Primroses

THE QUARTERLY OF THE AMERICAN PRIMROSE SOCIETY

SPRING 2005 VOL. 64 No. 2

Breeding at Barnhaven

Easy European Primula

2005 National Show
The purpose of this Society is to bring the people interested in *Primula* together in an organization to increase the general knowledge of and interest in the collecting, growing, breeding, showing and using in the landscape and garden of the genus *Primula* in all its forms and to serve as a clearing house for collecting and disseminating information about *Primula*.

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Perhaps the tiniest primula at the 2005 National Show was this *Primula magellanica*, remarkably the only primula native to Patagonia in South America, and the only primula known to grow south of Mexico.

Primula magellanica, grown by Joseph Philip.

PRIMROSES • The Quarterly of the American Primrose Society

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Editorial DEADLINES
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American Primrose Society Spring 2005

**President’s Message**

**ED BUYARSKI**

Welcome primrose growers and friends! As I write this in May, Alaska gardens are blooming with primroses and other spring flowers and the days are long. This is what we wait for during those short gloomy days of winter when we catch up on our sleep. The unusually consistent (for Juneau) snow cover has resulted in the best overwinter survival and flowering of perennials I’ve ever seen. Of course last summer’s sunshine helped those plants store more nutrients in their roots to help make this happen also. After a three week stretch of dry weather we’re getting some needed rain but of course the weeds are thriving along with our cultivated favorites. I even have plants from seed I gathered in Kotzebue, Alaska (P. nutans) about to bloom along with *P. egaliksensis* from near Glacier Bay.

My wife and I recently returned from the National Primrose Show at Tower Hill Botanic Garden near Boston. This was a beautiful location to hold the Show and I understand that they and the Daffodil Society would like future shows to happen there. It was a good mix of flower enthusiasts who got to see lots of primroses and daffodils and learn from each other. I enjoyed walking around the gardens there in some nice Juneau style weather (light rain) that the local folks kept apologizing for. During our 350 mile tour of gorgeous
Connecticut gardens we also saw what incredibly fertile rock growing soil you get to deal with. Obviously a great place for rock gardening! I am glad that we had a comfortable bus to travel to the gardens so I didn’t have to drive either.

The show speakers were well received by the crowd and Angela Bradford was awarded the Dorothy Dickson Award for her years of work promoting primroses and supporting APS. She and her husband were a lot of fun to talk about their nursery operation and conditions in France. Over 200 plants were benched and a fine selection were judged worthy of ribbons and trophies.

We all need to thank Elaine Malloy and the members of the New England Chapter for the work that they accomplished to bring this Show to completion! I want to thank Rodney and Betsy Barker for putting us up and Matt Mattus and Joe Phillip for the great meal and social evening before the Show. Congratulations to Amy Ohmstead as new leader of the NE Chapter also.

Now for the controversial part. When we found out that many people in the Northeast were not able to vote because the Quarterly did not reach them in time, the Board voted to nullify the election results and have a new ballot appear in this Quarterly with a new postmark deadline. Additional complications include Vice Presidential candidate Robert Tonkin asking to have his name removed from the ballot and Board member Paul Dick resigning due to work pressures. So now there is room for three Board members to be elected and Judy Sellers has agreed to be on the ballot running for Vice President. Please vote.

So take good care of your plants, divide and prosper and start gathering seed for our next Seed Exchange.

I've dreamed of owning an alpine house ever since I was a kid. Now, with my new interest in Primula, I've been on a road of discovery searching for a suitable alpine environment. Two years ago I set out on a journey to find an inexpensive alpine type house in which to grow Primula as well as bulbs, Saxifragas and other potted alpine treasures. What I found thus far is that there is very little information available on alpine houses found in North America. One is more likely to find information pertaining to those houses that are in Great Britain. In fact, there are very few alpine houses in this country, and it
appears for a very good reason: unless you live in the Pacific Northwest or in
the high mountain states, most of North America is either too sunny or hot and
humid in the summer, and/or too cold and damp in the winter.

Thus, I have set on this experiment to redefine how we grow alpine plants
in America, at least in the North East, well, at least in central Massachusetts
where I live. In the next few issues, I will update what I have discovered
regarding Primulaceae and other alpines under glass, as well as share with
you my successes and disasters, because believe me, there have been both. I
courage you all to share with me your thoughts and history with this same
subject, and maybe together, we can compile enough information to redefine
how we grow more precious alpines under glass in America.

I know of few true alpine houses in the U.S. that can be maintained success-
fully. I am basing my tiny experiment on a much larger version at the New
York Botanical garden. This semi pit house has removable glazing panels, so
that the sides can be removed during the hot humid summer, but the roof can
remain to protect the crowns of the plants in the sand plunge. This was a fea-
ture that I would need, since summer temperatures in Massachusetts can reach
a high of 100 Degrees F (38 C). with near 100% humidity. Good air circula-
tion would be a critical feature to add to my design.

I settled on a small hobby house, which I found available on a Danish web
site. Hardly a true alpine house, this tiny greenhouse met all of my require-
ments of low price, (well under a thousand dollars) and aesthetically attrac-
tive. It is shipped with the ubiquitous twin wall channeled plastic and pre fab
aluminum, but at least it was painted green. A house like this can be found
easily in most mail order greenhouse catalogs, and, best of all, it was easy to
assemble, arriving as a kit in a box. It was assembled with the aid of a friend,
some beer and a screwdriver on an August afternoon during a barbecue. I
was now imagining a life filled with buns, tufts and perfectly potted domes of
crusty alpines in full bloom - plant orders were placed for fall delivery.

