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SEVEN ASPECTS OF COLOR

Aspect 1  Theory

There are two basic theories of color in use from a pigment point of view which is the standpoint from which all artists regarded color up until the time of the Impressionist artists of the late 19th century. At that time, color as expressed by light and play of light in the realm of physics was introduced and the Physical Theory involving the shift of one of the primary colors was used. But this had then to be translated back to the Basic schemes to put it on canvas.

The most important and most used theory is known as the Six Color Theory which involves three primary colors: yellow, red and blue; three secondary colors: green, violet and orange; and six tertiary colors (see Figure 1).

The other theory is the Five Color or Munsell Theory involving five primary colors: yellow, green, blue, violet and red; and five secondary colors (see Figure 2). For the balance of this discussion the Six Color Theory will be used as a basis. Translation to the Five Color Theory can be done by any reader so interested.

The pure hues of the Hue Plane in Figure 1 are merely a slice of the color sphere cut through at the equator. A glance at Figure 3 shows the relationship between the colors at the equator to white (presence of all color) and black (absence of all color) at the poles. All the tints of colors lie between the equator and the white pole. All the shades between the equator and the black pole.

This tinting or shading of a color introduces another attribute in addition to the Hue. This attribute is called Value. In Figure 1, it can be noted that each color is diametrically opposed by its opposite color. As we transverse through the center of the sphere toward the opposite the starting point color is gradually dilute by this opposite color until at the center we have equal proportions of the two. This is the neutral point and is called gray. Actually this is brown in as many instances as it is gray. This transition comprises the third attribute of a color, viz., Purity. The Value and Purity scales of Red are shown in Figure 4. Green, being the opposite color to red, is necessarily involved in the Purity scale. Similar scales can be derived for any color by reference to their position in Figures 1 and 3.

In a Dictionary of Color by Maerz and Paul, these three attributes of a color are referred to as:

Attribute X—Value: Degree of tint or shade.
Attribute Y—Purity: Degree of grayness.
Attribute Z—Hue: The color itself.

Note: In physical analysis of colors by means of light and not pigment, the three primary colors are red, green and blue. For practical purposes, this, however, is not too useful. This is called the Theory of Color Sensation by physicists.

Aspect II  Harmony

To properly use colors we must have an inkling of their harmonious relationships. The system of Harmony evolved through the epoch of civilized man is fairly simple in that five basic patterns cover it for all practical purposes. Referring again to Figure 1, we see that each color is diametrically opposed by what we called earlier its opposite color. The combination of these two opposite or complementary colors constitutes a

![Fig. 1. Hue Plane — Six Color Theory](image)

(1) Primary Colors. (2) Secondary Colors. (3) Tertiary Colors.

Complementary Harmony as is represented in Figure 5. All the values and purities must be considered here too. If we go up the sphere to use a Tint of Red, its complement will be a Shade of Green, as the line between the two complements will always pass through the center of the sphere (Fig. 3).

A related Harmony is the Split Complement shown in Figure 6. Here a color is used with the colors adjacent to its complement.

![Fig. 2. Hue Plane — Five Color (Munsell) Theory](image)

(1) Primary Colors. (2) Secondary Colors.

Another variation not illustrated is the Double Complement wherein two adjacent colors and their complements (of necessity, also adjacent) are used. For instance violet and its complement yellow would be used with red violet and its complement yellow green (chartreuse).

One of the simplest of all Harmonies is the Monochromatic in which but one color with its tints, shades, and grayed tones is used. (Figure 7). White and black are often used in Monochromatic Harmonies to paint a garden picture. Three years ago, the first prize garden at the New York Garden Show was a complete garden with no color but green set off with white flowers.

The Analogous Harmony (Fig. 8) differs from the Monochromatic in that up to three neighboring colors together with their tints, shades and grayed tones can be used with the most pleasing results. For some reason, ana-

The final major Harmony is the Triad. The Triad illustrated in Figure 9 is called the Primary Triad as it is composed of the three primary colors which lie all 120 degrees one from the other on the Hue plane. The Triad composed of the three secondary colors—orange, violet and green—is often referred to as the Chinese Triad as it was a major factor in older Chinese art.
There are other Triads which are not quite as geometrically regular. One could use a Triad with yellow as one leg but substitute red violet for red and blue green for blue. But to venture farther away would lead to color clashes. Compressing two legs of a Triad towards each other leads directly into the Split Complementary type of Harmony.

Proper use of color also requires a balance be maintained. The complement of any primary color is a secondary color. It takes more of a secondary color to balance out a primary. For instance, equal blocks of red and green do not balance. The red will dominate. Careful additions to the green or subtraction from the red (this may be achieved by using a grayed red) is necessary here. The limits are not exact, however. Balance will be discussed again under another Aspect.

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All colors have strong psychological effects on people, some colors more so than others. Also some people are more sensitive to this aspect than others.

The complementary colors, red and green, are complementary psychologically also. Large amounts of red are tiring, large amounts of green are restful. Red is exciting to some of the senses. Green again takes the edge off our nerves and soothes. Red is harsh while green is soft. Nature is mostly green and most of us have seen much more green than any other hue. We take it for granted, whereas red is more unusual to us. It startles, shouts at us, and burns the retinae of our eyes. Red is hot and we feel uncomfortably warm in a red kitchen. Green is cool but a living coolness that is pleasant.

Blue is cool too, but a dead cool. Minute graduations of shading in blue suggest to us vast, cold, impenetrable depths like the deep blue sky at night. October’s bright blue weather does not seem dead because the blue is full of violet at that time of year.

Blue greens such as aquamarine and turquoise are cool and pleasant colors—enough green to suggest life and enough blue to suggest moisture.

Violet is used by many to suggest royalty, great solidity, and other allied sensations. In its tints and hues on the red side it can and does be-

Fig. 3. The Color Sphere

Aspect III Psychology

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Fig. 4. Purity and Value

some green yellows suggest illness to the point some people actually become nauseated. These same hues tinted properly are very restful and cooling to the same people. As we approach orange through the orange yellows, we are reminded of gold and opulence and all that goes with it. The warmth of the color increases and as we go into orange the opulence disappears and all is rather commonplace.

