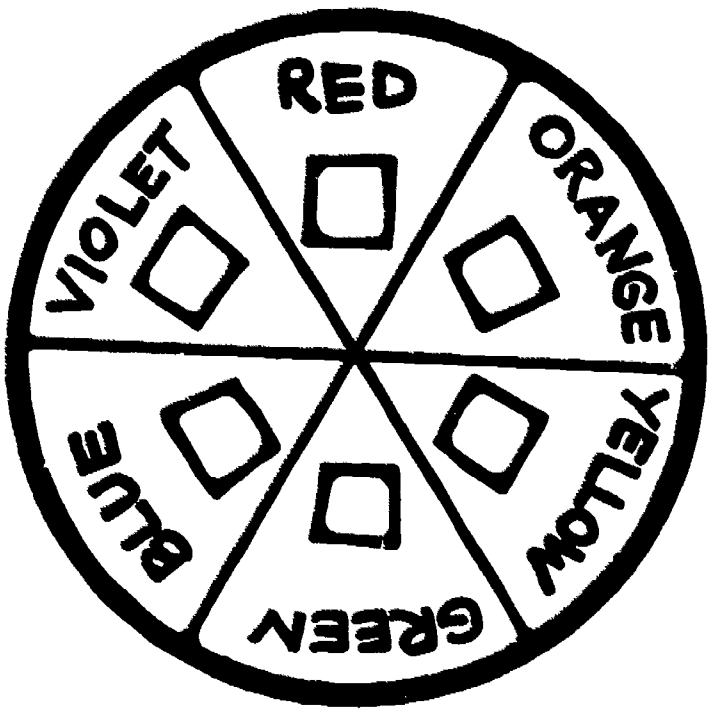
As a variation you might want to hide the pieces of paper around the room and have the children hunt for them.

When all of the pieces have been placed in the three boxes, examine them with the children. Discuss and vote on the placement of "questionable" pieces.

Children will probably remark about the orange, green and purple pieces. Since these colors are so common, perhaps the children will suggest making three more shoe boxes for these colors. Bring out three more shoe boxes. Ask the class which of the various shades and tints is the most "true green"? "True orange"? "True purple"? When one piece of colored paper has been chosen to represent each of the three colors, tape each piece to a shoe box. After the new boxes have been marked in this way, groups of children may re-sort all of the pieces of paper into the appropriate boxes (red, yellow, blue, green, orange, purple).

As they work, the children should gradually become aware of an ordering or grouping of colors. Perhaps they could now arrange the boxes in order in a circle. Through discussion it may be decided that orange belongs between yellow and red, purple between red and blue, and green between blue and yellow. (The children still may not realize that the secondary colors can result from *combinations* of the primary colors. This concept is not important at this time.) When the boxes have been arranged in the circle, encourage the children to walk around the circle and name the colors.

Extend the activity by showing the children how to make their own color charts. Have them paste pieces of each of the six colors (the three primaries plus the three which the class chose as true green, orange and purple) on a piece of tagboard. This will give each student his own color chart and enable him to walk around the room identifying the colors of different objects through comparisons with his chart. The children will also see that objects come in many colors which they have not charted. Some students may notice that brown, black and white are not included on their charts, yet many objects contain these colors. If they wish, have them add these colors to their charts.



Color and Change in Natural Objects—Indoors

Natural objects display a variety of colors. In this section the children will first describe and reproduce the colors of a collection of fruits and vegetables. Then they will observe the change that naturally occurs in these fruits and vegetables over a period of time. Finally, they will work with natural pigments which have been extracted from familiar materials.

The aim of this section is to get children aware of color as a *significant* characteristic of natural objects and to get them interested in *observing* changes that occur in those objects.

MATERIALS

paint (a jar of yellow, red, blue, white, and black for every two students)
drawing paper
vinegar—one quart
[illegible]
heatproof, transparent containers—6
variety of fruits and vegetables—one for each child
medicine droppers
shoe boxes from "Perception of Colors"
red cabbage
clear ammonia—one quart
[illegible]
[illegible]
[illegible]
other transparent containers (jars) for every 2 students
[illegible]
paper
pot
gallon bottle

I. Descriptions of Fruits and Vegetables According to Color

Display all the different types of fruits and vegetables on a table before the class. Ask the children to identify the various types by name. There may be some objects the children do not recognize. Name these for the class, and then have the students assign color descriptions to all the objects.