I chose not to buy a heater since I have a large glass greenhouse where I
grow more tender plants. The plants selected for this house are hardy and
can freeze. My research led me to some basic requirements that most alpine
houses needed: excellent air circulation; cold, even temperatures during the
winter and the spring; and protection from the wet weather. Since it seems that
most alpine houses are in England, my biggest challenge was trying to find
information that was applicable to our more variable climate in the States. To
address the ventilation problem, I installed in the roof an extra roof vent, and
the sides can come off for the summer.

Here in Massachusetts, providing the cold temperatures would not be a
problem, but I still had many questions that I could not get answers for, such
as: How cold can I let it go down to in the winter? Should I use heating cables
buried in the sand in the plunge beds? Should I move the plants to an outside
plunge in the summer, or can I leave them in the alpine house? How hot can it
get in the summer? Clearly this is going to be an ongoing experiment.

As many of us know, the biggest challenge would come in summer with the
heat. I hoped to solve part of the problem with a creative site for the house,
one that would capture the shadow of our two story house after about 1:00
PM in the summer, and about 11:00 AM in the winter which would help keep
it frozen. An alpine house for alpine Primula must keep the plants cool and
semi-shaded in the summer, and in the winter keep them well frozen with
no thawing. Easier said than done in most cold frames, but this small house
worked perfectly. I was able to keep the roof vents and door open all winter,
except during blizzards. On sunny cold days, I could start grooming plants in
the 32 degree atmosphere. Some Androsace bloomed all winter.
In April the house was draped with a 60% mesh shade cloth which was clamped to the outside frame to protect the new growth. As days became more spring-like, I began to remove panels of the twinwall side panels. By summer, all of the side panels were off and put away into a shed, thus providing full ventilation and rain protection from the heaviest rain. This was critical for the farina blessed *Primula* and the denser, harder to grow high elevation *Androsace* since they could truly develop their “look” all summer long. I had hopes of growing *P. allionii*, and now they seem to be thriving in our hot summers set in their cool sand bed.

When the weather starts to cool in September I repot and start to get ready for the fall. As day length shortens in October, I remove the shade cloth and by Halloween the twin wall sides are back up. A few plants spend time in the alpine house only in the fall. Specifically, the hardy *Cyclamen* species, which have been dormant in the hot summer and kept barely damp, now start their fall growth in pots as well as their seedlings that were sown in June and lay dormant in their pots the start of the cooler weather. The *Narcissus romieuxii* species which all enjoy a cool fall with protection from the rains also share the space. These tender alpines stay in the house until Thanksgiving when it really is too cold for them, and they get relocated to the big glass house where the winter where temps are kept at 45 degrees.

As winter closes in, the *P. auricula* are finishing their flush of fall growth, and the *P. allionii* never looked so good. At this cold temperature, the sun can still warm the house to around 20 degrees F (-6 C), but not thaw the sand beds. Ones goal is to keep the pots and sand bed frozen solid until spring. This has proven successful for all *Primula*, *Saxifraga* and *Androsace* species, but has proven fatal for all geophytes and bulbous plants. Next year I will experiment with again with *Fritillaria* and *Corydalis*, but with heating cables to help keep their root area frost free. If that doesn’t work, I may have to be realistic and focus on what I can grow well and be happy with that.
Sydney Eddison’s Garden:
A Primrose Arcadia

JUDITH SELLERS

We practically tumbled from the bus in anticipation of seeing this special garden, leaving the driver to solve the problem of how to turn the wheeled behemoth around in the narrow, unpaved, dead end road that leads to Sydney Eddison’s Connecticut home. The enthusiasm of our group of visitors from the National APS Show of 2005 was well placed. The garden was truly an arcadia, beautifully landscaped and planted with only the kinds of things Sydney would recommend that others grow: plants that are big enough to be seen, tough enough to survive a northern winter, and able to grow happily through many humid summers.

We had all seen magazine articles by or about Sydney Eddison, or read her books, and we were pleased to find that she follows her own gardening advice. Her garden looks as stunning in reality as in the illustrations we had seen, proving that her methods and her artist’s eye have combined to create a truly beautiful environment.

A large weeping cherry tree, in full bloom, dominates the scene above the wide lawn. Choice trees, hedges, shrubs, and borders containing flowers to bloom at various times of the year bring points of interest and color nearer. At the far back of the garden, a low wall is visible with an inviting path splitting it and leading one through to the woodland garden.

Beyond that wall we discovered the Primroses. The hundreds of plants appear eager to grow in this garden, not as though they have been forced to survive here. Her secret has been selection of species well adapted to her location. Protection from deer and sun are provided, water is supplied, and sound cultural practices are followed.

Sydney has chosen a well drained rocky hollow under young hardwood trees for her Primulas. The plants bloom profusely with plenty of sunlight in spring before the leaves above them unfurl. In this woodland she has diverted natural run-off water to create a small spritngtime stream, and built a wide pool to hold the water until the heat of summer evaporates it or the fall rains replenish it. Native rock, rich soil, and healthy vegetation are the only elements here. Large, smooth stones form the paths which curve into the shade garden, beside the stream, and around the pool.