![Fig. 5. Complementary Harmony](image1)

**Aspect IV Chemistry of Color in Plants**

Color in flowers is composed of three basic chemical groups: anthocyanins, anthoxanthins and plastids. The most important of these is the anthocyanin group providing the reds, violets and blues which predominate in flowers. These are naphthalene ring compounds with a phenyl ring attached at the two position, the three basic compounds being: (1) pelargonidin in which the phenyl ring contains a hydroxyl group at the four position on the phenyl ring; (2) cyanidin in which hydroxyl groups are attached at the three and four positions; and (3) delphinidin in which hydroxyl groups are attached at the three, four and five positions. All three of these compounds exist as glycosides, i.e. in compounds with attached molecules of sugar. One of these sugar molecules is always attached at the three position. As sugar attaches at the three and five positions, the only other open to it is the five position, or to the sugar molecule already attached at three. An increase in the number of sugar molecules attached increases the blueness of the compound involved. These positions for glycoside attachment are on the naphthalene ring whereas the methyl substitutions next discussed are on the phenyl ring. Methylation consists of replacing a hydrogen of an hydroxyl group with a methyl radical. This increases the redness of the compound. As the para position is never methylated, no methylation is possible in pelargonidin while cyanidin may be methylated at the three position, and delphinidin at the three position or at both the three and five positions. Thus we have a range of twelve possible anthocyanins:

1. Pelargonidin 3-monoglucoside (scarlet)
2. Pelargonidin 3,5-diglucoside (scarlet-magenta)
3. Cyanidin 3-monoglucoside (red)
4. Cyanidin 3,5-diglucoside (crimson)
5. 3'-0-methyl cyanidin 3-monoglucoside (peonidin)
6. 3'-0-methyl cyanidin 3,5-diglucoside
7. Delphinidin 3-monoglucoside (blue)
8. Delphinidin 3,5-diglucoside
9. 3'-0-methyl delphinidin 3-monoglucoside
10. 3'-0-methyl delphinidin 3,5-diglucoside
11. 3,5'-dimethyl delphinidin 3-monoglucoside
12. 3,5'-dimethyl delphinidin 3,5-diglucoside (Malvadin blue)

The concentration of these materials in the sap as well as the amount and presence of other coloring materials are other variables which lead to the immense number of different shades, tints and tones which exist in flowers whose main source of color is anthocyanin derivatives.

The anthoxanthin colors are also sap soluble compounds of similar chemical structure. There are two basic groups of these: flavones and flavonals. Flavones have no hydroxyl group at the three position on the phenyl ring whereas flavonals do. These compounds also exist as glycosides in plant colors. The flavones are pale ivories and soft yellows, whereas the flavonals are richly yellow.

When no anthocyanin matter is present, anthoxanthins are responsible for the color entirely. In combinations with anthocyanins, flavonals blend and are equally responsible with the anthocyanin for the color, whereas a flavone acts more as a co-pigment and does not directly affect the color. However, flavones may intensify the blueness of an anthocyanin.

Plastids are insoluble coloring bodies such as carotene (orange) xanthophyll (yellow) and chlorophyll (green). No copigmentation with plastids is possible because of their insolubility. With anthoxanthins they help supply the color because of their similarity in color whereas with anthocyanins, plastids furnish only a background effect.

**Aspect V The Genetics of Color**

By using the materials of Aspect IV we may now set down a list of ten color situations possible in plants.

I. Increase of hydroxyl groups  
II. Increase of sugar molecules  
III. Increase in methylation  
IV. Increase in Ph  
V. Copigmentation  
VI. Colloidal condition

Of these first six, numbers I, II, IV, V, and VI increase blueness in anthocyanins while III decreases blueness.
Concerning anthoxanthins:

VII Increase in hydroxyl groups

VIII Mixture with anthocyanins

No. VII increases yellowness and alters the background color.

No. VIII leads to partial suppression of either one or the other.

IX Presence of plastids—white becomes yellowed to either yellow or orange and background becomes altered.

X Intensification of plastid type—yellow becomes orange and background becomes altered.

Each of the above factors is controlled by a gene or genes. One gene determines the presence of an anthocyanin, another the quantity of hydroxyl groups, still another the quantity of sugar molecules attached, and a fourth the methylation. Still other genes controlling anthoxanthin factors may cause co-pigmenting actions so it can be readily seen that the genetics of the color in a flower can be quite complicated, or as many as ten genetic actions may be involved.

Fig. 8. Analogous Harmony

Aspect VI Color in Garden Practice

It has been said that no single genus contains pure examples of all three primary colors. The genus Primula comes closer to doing this than any other. And with continued development of the blue strains, a real blue should be forthcoming. But for all practical purposes, Primulas at present do cover the complete color range, so a complete palette is on hand with which to paint ones border and garden. To use colors we must first think of Aspect III to set the mood or character of our border. Then by using Aspect II we can determine what color or colors to use together in harmony and proceed to lay out our planting plan. Here balance enters the picture. What background material will be in bloom with the Primulas? If high bloom is concentrated to one side of our plan, low massive heavy groups of plants in a heavier color will be necessary to give balance to the opposing side. Balance need not be symmetrical except in formal plantings. Variations in height and depth, in solidity of plantings and in dominance of colors concerned can be used to advantage to create asymmetric balance and a delightful informality. Such plans are never stiff and artificial appearing.

In the plant breeding plot, we should consider particularly the Aspects IV and V in an endeavor to breed for definite colors and increased clarity of color. The dominant character of a gene pair may be but one hydroxyl group in which the dominant color would be bluer than the recessive.

Fig. 9. Triad Harmony

Aspect VII Color Nomenclature

One of the most confused situations in horticulture is the nomenclature of color. No one set of standards has been adopted by the horticultural field as a whole. At the present time, in this country several specialized charts or systems are used for specific genera and the rest of the genera use one or more of the various other color charts on the market.

The American Iris Society has a simple system of number and letter symbols which determine a series of color ranges. Any Iris will fall within the confines of one of these ranges, but at best it gives only a hazy idea of the color of any individual clone.

The New England Gladiolus Society has a single sheet color card which is very inadequate even for Gladiolus and highly impractical for any other genera.

Koster's Color Guide, while very admirable in its looseleaf makeup, is inadequate in the number and range of colors presented, although many nurseries use it.

Ridgeway's has quite a range of colors but the naming is meaningless and the general background of the system faulty and outmoded.