Multicolored fruit (e.g., fruit that is not quite ripe) might confuse the children, so you should suggest that they assign a description on the basis of the *predominant* color. Bring out the six shoe boxes you prepared for the previous section (red, blue, yellow, purple, green, orange) and have the students compare the colors of the fruits and vegetables with the colors on the outside of the boxes. They should place each fruit or vegetable in the box which has the color most closely matching the fruit or vegetable. If there are still some items which the children do not feel clearly match any of the shoe box colors, make up another shoe box with a question mark on it so that the objects with confusing colors can be categorized along with the rest. This activity is intended to encourage the children to make careful observations of the colors of the fruits and vegetables and to give them experience in grouping by color.

II. Observation of Color in Fruits and Vegetables

This activity will illustrate two diverse concepts: (1) colors may be mixed to produce other colors, and, (2) fruits and vegetables vary in color and shape not only between types, but also within a type.

Lay large sheets of paper on the floor and provide every two children with red, yellow, blue, white and black paint (colored chalk could be used if paint is not available). Pass out one piece of fruit or one vegetable to every child. Ask each student to paint a picture of his piece of fruit or his vegetable on the paper, duplicating as closely as possible the actual color of his sample.

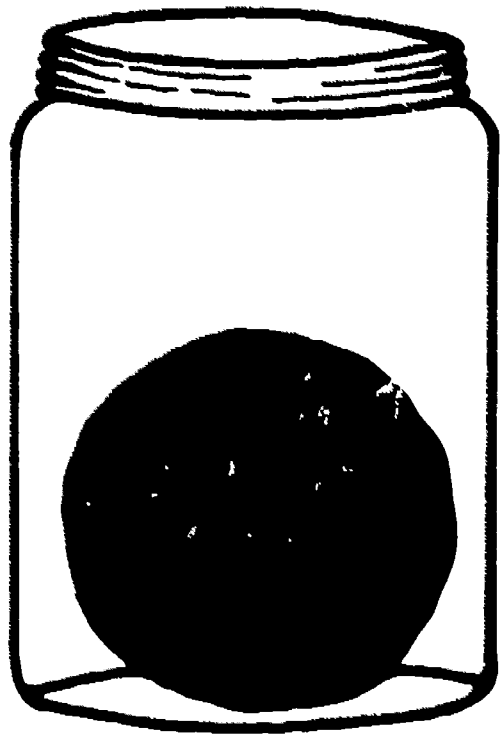
Since the children are sharing only primary colored paint they may have difficulty reproducing certain colors such as the color of an orange. They will find it necessary to mix two colors to produce some colors, and some shades and tints of colors. When they have reproduced the shape and color of their piece of fruit or vegetable as accurately as possible, each student might exchange his sample with someone else and make another drawing. You might want to have each child make a drawing of several different fruits and vegetables. They should find that differences of color and shape not only exist *between* types of fruits and vegetables, but also *within* a type of fruit or vegetable. For example, one orange (fruit) might be entirely green in color while another is entirely orange.

III. Observation of Color Change in Fruits and Vegetables

Give each child a transparent container which can be sealed tightly (plastic refrigerator dish, glass jar, plastic bag tied shut). Ask each child to put into the container the last piece of fruit he has painted on his paper. He should seal the container and put his name on it. Either mark the wall calendar on the day this is done, or have the date put on the containers. (Some students may only be able to use a portion of their fruit or vegetable if it is too large to fit in any of the containers.)

If the children have painted several items, ask that they each put an "x" beside their painting of the piece of fruit in their container. Collect and save the paintings or display them near the containers of fruit. Place the containers where they can be easily observed by the children. Ask each child to "keep an eye on" his piece of fruit or vegetable. Obvious changes may not occur until the fruit or vegetable has been sitting for over a week. From then on, all the items will change rapidly. Some will develop very interesting and beautiful molds. They will all decompose completely in about six weeks. The children might make one or two further paintings as a record of the color and shape of their fruits or vegetables as the decomposition continues. It might be interesting for them to compare the different kinds of molds which occur. At various intervals during the period of time when the children are observing their fruits and vegetables, you may want to have class discussions concerning the changes that are taking place in the samples.

In the back of the book on page 11 is a data sheet which you can duplicate and give to the students to use in keeping a record of change in their fruit or vegetable.