Because there is never enough room for all the Primulas she would like to grow, Sydney has been careful in her selection of specific plants. She has included double flowered varieties in soft color tones, Jack-in-the-Green and Hose-in-Hose forms, velvety Cowichans, named varieties of polyanthus, some P. juliae, P. abschasica, and a few gold laced or wire edged flowers. One of
her favorites, a Hose-in-Hose yellow polyanthus, has been photographed so often for magazine articles that it has become her 'signature plant', and Sydney energetically dug a blooming clump as a gift for Angela Bradford to grow in her Barnhaven Garden in France.

Very close to the stream bank, even in the stream itself, are the elegant plants of P. japonica, with flat stones separating them from each other and keeping their roots damp. Higher up the bank, where the soil is cool, but away from the running water and winter wet, are masses of carefully selected Primula polyanthus, P. acaulis (P. vulgaris), P. denticulata, and P. elatior. These are planted among companions which may bloom at the same time as the Primulas or simply provide protective shade later in the summer. An impressive patch of glowing pink P. kisoana grows on a slightly raised area of gritty soil. Closer to the stream, with less competition from other plants, are the P. sieboldii in sufficient numbers to form lovely drifts of color.

Plants are treated with respect in Sydney's garden. Shredded leaves comfortably blanket the beds from fall through winter, deter weed seeds in spring, and feed the perennials as a good compost thereafter. The rare combination of sound landscape design and healthy plants captivates and encourages the visitor. We all aspire to creating simple beauty, restfulness, and elegance in a place where each plant is grown in the right spot, and Sydney has achieved these elusive characteristics in her garden. She has said that 'a garden takes time: your time and Nature's'. This garden reflects her dedication to cooperation with Nature through the years.

Those of us who have been privileged to visit here will value the experience and treasure the memories of a gracious hostess and a delightful garden tour.

European Primula for the Rock Garden

HARVEY WRIGHTMAN

In raising a great deal of plants from wild collected seed we have gradually accumulated a broad collection of primula thanks largely to the efforts of collectors from the Czech Republic. Although all the species here discussed are from Section Auriculastrum, there is a lot of variation in not only substance of the plants but also in cultural needs. My interest was first piqued by the Archibald seed list of 1988 which offered many collections both from Europe and Turkey — it is a marvel how the seed collectors can achieve as much as they do.

The most commonly occurring European Primula is P. auricula which ranges all across the Alps to the Carpathians. I remember seeing it in bloom in Slovakia on a steep, rocky slope in full sun, quite dry. In the garden it will grow almost anywhere, as will most of its hybrid derivatives. The true species with its deliciously scented, lemon yellow flowers is my favourite. P. auricula Var. albo-cincta has farinose leaves and a white throated corolla.

- P. baumgartneriana- Several seed collections by Josef Halda of this very rare primula have now established it in cultivation. Halda's field notes indicate a north or east exposure in wet crevices (dolomite), also growing in moss cushions. In cultivation, this has been a slower growing species with an aversion to excess heat and dryness. Some I have planted in the garden directly on tufa. In pots they have grown best in a mix of tufa and pumice gravels with a little rotted pine bark — definitely not the standard perennial mix; but, it needs a highly aerated medium kept constantly moist. The plant roughly resembles P. glaucescens — both have leaves coming to an acute point- but those of P. baumgartneriana are somewhat broader. No flowers (described as
**P. deorum**—another endemic from the Rila Mt. of Bulgaria. Most unusual habit as the narrow leaves are arranged about the stem in an erect fashion. Initially, the seedlings grew very slowly and I really didn’t expect them to survive. However once they are established, growth is continuous, but still very slow. For this one the potting mix is almost pure pumice. In the garden, moist gravel with some organic material is the order.

**P. daonensis**—This was the sensation of the spring garden, as one plant that was in the tufa garden in a rather hot and desolate site put forth flowers of an electric, hot pink colour. Against the reddish tinged leaves, it was smashing. Superficially, it resembles *P. hirsuta* with similar toothed leaves covered with red, sticky glands— the whole plant is half the size of *P. hirsuta*. Halda’s notes are that it grows in crevices or steep screes (granitic). Unfortunately, little seed is ever available from collectors, and it is rather slow to produce sideshoots.

**P. marginata**—If I were to grow only one leather leaved primula, then *P. marginata* would be the choice. Quite variable when raised from seed, all sorts of selections can be made for the amount of farina, which adds a shimmering, golden hue to the leaves. Flowers are freely borne from a light blue/lavender to darker violet shades. As easily grown in the garden as *P. auricula*, it is not so readily found in catalogues—it is slower to propagate and sells quickly. Selected forms such as Freedom, Kesselring, and Alba are all worth having. There are also interesting crosses with *P. allionii* too.

**P. spectabilis**—Occurring in a rather restricted area in the mountains about Lake Garda, *P. spectabilis* can be found in limestone fissures, screes, and even in rocky turf, all alluding to an easy character. Indeed, our first seedlings rapidly attained size in 6 months from germination, and immediately formed multiple rosettes with large leaves of a sort of rumpled nature, both tough and leathery. In the garden, it responds to a rich, free-draining soil with lots of sun. With extra feeding and water in spring, it will encourage the production of its enormous, rose flowers. Divisions can be made frequently.