The R.H.S Color Chart is very good, based on the Six Color Theory and indexed to this theory. There are two hundred, each with four color panels. These four panels are the color named and three tints of it. Sixty-four of these plates are of pure hues and are keyed with the color number, as 24. There are sixty plates of tints. In these the basic number is prefixed
with a 6.5 or less to indicate a tint, as 624. This indicates that the named color on the plate is No. 24 once tinted; 524 is No. 24 twice tinted, etc. The three lighter tints on each plate are also numbered /1, /2, /3 (lightest). There may be some overlapping between plates as 24/1 may be the same tint as 624. There are also 38 plates of shades in which the hue number is prefixed with a 7, as 724 if once shaded, 824 if twice shaded. The basic color of the remaining thirty-eight plates are grayed hues. These are prefixed with o (o24) to indicate once grayed, oo (oo24) to indicate twice grayed, etc. An example of this system is the eight plates making up the Magenta system:

Plate 27 Magenta—Pure hue
Plate 627 Magenta Rose—Once grayed
Plate 6027 Erythrite Red—Twice grayed
Plate 627 Fuchsine Pink—Once tinted
Plate 527 Rhodamine Pink—Twice tinted
Plate 427 Rose Pink—Thrice tinted
Plate 727 Tyrian Purple—Once shaded
Plate 827 Ruby Red—Twice shaded

The only disadvantages to this system are that the plates are furnished in a box-like folder which is awkward in the field as the plates blow away in all directions when a breeze is blowing. The other disadvantage is that only eight hundred color patches are included in all. One indisputable advantage of this system is the large size of each color patch and the fine numerical reference system.

This writer is required to use the R.H.S. Chart in work as that is the standard adopted for Lilies both in this country and Great Britain. However, given his choice, he would choose A Dictionary of Color by Maerz and Paul. This book not only has fifty-six plates showing altogether 6,912 color patches, but also approximately 150 pages of text on color which is very helpful. Opposite each plate of color patches is a similar ruled chart with the name of the color in the appropriate square. These squares are lettered across the page and numbered down the page and thus we have an indentifying number for quick reference to any color. For instance, Coral is found in plate 2, column 1, row 10 so it is designated as 2 1 10. As this dictionary is intended for all fields dealing in color such as textile dying, paints, horticulture, etc., a color name to be printed in capitals must be an accepted name in common usage. Names in italics are obsolete. Names in brackets are generic and names in parentheses are modern synonyms of the older name they accompany. Lower case names are in daily accepted use but not as frequently as those printed in caps. All names marked * have an explanatory paragraph in the section, Notes on Color Names.

* Mr. MacAlevy is in charge of Lily hybridizing at the Jan de Graaff bulb farms, and is chairman of the Society's scientific committee (see page 74). This article and future ones recording the findings of the committee are for the particular benefit of the members requesting material of a more scientific nature.

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COLLECTING PRIMULAS IN THE NORTHWEST
Dr. R. M. Bond, Portland

In 1950, I was fortunate enough to make four collections of native Primroses in Oregon, Idaho and Nevada.

The first two collections were made on a rapid tour with Mrs. A. C. U. Berry. We left Portland early the morning of May 9 in Mrs. Berry's car, and drove to Nampa, Idaho for the night. The next morning we drove to Gooding, and turned north into Camas County, crossing the county line along a range of hills. Near the foot of the grade, we stopped by a small stream and searched for Primula Brodheadae, but found only such flowers as shooting stars, Mertensias, yellows bells, buttercups and the beautiful Viola Beckwithii. After the best part of an hour we gave up, and drove a couple of more miles, out on to the valley floor. Here we stopped again, and there, all along the road, and back hundreds of yards from it were the Primulas. This was the easiest to reach of the dozen or so sites told me by Mr. J. H. Christ of Portland, who has long been a collector of the flora of Idaho.

The area where they grew was a heavy clay soil. It was dominated by a stand of scrubby sagebrush (Artemesia tridentata), with grass between the bushes. This is a site that must bake hard and dry in summer, though it was still saturated from melting snow when we were there. The area was used as a horse pasture, and had the appearance of long overuse, in that most of the grass was cheat-grass (Bromus tectorum) with very small amounts of two better perennial grasses, Idaho fescue (Festuca idahoensis) and scabland bluegrass (Poa scabrella). Mertensia, buttercups and yellow bells were still common, and the violets were even more abundant and more vigorous. The Primulas grew in full sun in the open and under the sagebrush apparently equally well. The flowers in the sun were smaller and deeper colored—a rich purple while those in the shade were larger and paler—some a clear, light blue. None of the plants we saw had any trace of farina on foliage, flowerstalks or sepals.

On the way back we searched in the sagebrush just over the line in Gooding County, and Mrs. Berry's sharp eye spotted a single plant, just past bloom, to extend the known range of the species into another Idaho county.

The next day we spent some fruitless hours searching the hills of Union County in Oregon looking for P. Cusickiana in the neighborhood in which Cusick first found it. We knew we were within two or three miles of where it has been collected much more recently, but either our directions were not detailed enough, or we were too late at this low altitude, and failed to find our quarry.

The fourth day of our trip we went into the Wallowa Mountains from Joseph, looking for a spot where Mrs. Berry had collected P. Cusickiana in past years. The spring, as you may remember, was late, and there was lots of snow. We drove as high as we could, parked the car, and walked on through the drifts. The country looked so different because of the snow and because of our being afoot, that Mrs. Berry could not lead us directly to our goal. I left the road and cruised the bare patches on the south slopes, and just as we were ready to give up, I stumbled
on the colony. A few hundred plants, in an area about 50 by 200 feet were just coming into bloom. The smaller, darker leaves, the uniformly dark purple flowers with petals tending to cup a little, and the farina on the calyces made this plant appear very distinct from P. Brodheadiae, though the two are obviously closely related.

The soil here was a medium loam, with much coarse sand and sharp stones, up to the size of a hen's egg or a little larger. The site was on a gentle south slope in open grass-land, surrounded by ponderosa pines. This site undoubtedly bakes out in summer, though it was then saturated from the snow melt, just as the P. Brodheadiae site in Idaho had been. Few other plants were up and out enough to identify, but there were a few yellow bells, shooting stars, buttercups and a Lomatium (or something close to it). The grass was scarcely starting to grow, but was fine-leaved, like a fescue.