IV. Pigment Magic

In this section the children will work with several chemical solutions which have very definite and obvious reactions when mixed. The reactions will produce different colors, tints, and shades, depending not only upon which solutions are mixed together, but also upon what quantities of these solutions are mixed and in what order the solutions are mixed.

The activity will stress the need for careful observation and record-keeping. After the initial activities in this section, it will become especially important for the children to keep precise records of the amount of each solution needed to produce a certain color so that they will later be able to reproduce that color.

A. Ammonia, Vinegar and Red Cabbage

Before class time, boil a broken-up head of red cabbage in about a gallon of water for ten minutes. Pour the resulting colored water into containers of approximately one cup in volume. You will need enough solution and containers so that each team of two children can have one cup of the liquid.

Next, pour two inches of household ammonia (a non-sudsy kind) into a gallon bottle. Fill the remainder of the bottle with warm water. Provide each team with a babyfood jar full of the ammonia solution. This dilute solution of ammonia is not very dangerous, but the children should still be warned to be careful when working with it. It will irritate a child's eyes if it gets into them. If some of the solution should get into the eyes, they should be quickly rinsed with clear water.

Fill a third set of babyfood jars with vinegar. Again there should be enough jars so that each team of two children may have a supply of this vinegar solution.

Mark the three solutions so they can be differentiated from each other. Any designation is fine. We will refer to them as A (ammonia), B (vinegar), and C (cabbage water).

In addition to the three marked jars of solutions, each team of children should be supplied with six medicine droppers and as many small transparent containers as the class can gather together (babyfood jars, juice glasses). It would be well for each team to have about ten to fifteen such containers.

First Day—**Introduction to Solutions**

Ask the children to use their empty containers to mix portions of solutions A, B, and C in any combination and any order they wish. Brilliant colors will appear as they mix the three solutions. They can use the medicine droppers to take small amounts of the three solutions.

As a child discovers a color, he should put part of that color in a jar and set it aside on a table. Each time another new color is discovered, it could be kept in a separate jar and added to this grouping. Encourage all the teams to begin adding various shades and tints of colors to the collection on the table. The resulting group of colored solutions will probably include shades and tints of green, pink, lavender, yellow, brown, and blue.

The children will uncover two problems while doing this activity. First, when they discover a new color, they may want to produce that color again. This will only be possible if they have not **contaminated** solutions A, B, and C. For example, they may produce a green color by using an amount of solution A with an amount of solution B. However, in making their first green solution, if they have used a medicine dropper to take from solution A and have then used that same dropper to take from B, then B will now be slightly contaminated by A. If they try to produce the same green a second time, they may encounter difficulty because they will not have access to a pure B. To reproduce the same green, they might need fresh solutions.

The children will be able to see if their solutions A, B, and C have been contaminated, because if they have been, the colors in each of these original jars will change. Allow the students to discover this problem for themselves. Also, let them try on their own to avoid the problem. Let them experiment any way they wish on this first day.

A second problem they will encounter while trying to reproduce a color is that of "forgetting." They might forget *which* solutions were used to produce a color, *how much* of each solution was used, or *in what order the solutions were mixed*. Again, allow them time to consider on their own how they can avoid this problem.

Second Day—**Contamination and Record Keeping**

The children have now been experimenting for a day with various solutions and assorted problems. On this second day, ask the children how they have tried to overcome the problem of contamination. Might they use a particular medicine dropper in a particular solution? They could label the medicine droppers according to the solutions, making sure to keep the vinegar dropper in the vinegar, the ammonia dropper in the ammonia, and the cabbage dropper in the cabbage water.

Now ask the children how they might overcome the problem of forgetting the type, amount and order of components necessary for producing different colors. Can they think of a way to record **kinds, amounts,** and **order** of solutions used? They might record *kinds* by using the *letter* of a solution. They might record *amounts* as the *number* of medicine droppers-full of a particular solution used to produce a color. And the order of their addition might correspond to the order in which the figures are written down. For example, a green might have been produced by adding three medicine droppers of "A" to two medicine droppers of "B." This may be shortened to the formula **"2B + 3A."**

In the back of the book on page 12 is a data sheet which you can duplicate and give to students to use in keeping records of their formulas for different colors.