(Continued on page 38)
An educational display at the National Primrose Show designed by Paul Held featuring the Japanese ‘Sakurasoh’ primroses.

Primula marginita

LEFT: An educational display at the National Primrose Show designed by Paul Held featuring the Japanese ‘Sakurasoh’ primroses.

OPPOSITE PAGE. Rows of entries at the National Primrose Show. A view of the Awards tables featuring both prizes, ribbons and hand-thrown pottery for awards.

CENTER. The Orangerie at the Botanic Garden.

BELOW. Judge Ed Buyarski shares notes with Mary Irwin.

THIS PAGE. RIGHT. Thea Oakley's award winning entry 'Ms. Indigo' which traveled all the way across the country from Washington.

BELOW. Androsace vandellii grown by the editor, design competition winners and the best of show winners Kathryn Petuck and Clifton Below with their P. denticulata 'rubrum' from APS seed.
Growing primulas is fun. Trying to improve on what you have or even to create something new is even more fun. But – and it’s quite a big “but” – you do need to follow some basic rules if you want to avoid wasting too much time and energy. So, the theme of my talk is the fact on which all breeding programmes are based and it’s this: Offspring are not identical to their parents.

To get there however, you really do need to understand some basic facts about botany and genetics, so to make certain that we’re all starting from the same place, I intend to take a quick look at some basic botany. You’ll be relieved to hear that I don’t intend to give a long treatise on this, but if you want to do some serious plant-breeding, you’ll have to read a basic textbook on the subject. However, here we just take a quick look to stop you making fundamental errors.

Let’s start with the terms for the parts of a flower. Here we have a cross-section of a typical flower that contains both male and female parts. The male parts are collectively known as the stamen (there are usually several). The stamen is composed of a filament which attaches to the flower and the anther.
which is the pollen-producing organ.

The female parts are more complicated... At the bottom is the ovule (again there are usually several) These potential seeds are contained in the ovary. Extending from the ovary is a long tube called the style and on top of this is the stigma which is a sticky structure to catch the pollen.

**POLLINATION**

When pollen is mature, it’s released from the anther. In most primulas, this pollen is picked up by visiting insects and transferred to a receptive (i.e. sticky) stigma. If the stigma “recognises” the pollen (more about this later), and other conditions such as temperature are favourable, the pollen starts to grow a tube that travels down the style until it meets an ovule. The tube penetrates the nucleus of the ovule, and fuses with it to form the cell that will become the seed.

**PRIMULAS – A SPECIAL CASE**

The genus Primula contains over 400 species. Over 90% of these display a characteristic that botanists call heterostyly – i.e. separate plants will display either pin-eyed flowers (where the style protrudes above the stamen and is visible in the throat of the flower) or thrum-eyed flowers where the style is shorter than the stamen so that the anthers are visible in the throat of the flower. Incidentally the word “thrum” is a weaving term and refers to the fringe of warp threads that are left at the end of a piece of cloth when it’s cut off the loom.

Every primula grower is aware of this fact, but what’s not so immediately apparent is that the difference in the two flower-forms is only the most noticeable of a whole range of differences between the two types. These include pollen size, the profile of the stigma and chemical differences in the pollen and pin. Most plants, of course, are able to recognise pollen from their own species, so that crosses don’t usually take place between unrelated species. This is achieved either because the pollen doesn’t fit into the profile of the stigma or because the stigma (or sometimes the ovule) produces chemicals that inhibit the growth of the pollen. In primulas these differences are designed to encourage cross pollination between different plants and to inhibit self-pollination, but they also have the effect of discouraging so-called illegitimate crosses (i.e. pin x pin or thrum x thrum.) When an illegitimate cross takes place then the growth of the pollen down the style is inhibited or even prevented, because the chemicals that control the growth of the pollen are incompatible. The result is that you never get as many viable seeds with an illegitimate cross – and occasionally you get none at all. If fertilisation does take place, then the resulting plants are likely to be weaker than plants from legitimate crosses.

**SO WHAT ARE POLLEN AND OVULES?**

In most of the higher plants and animals, genetic information is stored in structures called chromosomes which are found in the nucleus of each cell. The number of chromosomes varies according to the species, but in most plants and animals they occur in pairs. For sexual reproduction to take place, genetic material has to be exchanged between the male and the female. To do this, plants create special reproductive cells – the pollen (male) and the
ovules (female). These cells are different from the other cells which make up the plant. When ordinary cells reproduce by division, the chromosomes in the nucleus first separate into two identical parts. When the cell divides one part goes into each of the two cells that are formed, so that both are genetically identical.

However, an entirely different process takes place when the reproductive cells are formed. In this case, the pairs of chromosomes lie along aside each other and each chromosome splits along its length to form two parts. Each part breaks at a point somewhere along its length and crosses over to join up with the broken end of the other part of the chromosome. This happens for every pair of chromosomes in the nucleus. When this process is complete, each chromosome has a different pattern - i.e. it's genetically different - from the original chromosome. After this process the reproductive cell is formed in which the nucleus contains only one set of chromosomes.

When fertilisation takes place, cells from the male and female parents fuse to give cells which once more contain pairs of chromosomes, but which contain genetic information from both parents.