We collected a few of the Primulas and staggered off through the snow back to the car. On the way home we stopped off in the Blue Mountains to collect some Syntheris missourica and Dicentra uniflora. We arrived at Portland a little the worse for wear, at about 2:30 the next morning.

The next week I had a meeting to attend in Idaho Falls, Idaho, and after finishing that assignment, I borrowed a car and headed on May 17 for "Birch Creek, Lemhi County" which is all the data given on a sheet of Primula incana, in the collection of Mr. J. H. Christ.

Birch Creek turned out to run through an area with a good deal of alkali in the meadows, and I kept going upstream trying to find more normal-looking Primrose sites, barely stopping to admire the magnificent displays of Phlox of at least three species. The stream left the highway and I followed it on a dirt road, past a couple of ranches, and found several beautiful, alkali-free meadows with lots of flowers but no Primulas. At one point the road crossed a fork in the creek, but my car did not quite do so. Nor could I back it out again. The water was deep and the bottom soft, so I started out afoot for one of the ranches. Here I was able to borrow a rather elderly pick-up and a chain. The only trouble with this arrangement was that the pick-up mired down in a place my car had passed through easily. This time I walked back to the other ranch and borrowed a tractor, with which I pulled out the pick-up and then my car. By the time all the mechanical equipment was back where it belonged I had walked about six miles and was tired and hungry, and decided to start back for Idaho Falls.

Back in the alkaline area, I stopped for a final look at one more meadow, and there, within fifty feet of the paved highway, were thousands of the tiny Primulas. They were growing in a bog of peat made up mainly of roots and grasses and sedges, along both sides of the stream. They were thickest right on the edges of the cut-banks overhanging the creek, a foot or two above the water. Primula incana is described as lavender, but the great majority of these were pure white, with just a few showing a faint tinge of pink.

Subsequent testing of the peat showed that it was almost exactly neutral, rather than alkaline, as it appeared to be. No other flowering plants were in bloom in the bog, though there were a few leaves that seemed to belong to a violet and some that may have been a shooting star.

The evening of July 21 Mr. Haley Houghton and I left Ely, Nevada, in a borrowed jeep and drove (eventually except for a flat tire) to the Blue Eagle Springs Ranch, where Mr. and Mrs. James G. Sharp put us up for the night. The next morning we got up about 5:30, fixed the spare tire, and started up Troy Peak with Jim Sharp directing us. This is the same peak that was twice climbed a few years ago by Dr. Worth, and well and fully described by him in the Quarterly (5 (1):13-14, 1947; 6 (1): 1-4, 1948). I will, therefore, not repeat any details of the day, except to state that the scramble from about 8500 feet elevation (where we left the jeep) to 11,000, where we found the Primroses, was a great deal farther than simple arithmetic appears to show. Also, our stop at the Primrose cliffs was made exciting by a band of nine mountain sheep passing within 100 feet of us. They were just as surprised as we, and much less pleased.

We got back to the Sharps' for a 10:30 p.m. dinner, and after dividing and repacking the plants, took off for Ely, where we arrived at 3:00 a.m.

We were lucky enough to find the Primulas barely past the peak of bloom, and still very showy. The flower color was surprisingly variable, ranging from pale blush (one plant) to deep purple rose (one plant). Most of the plants were some shade of lavender pink, though clear pinks of various depths were by no means rare. One plant with six-petaled flowers was found. The plants had had a better season than when Dr. Worth saw them and were somewhat larger than his description indicates.

The Primula, of which we collected several sheets in excellent condition, seems to fit very closely the original description of P. Maguirei as given by Louis O. Williams, in 1936, and has been identified as such by the University of California Herbarium.

Specimens of other plants mentioned by Dr. Worth, but not named, were also determined by the Herbarium of the University of California as follows: the creeping Pentstemon is P. Keckii; and the multicolored Columbine, called an aberrant form of Aquilegia scopulorum by Dr. Worth, was considered to be A. macrantha.

Plants of Primula Brodheadiae and of P. Cusickiana matured seed and shortly died down even though watered, according to their habit. Since there has been some doubt as to their distinctness, I cross-pollinated them, but no seed was set either way. This is hardly conclusive proof that they will not cross, and if both bloom again next spring I expect to try it again. Pots, or rather cans of P. Brodheadiae were kept in a dry basement and given no water at all for three months after they had gone dormant. They were put outside in the rain November 1, and within a week had sent up a few leaves.

The farinos P. incana was potted in a peaty mixture and kept wet. It went through the summer in good condition and has (November) formed typical winter buds. P. Maguirei stayed green till October, when the tops died down. I imagine that, contrary to Dr. Worth's supposition, it acts the same way on its native cliffs, at least in years when summer moisture is available.
Two great changes will mark the 1951 show. First, the show will be held in the Tourist Information Center, 1020 S.W. Front Street (which, as Portlanders know, is on the west bank of the Willamette River) instead of at the Masonic Temple as for several years past. Second, there will be no admission charge.

The light at the Information Center is much better than that at the Masonic Temple, and the marvelous Primrose colors will be seen in their true values. At the same time, the space is much smaller, so it will be impossible to show either miniature gardens or garden club exhibits. Of course, garden club members are warmly urged to enter Primroses in the competitive classes, which will be the main part of the show.

Prizes will be about the same as last year, and just as easy to win.

Dates of the show will be Saturday and Sunday, April 14th and 15th. It will be open to visitors from 9 A.M. to 9 P.M. on Saturday and from 10 A.M. to 8 P.M. on Sunday.

Entries will be received on Friday, April 13th (this day being unlucky only for sailors—don’t come by boat) from 1 p.m. to 7 p.m. Judging will begin at 8 p.m.

—R. M. Bond, Chairman

One of the many trophies to be won at the Tenth Annual Show, a Reed & Barton silver pitcher for the best amateur seedling, Mr. Lewis J. Cullen, member from Staten Island, New York, is offering a Haviland Primrose plate which he suggests be given either to the man who sweeps up after the show or the girl with Primrose-matching eyes.

Primroses are so beautiful that I can’t see why everybody doesn’t have them—or at least try them. They seem to fill a need in their season that nothing else can.