Ask the children to again produce as many different colors, shades, and tints as they can. This time they must take care not to contaminate the solutions. They also must keep a record of their formulas. Each time a new color, shade or tint is added to the class collection of colors, the formula should be written on the cover of the jar or on a piece of paper taped to the jar.

Third Day **Reproducing Colors**

Have the children work in pairs. Each pair may select one of the colors from yesterday's class collection and try to reproduce that color by using the formula written on the cover. Each child in the pair should work independently to reproduce the color. Have the children hold the colors against a white sheet of paper to compare them.

When both members of the pair have closely reproduced the color in one jar by following that jar's formula, they could exchange their jar with another pair of students. If, however, neither member of a pair can reproduce the color in a given jar, they should examine their technique. Are they following the formula carefully? Are they sure they have not contaminated their solutions? If they still cannot reproduce the color, they may assume the formula is incorrect. They could then experiment to find what the correct formula would be.

B. Other Pigment

When the children have finished working with the cabbage water, tell them that you obtained this water by boiling the cabbage and that the color pigment of the cabbage came out of the cabbage during the boiling. Tell them there are some pigments which will not come out when boiled in water (e.g., chlorophyll will only come out when boiled in alcohol). You might want to demonstrate this for the class. If you do, be careful. ALCOHOL IS FLAMMABLE! Ask the students if they think they could find other plants which might have pigments that would come out when boiled in water.

The children might bring in such things as flower petals, plant leaves, vegetable rinds, and fruit rinds. You can boil these in class for the students and the resulting solutions can be examined to see if they will change color as the cabbage water did.

Color and Change in Natural Objects—Outdoors

Colors and changes in the natural world are often observed by children, especially when the seasonal difference in foliage becomes apparent. But leaf change is only one example of a natural color change. This section of the unit demonstrates to the children that color change is widespread and significant.

I. Color as a Distinguishing Characteristic of Natural Objects

Give each child a lunch bag and take the class out to the school grounds. Ask the children to bring back examples of as many different colors as they can by collecting natural objects they find around the school grounds. Stress that these objects should be *natural*. Tin cans, balls, and anything else man-made should be excluded. If they wish to bring back part of a living plant, ask them to bring only a small part. You might want to have a contest to insure that a great number of colors will be collected. When the children return to the classroom they could place the articles they have gathered on a table.

First have the class make a list of all the *different colors* they have found.

Then make a list of all the *different kinds* of objects brought back Such a list might include: flowers, leaves, branches, grass, rocks, soil, and bugs. The children might now make a more complete study of the different colors each of these items exhibits. To do this, each child might collect two or three more examples of each kind of item from their own home areas. For instance, if one of the children has collected two dark green leaves from the school ground, he might find leaves near home that are pale green or yellow which he can also bring to class.

You could divide a couple of large tables into sections. One section would be designated for all the different leaves brought in. This section might be covered with white paper for a background. Provide tape for attaching the leaves to the paper. Each child might keep his leaves separate from the leaves of the other students by circling his own with a pencil mark and writing his name inside the circle. Leaf color should be examined before two days have elapsed or else the leaves will become dry and crumbled.

ASK THE CHILDREN

Are all leaves green? Are all green leaves the same shades and tints of green? If you have leaves which have come from the same plant, do they have the same color? Does a small and possibly young leaf have the same color as a larger and possibly older leaf from the same plant?

You might reserve another section of a table for branches and concentrate on a study of bark color. Ask the children if all bark is the same color. If each child brings in a couple of small twigs from trees and bushes around his home, you may have examples of red, orange, yellow, brown, black, and even green barks. This usually amazes children who tend to think of all bark as being brown. (See also **Plant Puzzles**, another unit in this series.)

A section of the table for soils can be interesting. A collection of dirt samples from the children's home areas may result in soils which are red, others which are yellow, and a range in shades of brown and black. As with the bark, this variety of color is not usually realized until the comparison can be made in one spot at one time. (There is a unit on **Soil** in this series, also.)

Flowers and rocks may also be compared in this way. The variety of colors that can be found in these two items is almost unlimited Flowers might be kept in jars of water for the study. Rocks should be displayed on a white background and might be observed with hand lenses.

II. Color and Change Over the Year

Prepare the class for a field trip around the school grounds and give each child a plastic bag and a plant tag on which to write his name. When outdoors, have each child choose an outdoor plant —an oak seedling, bush, etc.—for investigation. Each child can fasten his tag to the plant he has selected. To protect the paper tag from rain and snow, he should slip the plastic bag over it and close the top tightly by tying or fastening with a rubber band.