Usually, however, because of the "crossing over" that occurs, the genetic characteristics that are transferred will not be exactly the same as those shown by the parents. This crossing over allows genetically transmitted characteristics to be recombined in the subsequent generation. However, this process is not entirely random. Some genes are joined together so closely that they're hardly ever split apart during the crossing over process and effectively act as a single gene - this is usually referred to as a Supergene. These supergenes are usually fundamental to the nature of a species. In the auricula, for example, basic leaf shape and texture; the shape and size of the seeds and seed capsule; pollen shape; and general flower shape all vary little between one individual plant and another, so we can surmise that these characteristics - which define the basic nature of the auricula and differentiate it, say, from a polyanthus - are always transmitted as a group from one generation to another.

MENDEL AND THEORIES DERIVED FROM HIS WORK

Gregor Mendel was born in Austria in 1822 but lived most of his life as a monk in what is now the Czech Republic. He experimented with successive generations of peas and this led him to formulate his "laws" and which I'll summarise.

ABOUT F1

But before we go any further, I would like to introduce you to another term - F1 - that is used in plant breeding. It stands for "first filial generation" and simply means the plants that are produced as the result of the first cross you make. If you cross these plants together, then you get the second filial generation - the F2s and so on.

By the way, the extremely expensive seeds that are marketed as F1s mean something slightly different. Two separate pure breeding lines are produced and then crossed together to give specific characteristics. They're expensive because they have to be produced under highly controlled conditions and then pollinated by hand. This is why it's not worthwhile to collect seeds from these plants as when they're open pollinated their offspring will have the recombined genes of the original parents rather than the characteristics of the F1 cross.

LAW OF SEGREGATION

Mendel's first experiments were with two types of peas - tall growing and dwarf. He made two separate crosses using pollen from a dwarf pea to pollinate a tall pea in one instance and the pollen from a tall pea to pollinate a dwarf pea in the other instance. He grew them on separately and discovered that all the F1 generation were tall. He allowed this generation to self-pollinate (peas can do this without the need to segregate them) and found that in the F2 generation 25% of the plants were dwarf. For the F3 generation, he separated out the dwarf and tall peas and pollinated them with peas from the same type. This time he found that all the crosses from the dwarf peas had dwarf offspring.

The tall peas worked differently because there were again 25% dwarf plants or a ratio of 3:1. Mendel reasoned that although both tall and short characteristics had to be present in all the F1 generation plants (because they turned up again in later generations), only the tall characteristic was expressed. He
named this the dominant form. The dwarf character which did not appear in the F1 generation, he named recessive. He also found that tall was dominant, irrespective of whether it had been contributed by the male or the female parent. Therefore the direction of the cross did not matter. So his first law states that each hereditary characteristic is controlled by two “factors” (the proper name for them is “alleles”) that separate and pass into separate reproductive cells. These pairs of factors separate independently of each other when reproductive cells are formed.

Mendel then went on to investigate what happens if you look at two characteristics at the same time. This time he used peas that had either yellow or green cotyledons and either smooth or wrinkled seeds. He had already established that yellow cotyledon colour was dominant over green and that round seeds were dominant over wrinkled seeds by obtaining the same 3:1 ratio as when he crossed the tall and dwarf peas. So his next experiment was to cross round yellow peas with green wrinkled peas. He found that the F1 generation all the peas were round yellow. When these were crossed together, he found that the four possible combinations worked out as planned.

This is because there are actually sixteen possible combinations and here I am going to use the usual way of expressing these characteristics by using a capital letter for the dominant characteristics and its lower case for the recessive. So here a capital R stands for the Dominant round characteristic and a lower case r stands for the recessive wrinkled characteristic. A capital Y stands for the dominant Yellow characteristic and a lower case y stands for the recessive green characteristic.

This leads us to Mendel’s second law – the Law of Independent Segregation. Briefly, this means that when two or more pairs of characters are brought together, they segregate independently of each other, provided that the genes are not linked as part of a Supergene.

RECOMBINATION

Another of Mendel’s important observations was that crossing plants that are unlike one another can lead to a new type of plant. In the case of the peas he used, the cross produced plants that resembled their parents i.e. round yellow peas and green wrinkled peas, but also plants that displayed new combinations of characters that weren’t shown by either of their parents i.e. round green peas and yellow wrinkled peas. This is called recombination and it’s an important factor in genetic variation, both in the wild and, more importantly for us, in plant breeding.

A gene is said to be either dominant or recessive. We’ve already seen that the offspring obtains characteristics from both its parents. Incidentally, there’s very little truth in the old beliefs that the pollen parent is responsible for certain characters like colour and vigour and the seed parent is responsible for flower-shape and general outline. All characteristics are inherited equally from both parents. (Well, I’ve got my fingers crossed here as there are some characteristics, in humans especially, that are definitely sex-linked, but I know of none in Primula – and now somebody’s going to prove me wrong!) So let’s say that, for all practical purposes when breeding primulas, all characteristics are inherited equally from both parents. Each characteristic is coded in a particular position on a particular pair of chromosomes. One half of the pair will have come from the mother and the other half will have come from the father. When a gene is said to be dominant, this means that the particular characteristic (say brown hair in humans) will appear in the offspring whether it’s inherited from the mother, or the father or from both. If a gene is said to be recessive, this means that the characteristic (say red hair), will only appear in the offspring if it appears on both chromosomes. If it appears on only one, then the characteristic will be masked by the dominant brown haired gene.