My own experience with them began four years ago when I set out a plot of Polyanthus seedlings. As my past experiences had been none too good I wasn’t expecting anything miraculous. However, I know now that it was more from improper location than anything else as I had the plants in an open border in full sun and exposed to every whim of weather.

These seedlings were planted in a bed with an eastern exposure with no sun after 11 a.m. Aside from watering, I gave them no special attention. They seemed to like this as the following spring they bloomed for six weeks or more. Some florets were almost two inches across although the majority were somewhat smaller. One bloom stalk after another kept coming and were progressively taller. At first they were four to six inches but by the end of the blooming season many were eight to ten inches in height and as thick as a lead pencil. The colors were fine ranging from white through yellow, pink, mustard, brick to deepest red maroon with a velvety nap.

During the winter I let the tree leaves mulch them and they did very well. However, this past winter I felt I made a mistake. Having read where leaves should never be allowed on the plants as it promoted rot I raked them off. In a few days the temperature dropped to near zero with high winds. After an unusually mild early winter (1950) this alternate freezing and thawing continued until early April. The mild weather earlier had produced fine leaf growth and the plants looked wonderful, but after a week of near zero all foliage was burned off with only a tiny rosette of pale green at the crown. I tried mulching some valuable specimens with sphagnum moss but the damage was done. A number of new plants and newly set divisions were completely killed and some of the old plants were partly or entirely killed. Those that came through the best, strangely enough, were the plants under mats of chickweed I hadn’t removed in fall, those still under leaves, or the ones shaded by shrubbery. All were sheltered from the full force of the wind. The fact that we were completely without snow cover at any time undoubtedly accounted for most of the losses. In my experience this is the first winter we have had such conditions and from what I read it was bad all over the country.

When April finally arrived I wasn’t expecting much from the Primroses. Large plants the year before had two or three rosettes of leaves, many only one. However, one day as I was enjoying the first crocus I noticed a tiny flower of the most beautiful blue on one of the Miniature Blue Polyanthus. Things immediately looked brighter and in a few days the Julianas were coming into bloom. Following them the Polyanthus began and before the season was over some plants had a dozen bloom stalks. As one faded another appeared. To have seen them a month before you wouldn’t have thought any could have bloomed.

I have been growing P. japonica only two years but they came through
well with every plant blooming. These were mulched lightly with leaves planted as they were among the holly trees. Two years ago I saw my first P. japonica in the garden of a friend who specializes in pink Iris. We had come to see the Iris but a large colony of pink and white Japanese interested me more. She was trying her luck crossing them and had the pollinated plants draped with white net. My first thought, seeing them, was a bridal procession. They were doing very well in the shade of a magnolia tree. The P. japonica overlaps the Polyanthus somewhat and continued the blooming season into June.

The weather this spring (1950) may have helped them. For the most part it was cloudy with lots of fog and drizzle so they never suffered from lack of water and the temperature was always cool. The blooms last much better than they do when the weather is hot and overly windy.

We have a large collection of Narcissus and every spring have many visitors to see them. Lately, however, more have enthused over the Primroses than the Narcissus. Also it is surprising to see how few people know there are blue or double flowered types. These are our special favorites and some day we hope to have a large planting of them.

Our soil is principally clay loam and I have found Primroses do well on it provided they are sheltered from winter sun and wind and have a light mulch of some non-packing material to prevent heaving. Also they should have shade from the hot mid-day sun in summer. Morning sun doesn't seem to bother them. I have seen plants exposed to continual sun wilt day after day while those in more favorable locations remain fresh and crisp.

In naturalistic situations in association with evergreens and ferns, they look very fine and their blooms are displayed to best advantage. One garden I know has them excellently planted. In shade at the foot of a low mossy rock wall among ferns they are growing, with massed Azaleas, Mountain Laurel and some Hemlock above the wall.

Try a few Primroses and soon you'll be looking forward to them every year and wondering what you would do without them.

Onondaga, New York 1950 Show

The Onondaga Primrose Society has a constitution which provides that every member must exhibit at the annual show, their first show had 115 entries. A wealth of good specimens of the Vernales Section including Acaulis, Polyanthus, Julianas with a sprinkling of Auriculas and Denticulas were on display, and the first Primrose Show goes on record as having been a success for the Society as well as a pleasurable revelation to the many visitors.

TROPHY WINNERS, NINTH NATIONAL PRIMROSE SHOW

After reading Mr. MacAlevey's article on the Seven Aspects of Color it is with some hesitancy the following report is made on plants winning trophies at the Ninth National Primrose Show held in Portland, April 22 and 23, 1950. Now it is not certain whether the Polyanthus which won for Mrs. Florence Bennett the Marguerite Clarke trophée—a large copper Chinese bowl—was really salmon, so-called salmon or something quite removed. However, in all seriousness, it was a beautiful specimen.

Mrs. Helen Jones' new light blue Juliana won Mr. Henry Wessinger's silver shell for the best blue, and a well grown pink Acaulis, raised by Mrs. C. Y. Griffin, took the KPOJ (The Journal) cup. A green edged house-in-hose Auricula (pictured on page 3, July 1950 Quarterly) entered by Mrs. John L. Karnopp in the Rarities and Oddities Division was awarded Mrs. A. C. U. Berry's Spode Auricula plate, and the President's trophy for the best commercial seedling went to Barnhaven for a Chinese red Polyanthus, as did the Lawrence's silver plate for the best Gold Lace Polyanthus. The silver tray offered by Mrs. S. R. Smith for the most points in Division X (Best Display of One Variety) was won by Mrs. Robert Johnson, and the best Miniature Garden won for West Hills Horticultural Society Roy & Molin's silver shell.

Exhibitors with specialized interests added materially to the beauty and interest of the show. Mr. Carl Starke is recognized for his work with Sieboldis and his pan of Southern Cross seedlings won the Bradford Trophy given in memory of the Society's first president, Capt. E. S. Bradford. Dr. M. C. Riddle, known for his interest in miniatures, won both the Torpen and Barnhaven trophies for the best Juliana (rose-tile of Polyanthus habit) and the best amateur seedling—another Juliana, apricot of cushion form, Mrs. Carroll S. Higgin's' (1949 and 1950 president) pride in Auriculas was acknowledged by the Lois Land cup for the best garden Auricula (which was some delicious shade of pink) in addition to her winning sufficient points to receive the Robert Ewell silver vase awarded the runner-up to the sweepstakes winner. This honor went to Dr. R. M. Bond, largely because of his enthusiasm for Auriculas which did much for that Division. The well-and-tree platter for sweepstakes and an engraved silver tray for runner-up in the Auricula Division were awarded Dr. Bond.