Tell the children that they will be observing their plants throughout the school year. They will also be discussing and comparing whether or not their plants change during that period of time. By continuing this part of the observation over the entire school year, a complete color cycle can be observed. Perhaps you can arrange monthly observations and reports so that the children remain involved. The children may want to keep written records of changes that take place.

You might have the children make drawings of their study plants with crayons or paints. If they do make drawings, it would be good if they could duplicate as closely as possible the color of their plants, making drawings on the day that they tag the plants and at successive intervals throughout the observation period.

Also try to get the children to predict, either during or after each drawing, what they expect is going to happen to their plants as time passes.

Do they anticipate any changes in color in their plants? If so, you might encourage each child to make a second drawing of what he expects his plant to look like by the time he next observes it.

Painting or drawing pictures of their plants can be a good outdoor activity for fall and could be easily correlated with the children's art work. If bringing art materials outdoors presents too much of a problem, the drawings could be made upon the children's return to class.

Mount the children's drawings so the entire class can view the results. As the year progresses, mount additional drawings of a given plant side by side.

Extended Activities for the Class

Will green leaves change color when placed in a cold environment?

Collect some maple or aspen leaves before they begin to change color or show signs of drying. Place them in a plastic bag in the refrigerator. Have the children observe color changes.

Will a banana ripen as quickly if it is stored in a cool place?

Take four bananas that are not completely ripe. Place two of them somewhere in the room and two in the refrigerator. Have the children note the date and observe and record the color changes daily.

Will evergreen branches change color if they are brought inside?

Clip some branches from fir or pine trees and bring them to school. Put the cut ends of the branches into a sugar water solution such as that used with Christmas trees. Have the children observe the changes.

What changes occur in people as they grow older?

Have the children bring in several snapshots of themselves taken at various ages. Discuss the changes which have occurred since the pictures were taken.

Are there hidden colors in washable black ink?

(This is analogous to the hidden colors in green leaves which appear when the chlorophyll is lost. Contrary to popular belief, chlorophyll is not the only pigment found in green leaves. The autumnal shift in color is not a mystical chemical process. In most instances it is the result of alterations in pigment predominance. Chlorophyll is lost as the day-length changes and the "unmasking" of other pigments occurs.)

Have each child place a single drop of washable black ink on a piece of mist filter paper or white paper toweling. All of the colors which make up black ink will be revealed in the rings spreading out from the initial drop. If all the children use the same ink, the color rings will be the same on all papers. Have the children compare their rings and name the revealed colors.

ASK THE CHILDREN:

Does everything have color? Is color important? What different things can color change indicate?

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Student

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MOLD DESCRIPTION CHART

Type of Fruit _____

DATE	DESCRIPTION

COLOR FORMULA CHART

Name, number or letter given to new color	Sample of color *(apply s. mple in each square)*	Formula for color

THE ENVIRONMENTAL UNITS

Below is a list of the first titles in the Environmental Discovery Series. The ones with order numbers next to them are available as of August, 1972. The others are in preparation and will be available in the coming weeks. Also, ten additional units will be announced soon.

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Kathleen DiBlasio
Wendy Kay
B. J. Mitchell
Phil Nicholson
Tom L. Smith

MESF
Edmund Pray
Barbara Clark
Robert Collins
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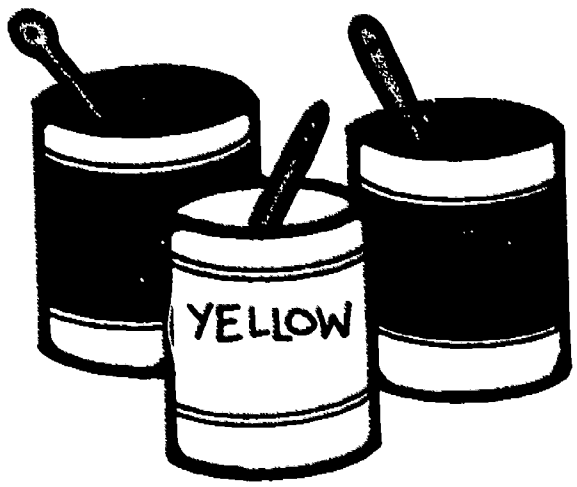

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