The important thing to remember about this is that a brown-haired person can still have one of a pair of chromosomes that carries the red-haired gene. So if two people who both carry the red-haired gene marry, even though they both have brown hair themselves, there’s a possibility that one (or more) of their children will have red hair.

The problem with breeding primulas is that most of the subjects you’re likely to be working with are already genetically very complex. Named plants, like this double primrose called “Blue Sapphire”, are only the selection of the best plant from a number of siblings from the same parents – most (if not all) of which ended up on the compost heap. Unfortunately, the named plant has inherited the compostable genes along with the desirable ones and will transmit them to its offspring. There’s no practical way of telling in advance which characteristics are dominant and which are recessive. This can only be deter-
mined by observation and meticulous record-keeping over a long period.

CONTINUOUS VARIATION

So far, I’ve been talking about the theory of inherited characteristics as if it’s always a question of an “either/or” situation. The peas are either wrinkled or smooth. A person is either left-handed or right-handed. Unfortunately, the real world seldom works in this way and what we can observe is a range of results for a given characteristic. For example, adult humans show a range in their height; petal colour in polyanthas and auriculas can range over the entire spectrum. When this happens, we can be sure that the characteristic is controlled by a number of genes which inter-relate to give an almost infinite number of possible results. The doubling of flowers is almost certainly controlled by a number of genes as there’s a range in “double” flowers from one or two extra petals to a head full of dozens of petals.

FIRST RULE – BE REALISTIC

It’s very understandable to want to do everything at once. However, your job, family, other hobbies and interests already take up substantial amounts of your time. You have neither the time nor the space to prick out and pot on thousands of seedlings. You’ll need to grow on about fifty plants from every cross you make. How many plants can you cope with?

SECOND RULE – SET OBJECTIVES

Unfortunately, leaving things to chance seldom achieves very much. OK, I know the Cox’s Orange Pippin and the Cowichan polyanthus were chance seedlings, but these are very isolated occurrences. Decide what you really want – a show self auricula in pure cornflower blue; a perfect gold laced hose-in-hose; a clear pink double auricula of classic form; a new marginata hybrid – anything is possible.

THIRD RULE – WHAT YOU SEE IS NOT ALWAYS WHAT YOU GET

You should be prepared for anything after you have made your first crosses. Be aware that genes can combine in any number of unexpected ways. Each organism has thousands of genes which control all aspects of its appearance and development. So in plants there are genes which control petal shape or colour or size; or height or leaf shape; as well as less immediately apparent characteristics such as hardiness and resistance to disease.

FOURTH RULE – BE PATIENT

Don’t be put off if the results of your first crosses aren’t what you were expecting. As Mendel’s experiments show, characteristics can often skip a generation, so cross your F1s together and wait and see what the F2 generation turns up. It will take a minimum of five generations before you start to see consistent results. By consistently selecting as parents the plants which show the qualities that you want – and rejecting qualities you don’t want – you can reinforce the recessive genes and reduce the effects of recombination so that your chosen characteristics always appear in the offspring. It could take as many as twenty generations before you get the exact result you have been seeking. You may never achieve it. The Sinclairs started the attempt to breed a pink Cowichan in the 1970’s. I continued to try, and Lynne is still doing it, but so far we’ve either obtained pink flowers with a star-shaped eye or eyeless flowers in almost every colour except pink. Of course, many other worthwhile plants turned up on the way and some ended up in the Flamingo strain.

FIFTH RULE – BEWARE OF UNWANTED EFFECTS

If you always breed from plants that bloom in their first year after sowing, you’re selecting for the ability to produce flowers on immature plants. If you always breed from the flowers that open first, you’re selecting for early flowering. If you always grow your plants under cover, then the ability to withstand a winter out of doors will not be selected and may disappear.

If you spray your plants against pests and diseases, you may be breeding
disease resistance out of your plants. You may also be breeding resistance to pesticides and fungicides into the very organisms you want to discourage.

A CAUTIONARY TALE

During the late 1930s Frank Reinelt in California started a hand pollination programme using plants from Sutton's seeds. He produced a strain of polyanthus with strong, bright colours that would show up well in the southern sunshine – the Pacific Giants. They came into flower early in the mild Californian climate and were a commercial success. But inevitably, the strain deteriorated. Years of selection under glass in mild California had bred out much of the polyanthus's winter-hardiness and a severe winter in the mid-sixties killed most of his breeding stock and most of the plants that had been planted out of doors died, so it was also a commercial disaster. Willie Sinclair told me that Frank Reinelt never really got over this loss.

A PRACTICAL BREEDING PROGRAM

So far, I've been talking theoretically. But of course, you're asking, “But what do we actually do?” But before I talk about a sample breeding programme that Lynne Lawson, who now runs Barnhaven, is actually undertaking now I think we need to look at how we actually go about pollinating our plants.

The Barnhaven pollinating method.

Many books will tell you to use a paintbrush to move the pollen from one flower to another. Florence Bellis found that this was awkward and time-consuming as you had to sterilise the brushes between plants and then wait for the brushes to dry. Her break-through came when she observed that the anthers in most primulas are attached to the petals and the petals are fused together at the base to form a tube. So if you carefully break the flower in half, you're left with two half-flowers that stay in one piece with the anthers attached to the petals.