Braeger's Oregon Seed Store trophy was won by the Little Gardens Club with a jewel-like display of six Acaulis; Mrs. Ben F. Smith won Dr. Riddle's cup with Primula kisoana, considered the best species in the show, while Mrs. Henry Lucas of Chehalis, Washington was awarded the brass flower holder offered by Helen's Primrose Gardens for the best Denticulata. For the best out of state entry, awarded Mrs. Nora Norris of Ethel, Washington for a vermillion Polyanthus, the Allen Davis cup; and Mrs. O. J. Zach's Alaskan copper pitcher went to Mrs. Henry Savery for most points won by a novice, or first-time, exhibitor. A pot of Cowslips, so well grown and charming in their fragrant simplicity, entered by Mrs. Henry R. Johnson of Beaverton was given a copy of Corsar's Primulas in the Garden as a special award.

Mr. Lawrence's Lessons from the 9th National Show in the July, 1950
issue sketches the beauty that was there but without special reference to the complimentary displays which added immeasurably to the educational aspects as well as the beautiful. Mrs. A. C. U. Berry’s large, and now traditional, complimentary exhibit included four native Primulas which is something of an achievement in view of their generally difficult personalities, Primulas specuicola, Cusickiana, mistassinica and laurentiana. The green, grey and white edged Auriculas attracted the usual expressions of disbelief, while the yellow, red, purple and black selfs were admired. Her new crimson, yellow, rose, purple and tangerine double Prim-roses were a torment to those with acquisitive natures since they are quite unattainable. Mrs. Berry used silver baskets brought from Mexico City filled with Magnolia stellata, white Narcissus and Tulips as background material.

The Ben Torpens of Woodland Acres brought Juliana’s Garden Delight and Dorothy, P. rosea grandiflora and Gold Lace Polyanthus, each massed in its own individual container. Their alpine Auriculas were truly superb, of great richness, both light and gold centers, in shades of burnt orange, red, purple and brick. The Xydens of Primrose Path Gardens displayed fourteen choice garden Auriculas of all shades with delicate skill in an old split basket which seemed to provide the exact mood for their best enjoyment.

Mrs. M. A. Lawrence, General Show Chairman, and Mr. Lawrence brought tile pans—each pan planted to a single species or variety — making an outstanding contribution to the pleasure and education of everyone. Primulas kisaoana, frondosa, Sieboldis in rose, lavender and white and a pan of Southern Cross of the snowflake patterned petals, Hose-in-hose (a pan of blue and a pan of scarlet, yellow and crimson) in addition to a large, splashy box of cerise, pink, salmon and crimson P. obconica.

Linda Eleckman brought two flats of garden Auriculas from Newberg, Dora Broeije, red and yellow shades of Hose-In-hose, and Mrs. John T. Wiley, a flat of gift Polyanthus from the Netherlands.

The Educational Table, in charge of the Study Group, displayed old forms which included Jack-in-greens and a Jackanapes; the differences in Julanias and Cinderellas, and in the three kinds of Auriculas (show, alpine and garden) with the species Auricula, Candelabras, tender varieties and seed pans in various stages completed the exhibit.

The Amateur Seedling Division was especially well populated with superlative plants and it is a disappointment that the listing of each exhibitor and his exhibit cannot be undertaken. Nor is it possible to list the many ribbon winners. But the Society does thank each one, with a special note of appreciation to Mrs. J. C. Lamb of Lexington, Kentucky, for her air mail entry, for making the 9th show the biggest and best to date.

Selecting and Forcing Plants for the Show

In selecting Polyanthus for exhibition, look first to plant habit. No matter how beautiful the flower may be, if not held in a comparatively compact, symmetrical cluster, well bloomed, on a stalk stout and sturdy enough and of sufficient length to display the florets to advantage, the plant is of small value in the garden and less on the show table. Good balance is the proportioned relationship of umbeled stalk to foliage, the latter indicating the type of care given. Near, compact, well groomed foliage, adequately fed but not over-stimulated is the perfect setting for the flower parts. Fifty of the hundred points are allotted plant habit: full, compact, symmetrical, 10; sturdy, round and proportionately tall stalk, 20; disease and pest-free foliage, generally well grown, 20.

To the form of flower, the remaining fifty points are given and the first consideration of the exhibitor and judge is clear, rich color and substantial texture, 15 points for each or thirty of the fifty. Polyanthus with moderately large florets have been awarded prizes probably as often as the super-jobs for the reason that only 10 points are allotted size of blossom, the other attributes being considered of more value. However, a truly giant-flowering Polyanthus, handsome and balanced in all its parts is a beautiful sight in the eyes of the judges as well as visitors. A bright central eye, untinged with ground color, or selfs that are without yellow centers, count five points as against clouded eyes. Florets, of course, should be fully open, 2 ½ points; and since thrum eyes (those with anthers projecting from the throat) present a more complete and satisfying appearance at close range than pin eyes, 2 ½ points are given this short-styled form (see page 46, January, 1951 for description of long-styled and short-styled forms.) (In answer to numerous inquiries, thrum is a term used by weavers to indicate the ends of the warp-threads left unwoven and remaining attached to the loom when the web is cut off, hence a fringe. The term was first applied to various structures in plants and animals in 1812 and in Primulas describes the boss of anthers or ‘thrums’ at the top of the corolla tube in the short-styled forms.)

After murderous winters which retard Polanthus, as this last one, Auriculas often come to the fore earlier and provide extra material for the

(Concluded, page 72)
Thinking back, I have been growing Primroses for a great many years but with just here and there success and not much encouragement from others, for when people saw them they did not overwhelm me in their exclamations of how pretty they were because they hardly knew Primroses except the most common types.

From time to time I would gather enthusiasm from articles in English garden papers. They would be complete enough as articles such as The Raising of Hybrid Asiatic Primulas but not enough to go on as I had to find the seeds and plants mentioned. And if I did find seed it was generally too few or too old.