Here is a step-by-step account of how it's done:

1. Start by removing all fully open flowers as these may have been pollinated by insects. Throw them away except for newly opened flowers that you should keep for their pollen. When the pollen is ripe, the anther releases it and takes on a fluffy appearance. If the anther is shiny, it hasn’t released any pollen and shouldn’t be used.

2. We always pollinate the flowers at the “large bud” stage – i.e. just as they’re showing colour – as this minimises the risk of the flower being already pollinated by insects. We’ve found that the stigma is already receptive (i.e. sticky) at this stage. Open the bud and remove the petals and stamens by grasping the petals between your thumb and forefinger and pulling outwards and downwards, so that the style (called the “pin” in primulas) is exposed. Like many operations, this is easier to do than to describe, but it’s probably best to practise on a few spare plants first! Leave the calyx intact as this helps to protect the developing seed capsule. This system means that it’s immediately obvious which flowers have been pollinated. Occasionally, you’ll find that the flower already has ripe pollen inside the bud. These must be discarded as they may have already self-pollinated.

3. Take a newly opened flower from your chosen pollen parent. Tear the flower in half. Using half a flower at a time, fold the petals back so that you make a little “brush” and transfer a good load of pollen from your pollen parent directly on to the pin of your seed parent.

4. You can repeat this process over a few weeks as the flowers open. Do, say, 12-20 flowers on each plant, then be sure to remove all new buds as they appear.

5. Pollinating is best done under cover, as you can’t work wet flowers, but the plants should be moved to a shaded, airy place out of doors as soon as possible after pollinating. The main enemies of developing capsules are grey mould (spray regularly with a fungicide) and caterpillars which scoop out the seeds (inspect your plants regularly and pick off the offenders). Birds,
especially blackbirds, will occasionally take the green capsules. Mice will sometimes take the capsules. Ants occasionally invade a bench and carry off individual seeds from open pods. Be vigilant.

6. Wait about four months. The capsules will swell. As the seeds of primroses and polyanthus ripen, an air bubble rises to the top and eventually splits the top open. Watch out for this and be ready to harvest your seed. Auriculas change colour from green to brown and the top splits open, so they need inspecting regularly. Sieboldii don’t change colour and split round the “equator” so they look like grinning mouths with lots of teeth. Catch them before the “hat” falls off.

7. Sow some of the seed immediately it’s ripe. (Be warned – don’t sow more seed than you’ll have room for. It’s depressing to throw away promising young seedlings). Keep your seed trays in a cool shaded place out of doors and the seed should germinate in about two weeks. Keep the seedlings cool, and you should be able to grow them on to give you plants in flower the following spring.

8. Pick the rest of the capsules into labelled paper bags and hang the bags up in a warm airy place until thoroughly dry. Put a colander on a large plate, empty the bag into the colander and the seeds will drop through on to the plate. Put the seeds in a labelled plastic container (e.g. the containers for 35 mm film) and keep them in the fridge for sowing in early spring. These will flower the following year.

9. As long as your seed is kept in the fridge at the normal temperature of 5-6°C, it will remain viable for at least 5 years.

Finally, I want to tell you about a sample breeding programme that Lynne Lawson, who now runs Barnhaven, is actually undertaking now. This, Ladies and Gentlemen, is primrose history in the making. The pictures I’m going to show you have never been displayed before, the plants and seeds are not available on the market, the strain isn’t even named yet.

YEAR 1

Lynne noticed that the “Paris ‘90” polyanthus series was producing the occasional flower that was pure white. She liked these as they were noticeably different from the original Barnhaven “Winter White” series. So she selected a pin-eyed plant and a thrum-eyed plant from the white ones and pollinated them together, both ways i.e. using pollen from each of the plants to pollinate the other one.

YEAR 2

The plants that Lynne had selected weren’t a pure-breeding strain, so we should expect to see the characteristic evidence of recombination immediately. This is, in fact, what happened. Unfortunately, Lynne didn’t keep a record of the number of plants produced, since this is a commercial breeding company and not a genetic experiment. However, she had grouped the results. What she got was a few pure whites, a few like the original Paris ‘90, a range of pastel-coloured flowers and a few pure yellow ones. She liked some of the
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Growing in the Garden

The more vigorous species, i.e.- P. auricula, P. marginata, P. spectabilis and P. daenensis can thrive in a great deal of sun. When in bloom and actively growing in Spring, they need frequent watering and appreciate some liquid feeding to help with flowering and growth. These species will grow in crevices or on rich sandy soil covered with a gravel mulch - the typical "horticultural scree". As the plants slow down in Summer, watering is reduced. Just as in nature these plants enter a dormant phase and need to have drier conditions.

P. elusiana., P. baumgarteniana and P. deorum need a more constant supply of water through summer to autumn, and are best planted in rich gravelly soil in cooler, partially shaded sites in a rock garden. Extra humus such as leaf mould or rotted pine bark will help to retain moisture. Again, feeding is beneficial.

The big factor with irrigation water is its source and the content of dissolved salts. These dissolved salts seemingly at a low concentration will accumulate as more water is applied during a drought - exactly when the plants are under the most stress. Knowledge of the pH and TDS (Total Dissolved Salts) of your water can alert you to potential problems. Collection and use of rainwater is an obvious remedy. The benefits are immediate, especially for the choicer specimens that are being raised for display in troughs and other containers.

American Primrose Society
Minutes of the Board Meeting
April 30th, 2005

Present (online): Rodney Barker (Director), Ed Buyarski (President), Paul Dick (Director), Julia Haldorson (Treasurer), Mary Irwin (Chair of the New England Chapter), Mary Kordes (Director), Matt Mattus (Editor), Theo Oakley (President of the Eastern States Chapter), Arlene Perkins (Director), Michael Plum (Vice President and acting Secretary), Hope Punnell (Doreetta Klaber Chapter), Robert Tonkin (President of the Juneau Chapter)

Meeting opened at 4:30 (Eastern Daylight Savings Time). The minutes of January 8th, 2005 (printed on page 43 of the Winter Quarterly, 2005) Accepted as presented. 2. Treasurer’s report. Although the Society is quite solvent, a recent drop in membership is slowly eroding funds. Michael suggested increasing the number of websites that have links to the APS. Ed suggested the possibility of increasing membership fees, and said he would look into what members of other societies pay. Mary K. thought our fees were already high enough, and comparable with other societies. Discussion turned to cutting the cost of the Quarterly, a major part of the APS’ cost for the Society, perhaps by changing the paper quality or reducing the number of annual issues. Ed said that any major change in the Quarterly would raise fewer issues would need a constitutional amendment. Ed informed the Board that costs had been cut from $4000 an issue to $2200 over the past four years. He said cutting the number of issues would not help much, and urged the Board to seek ways to increase membership instead of looking at cuts. Ed said Rodney and Matt were going to work on increasing advertising of the APS in other publications. Matt will offer a colorful ad to NARGS in exchange for their ad in our Quarterly. Michael suggested increasing the number of reciprocal links between our website and others such as nurseries and plant societies. Treasurer’s Report accepted as presented. Summary: Total liabilities and equity as of March 31, 2005: $24,486.14 (March 31, 2004: $26,958.96); Total income less expenses for the period April 1, 2004 to March 31, 2005: ($3,089.55); Membership as of April 21, 2005: 398; membership as of April 20, 2004: 440. 3. Seed Exchange Report: Michael reminded the Board that it had agreed to charge more for seed bought from commercial suppliers. MOTION (Rodney Barker/Matt Mattus): To increase the price of donated seed to $1.00 a packet, and of commercial seed to $1.50. Carried (one opposed). Michael asked why seed was free to overseas members. Mary K. added that most British societies charge us for seed, and we also have the expense of postage when we send them free seed. Ed replied that the SUCG and the AGS offer us free seed (NARGS too). Mary thought the issue should be investigated and discussed again at the next meeting. Robert informed the Board of the Juneau Chapter’s willingness to run the Seed Exchange. MOTION (Mary Kordes/ Michael Plum): To accept the Juneau Chapter’s offer to run the Seed Exchange for 2006 and 2007. Carried unanimously.

4. Primrose Quarterly. In previous communications, Robert had proposed digitizing all back issues. At the meeting the Board viewed this very favorably, but Robert would like more time to gather information before going ahead. TABLED 5. Other Reports None discussed at the meeting.

6. Recent business conducted by email (For information) a) Loan Agreement to North East Chapter – After much discussion by email during April, it was moved that the NE Chapter receive a loan from the APS of $850 to help cover the cost of printing a book by Alice Hills Baylor for sale as a promotional item at the National Show. The proposal passed with 11 votes in favor and none in opposition. The following members voted: Arlene, Hope, Michael, Mary K, Mary L, Matt, Robert, Rodney, Phyllis, Julia, and Richard. This includes an agreement by the New England Chapter to repay this loan to the APS treasury within two years (by May 1, 2007) at 0% interest. The New England Chapter will be responsible for the distribution of book copies to groups, chapters or other potential vendors, and the accounting for sales of these books.
b) The Dorothy Dickson Award: On April 26, President Ed Buyarski asked Board members to vote on Mary Irwin’s proposal that Angela Bradford be given this award for her services to Primula growing and for her contributions to the APS over the years. The proposal was supported by seven Board members, with none opposed. 7. New Business a) Appointment of Membership Committee: Rodney Barker, Julia Haldorson, Matt Mattus, Amy Omlsted (new President of the New England Chapter), and Robert Tonkin offered to be on this new committee. Their offer was gratefully accepted.

8. Results of the Election There was concern that the North-East US had been under-represented in the voting. There had been only one vote each from Connecticut, Indiana, Massachusetts and Vermont, and only three votes each from Ohio and New York. One cause may have been late delivery of the Quarterly in parts of those regions. The exact cause of the lack of response was dependent on a statement of those costs. Carried (8 in favor, 2 opposed).

9. Grant to NE Chapter from the APS National Treasury MOTION (Michael Plum/Rodney Barker): to grant the NE Chapter up to $200 to help defray their costs incurred in running the National Show held on behalf of the APS, the amount being dependent on a statement of those costs. Carried (8 in favor, 2 opposed).

The meeting was adjourned at 6:15 Eastern Daylight Savings Time.

Michael Plum, Interim Recording Secretary