One high spot was around 1928 when Watkins and Simpson of England sent a Mr. Holmes to America. He said Primula helodoxa was the most talked of in England and that they had good seed. I got some in May, planted it outside in a cold frame and had wonderful results the following year with flowers of rich golden yellow in tiers on slender two-foot scapes. I must have had them in the right place near the hose, as they did well and lived up to their name as one of the best Primroses in cultivation.

After that, a number of dry years came on and it was not until I began to get nicely illustrated Primrose folders from the Pacific Northwest that I could get fresh seed and learn more about the possible species to grow. The war being over, I also had more time and the Polyanthus strains seemed to get my attention. I was encouraged to produce the larger flowers and the wide range of delicate colors spoken of and find the results of the hand pollination. I took more pains to select the site as to shade and freedom from tree root crowding, and to get the soil rich in humus. Also to have them within easy reach of the hose. In doing this I found that seed planted in February and March, indoors, was the best for me as they did not get a check at any time.

About this time I joined the American Primrose Society and began to take even more interest and gained enthusiasm from each issue of the bulletin. I decided it was not impossible to grow the nicer Primroses in Ohio with our legend of hot and dry summers. It could be done if conditions were right. The specialized advertisements in the Primrose bulletins helped me get the seed I wanted—and fresh seed—so gradually I kept on trying. P. cashmeriana (denticulata) got to be easy. P. japonica grows wonderfully and I am gaining with Auriculas.

In April, 1948, I read with interest of the activities of the Akron, Ohio group. They had had their first exhibit in May, 1947 and "The visitors had never seen before such hardy Primroses and could not believe these plants grew out-of-doors, and their immediate reaction was a bid to buy everything in sight. The exhibitors were relieved to get their Primulas safely home once more."

In the fall of 1949 and spring of 1950 groups of men from the Toledo Men's Garden Club drove to Akron and viewed these Akron Primrose gardens with much interest. One of the most outstanding of them all was the garden of Mrs. L. D. Slusser, their president. It seems to have been a large bowl, 150 feet wide and 20 feet deep, well-drained but with the capacity to hold moisture. Overhead were a few large elms with just enough shade and the roots seemed to be somewhere else rather than crowning the Primroses and associated plants. There I saw many of the Primroses I had tried and failed with—Primula Sieboldii did well for her as did Auriculas and Japonicas. Mrs. Slusser seems always in a giving mood and offered us some of anything we admired. I told her about a nice batch of Postford's White (P. japonica) I had ready to bloom and was able to give her the Scotch source of the seed, so she now has a good start.

With all these helps and the help of K. C. Corsar's book, Primulas in the Garden, I was able to understand a little more about the sections of the genus Primula, but not too well as it will be only the species I work with I will know.

The season of 1950 seemed to be my best learning and growing year. I was able to get good seed of just about all the better known species and by avoiding some mistakes as to aspect, soil, proper shade and root-free ground, in addition to having natural rains, I have succeeded in having a quantity of interesting species and strains. These I will list in order of the easiest first: Several good strains of Polyanthus, Denticulata does well but too early for people to see it, Japonica—both Etna and Postford White—Julliana hybrids in separate colors, Rosea and Poisson, Gold Laced Polyanthus, Auriculas, Helodoxa, Cockburniana, Pulverulenta, Sikkimensis, Microdontas both alpica and violacea, Bulleyana and Burmanica. These are sure to bloom well next season as they are all large and in good health. I feel that August is the worst month for Primulas here. There are about ten more species I tried with only partial success and feel that some of these been left in the flats they would have been alright.

This last August I received some Julliana hybrid seed from Wisconsin which resulted in plenty of seedlings looking for all the world like Violas. In August I also planted some Dutch seed which germinated quickly and which I expect to carry over in my cool greenhouse until February. One nice thing about having my name in the Primrose bulletin as a member, I seem to be kept informed by many interesting growers.

Bremerton, Wash. Primrose Show, April 14th and 15th

The Seventh Annual Primrose Show sponsored by the East Bremerton Garden Club will be held April 14th and 15th in the Sheridan Park Community Building which furnishes a perfect inside setting for the show's theme "Garden Treasures." The show chairman, Mrs. Vere Farmer, announces that exhibits in horticulture, flower arrangements and corsages are competitive and open to any amateur whether a club member or not. Other divisions and commercial growers exhibit by invitation only. A larger attendance is expected than the record 4000 of last year.

Fourth Annual Primrose Show, Kirkland, Washington, April 20, 21, 22

The dates of April 20, 21 and 22 have been chosen by the Eastside Garden Club for their Fourth Annual Primrose Show to be held in the Civic Center, Kirkland, Washington. Primroses on Parade is the theme for 1951 presenting Primroses from the viewpoint of practicality as well as beauty. Mrs. Albert Brauss is general chairman.
LETTERS TO THE EDITOR ON SEEDING FROM W. E. DASSONVILLE, SAN FRANCISCO

Feb. 8, 1951

My answer to you was purposely delayed as I wished to first try an experiment with the seeds, and since it is a great success you may be interested. At least it seems a success to me to germinate every package of seed in six days. To me a seed has germinated when it splits and shows root formation. The first two leaves I consider a later stage than the germination.

In this experiment, where I differed from you is in the use of hot water for I know that when you use water on earth there is a very great falling off in temperature—your 120 deg. is markedly less in a few moments so what I did was to use boiling water very freely before sowing the seeds and immediately cover the seed box with glass and let it steam with a thermometer inserted upright in one corner, the depth (1/2 inch) was the height of the mercury. When the temperature was from 120 deg. to 105 deg. the seeds were sown and dry glass put over the box. The glass rapidly steamed over and the fall in temperature was very slow. Each seed variety had its own box and the temperature recorded. The reason I used from 105-120 degrees was that I did not know what the result would be from the prolonged heating and steaming.

Here are the details if you wish to check. All seeds treated the same (excepting temperature). Seed pan a shallow aluminum cookie sheet about 10 x 14 x 1/2" containing a wood frame of 1/2" redwood 3 1/2 inches high with about one inch of gravel in the bottom. This was filled to the top and leveled with one part sandy loam and two parts rotted leaf mold. A small piece of rough towel was placed on top to break the force of the boiling water which was poured on until it flowed freely from the pan. The cloth was then removed, earth patted gently to flatten, finely-sifted leaf mold was scattered lightly on top so that the roots could establish easily. It was at this point the box was covered and the thermometer inserted and temperature permitted to fall slowly.

After the seed were scattered the surface was pressed down. Now that the seeds are germinating, and can be seen, they are very much on the surface, especially one box over which I have just very lightly sprinkled sifted leaf mold.

Here are the details of the freezing procedure used on the seed prior to sowing. Each packet was transferred to a small phial and about 1/2" of water added. To my surprise only about half of the seed sank and the balance floated. These were frozen solid for eight days during which they were thawed twice. Then the seeds were washed out into a saucer, drained and planted as soon as dry . . . in about 30 minutes.

Seed boxes were kept in basement with a day and night temperature of 68-70 degrees.

Feb. 20, 1951

In answer to your inquiries, I have just examined the boxes and they are coming along fine, with the Belled and Candelabras having the highest germination. It would appear that at least 75% of the seed is in full swing, the actual growth is approximately 1/8 of an inch.
Actual temperature when sowing the seeds on February 2nd follows:
Bellad Primulas 98 deg. temperature of earth when seed was sown.
Candelabras 110 deg.
Polyanthus, 104 and 108 degrees. Auriculas, 106 degrees.
Each variety of seed had its own pan and all had germinated when I
first wrote on February 8th.
My snap judgment is that 110 deg. is high enough if the pans are cov-
ered immediately after sowing and permitted to cool at room tempera-
ture after sowing. The glass covers came down tight on the box so the
steam couldn’t escape.

(Continued from page 67)
show usually set to catch the peak of Polyanthus bloom which ordini-
tarily precedes Auricula season by several weeks. If Auriculas respond to
artificial light as do Polyanthus—and there seems to be no reason why
they should not—it could be as much an Auricula as a Vernales show. By
lifting the plants to be exhibited, potting and placing where they get the
most natural light, supplemented by artificial light in the early morning
hours, they will probably develop as rapidly as Polyanthus. In using arti-
ficial light, judgment should be exercised. All-night exposure to light
results in spindly growth. An article covering experiments with artificial
lighting is scheduled. Garden Auriculas, like Polyanthus, are used for
bedding purposes and are selected for the same characteristics. Judging
score on page 46, January, 1946.
Show Auriculas, described page 45, same Quarterly, are judged accord-
ing to the R.H.S. standard given there; Alpine Auriculas, also judged by
the R.H.S. score, given page 62, April, 1950.
With the advent of new Juliana forms, the score as it now stands is
considered inadequate and will shortly be revised to more nearly fit the
needs. Miniature foliage is the first requisite of a true Juliana and 25
points are given; floriferousness, 30; 25 for clearness of color and eye
and 20 for cultural excellence. At present, no points are given for new
and unusual color breaks, so that a very large clump of any established
named variety undivided for years and consequently a mass of bloom
takes precedence over an unnamed seedling no matter how remarkable
the color or form if the new variety has not had the advantage of several
years growth. However, the Juliana division in this year’s schedule has
been changed to provide separate classes for named and unnamed vari-
eties.

The major charm of Acaulis is a mass of bloom held well above the
foliage and score is to be found on page 46, January 1946.
The reduction of color classes in this year’s schedule seemed expedient in view of the comparatively new judging practice of giving duplicate awards in any class in which exhibits are deemed to merit them. All plants of award quality are given ribbons at the discretion of the judges and this eliminates any comparison of color values.
Again this year there is no limit to the number of entries by any ex-
hibitor in any class, a rule which works to the advantage of both the show and exhibitor.
Following selection, of course, is the preparation of your plants for
exhibition. This is a simple but important procedure and is outlined on
page 69, April 1949 and on page 59, April, 1947. —Florence Levy

Dr. Robert A. Wise

It will be seen from the above partial list of activities that the Society intends to increase its contribution and service to all primrose devotees. The members can aid materially in the program by proposing their friends for membership in the American Primrose Society.—Robert A. Wise, M.D., President.

Report of the Editor
Without the unflagging interest and support of the members, the completion of eight volumes would have been impossible. It is hoped that future publications can be designed for the pleasure and benefit of our oldest as well as our newest mem-
ers, and your remarks, criticisms, suggestions and requests, either to the secre-
tary or this office, will encourage a live medium of expression for the entire mem-
bership. There are a few requests for articles yet to be satisfied, but none will be
overlooked. If there are articles especially pleasing to you, and there is time for a
postcard to the secretary, contributors are always happy to know their work is
enjoyed. It is also an excellent guide for the editor.
Florence Levy, Editor
TREASURER'S REPORT

Balance, January 1st, 1950 $ 760.48

RECEIPTS:

Memberships and subscriptions 1,105.55
Show receipts $711.21
Sale receipts 132.06

Less show expenses 843.27

Show credit balance 97.53
Balance on Corsair books sold 11.29

Total Credits $1,974.85

DISBURSEMENTS:

Quarterly Printing $1,285.45
Less ads $278.00
Sales 94.80

Cost of Quarterly Office Expenses 892.65
Secretary 168.24
Incidentals 52.71
Slides and pictures 60.00
Advertising 70.55
Auricula Yearbook balance, due to loss in
mails, etc. 6.75
Leaflets 39.40

Total disbursements $1,470.30

On hand, January 1st, 1951 $ 504.55

Members and Functions of Scientific Committee

Mr. George L. MacAlevey, chairman of the scientific committee, announces that the general purpose of the committee is to present genetical and chemical factors in plants, particularly Primulas. Dr. M. C. Riddle, serving as morphologist, will further the establishment of chromosome counts within various species and hybrids; Dr. R. M. Bond, as plant pathologist, will analyze and endeavor to prescribe remedies for various fungi and virus diseases Primulas are heir to; Mrs. Florence Levy as taxonomist to assist in the establishment and verification of Primula nomenclature. A statistician is yet to be named for the purpose of analyzing the findings of the committee both through research and questionnaires.

Chairmen of Standing Committees for 1951

Program, Mr. George L. MacAlevey. Membership, Mrs. E. C. France, Jr. Public Relations, Mr. Paul K. Hutchinson. Hospitality, Mrs. Lou B. Roberts. Scientific, Mr. MacAlevey. Slide Librarian, Mrs. Robert O. Boyd. Tenth Annual Show, Dr. R. M. Bond.

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