PAEONIA

Volume 3. No. 2 June 1972

REQUIRED READING —

1. "The Peonies" by John C. Wister, $3.50 from American Peony Society.
2. The Bulletins of the American Peony Society.

SUGGESTED READING —

1. "Peonies - Outdoor and In", by Arno and Irene Nehrling.
2. "Create New Flowers and Plants" by John James. (Ed: This is the book that set me thinking of starting a hybridizing hobby).
3. March issue of American Peony Society Bulletin. (A dandy article on "The Use of Colchicine to Induce Polyploidy in Peonies" by David Reath.
4. The title of the textbook by Srb, Owen and Edgar is "General Genetics". (This is a college level text).

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The PAEONIA is authorized by our Miss Silvia Saunders.

DON HOLLINGSWORTH SAYS:

On mailing seeds, with automatic cancelling equipment, seeds in envelopes sometimes get ground into something like corn chops we used to buy for the chickens, Use a piece of corrugated box board to protect seeds when mailing in an ordinary letter envelope. Otherwise they may become crushed in letter handling machinery at the post office. Cut a "window" large enough to hold the seeds in the center of a piece that will fill the envelope. Cover one side with masking tape, spread the seeds in the "tray" thereby formed, then cover over with masking tape. Your seeds should then be protected. As an added precaution write "Please hand cancel" above the address.

LITERARY CONTRIBUTIONS FROM OUR READERS —

Santa Barbara Botanic Garden
April 19, 1972

Mr. Chris Laning
553 West F Avenue
Kalamazoo, Michigan 4900?

Dear Chris:

You should have the additional *Paeonia californica* seed by now and also the pollen which may spark considerable interest among a few. Our plants flowered beautifully this year, a very dry one, hence the pollen collection. There is not much in the vial, but there should be enough for at least a dozen or so crosses. Good luck to those who use it.

Incidentally, there is no chance of getting any hybrids from any of that seed sent to you as it was all collected in the wild, probably miles from any other peony species or hybrid.

As for an article on its culture, I have only a couple of suggestions and a few observations. Oddly enough a critical stage seems to be the dormant period. I have tried to over-summer seedlings repeatedly in gallon cans and 4" pots both in sun and heavy and light shade. The only seedling that has ever come through a dormant summer was one of several grown in a bulb box about 9" x 18" x 12" deep, in the lath house. The larger container was tried on the premise that with a larger soil volume the temperature would remain lower and fluctuate less diurnally. For whatever reason, one did survive and come up, but it rotted out early in the winter!

The best bet would probably be a ground bed in filtered sun, dried out in summer. For those who are trying the seed, the area would have to be protected from all but an occasional (or perhaps all) summer rains. The plants have none in their native habitat.

In the wild, the plants sprout in the fall, November or December, with the cooling temperatures and first rains. The plants are found on disturbed sandstone banks and in clay soils as well; often with a north or east exposure or under dense chaparral, or in a north-south draw where they receive only part sun. Occasionally, they are also found out in full sun on level ground. They receive water (rain - 10" to 20" per year) from late October or November to the middle of April or May.

The flowering period, depending on the year, is between the first of February to the last of March. During the period of active growth, say November through March, our official daily temperatures are as follows;

Month	Average Maximum	Average Minimum
November	70° F.	48° F.
December	66° F.	45° F.
January	65° F.	43° F.
February	66° F.	44° F.
March	67° F.	44° F.

The extreme low temperatures during this period in certain areas can be in the low 20's for brief periods, with average maximum and minimum somewhat lower than the above table. The foliage dries up completely in May or June.

Sorry I have no time to write an article, Chris, If you want to rearrange and print any of the above, go ahead.

Best regards,

/s/ Dara
Dara E, Emery
Horticulturist

P.S. Reference: Paeonia Vol. 2, No. 4, bottom of Page 9

1. I would be interested to know who and under what conditions *P. californica* will support two growing seasons per year.
2. If *P. californica* is a short day plant and the person was growing it back east; this could explain the inability of plants to flower.

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REPLY BY CHRIS LANING

May 8, 1972

Mr. Dara E. Emery
Santa Barbara Botanic Garden
1212 Mission Canyon Road
Santa Barbara, California

Dear Mr. Emery:

The additional seeds were most welcome, and the pollen was a most happy surprise! The gardeners are really interested in our American Peony and are willing to accept the challenge *Paeonia californica* presents.

Your letter of April 19, 1972, was also most welcome! The information it contains will be sent to all Paeonia members. Thanks!

Now as to *P. californica* supporting two growing season per year, I imagine that in your climate the growing season starts with the fall rains and continues through winter and spring. In Michigan the winter would cut the growing season in two. While the growing cycle is not completed — merely interrupted — I suppose you can rightly say it has but one growing season per year. Yet in hybridizing a modified hybrid plant could very well have re-blooming tendencies. At the risk of being verbose, let me recount my observations.

A giant root of *P. californica* was given me by Miss Silvia Saunders along with nine seeds of the same species. These all had come from Mr. Frank Ruppert's Green Mountain Ranch, Julian, California. Having no idea of the cultural requirements, I treated this root just as a regular herbaceous peony root. This root survived two of our Michigan sub-zero winters and died the following year (the third year). The seeds were treated as house plants with no regard for summer dormancy. These little seedlings also survived but two years.

Under two dissimilar conditions the giant root and the seedlings both behaved in a similar way — two growing season per year. I will admit to this, though, no flowers were ever seen and obviously no seeds produced. Mr. Don Hollingsworth has tried to maintain dormancy of his P. californica seedlings throughout summer and fall with disastrous results.

The pollen you have sent will present a new approach to our problem and is greatly appreciated. While Prof. Saunders had tried unsuccessfully to cross this peony with other species, we can't give up and look for easier things to do. 1972 may be the great year!

Very sincerely, Chris Laning
St. Mary's Church
Vining, Iowa
April 8, 1972

Dear Peony Friends:

Thank you for sending me copies of "Paeonia". I'm sending you a contribution, which I should have sent long ago. I don't want to miss any of your copies! Our Midwest Robin as you know has a number of "greats" and Leo Armatys is doing a great job as editor. I'm known in my group as "Father Joe". You've got "Father Fiala" who seems to be doing some fine work. I've done a lot of hybridizing but haven't come up with anything yet. Maybe I'll get the title of "doctor", as I've come up with some ideas on control of diseases and insects — my contribution of using bi-chloride of Mercury for controlling "rot root" and my latest idea of "Kerosene Emulsion" for thrips. (I'm using it this spring for daylilies — as I think these are the source of infection).

You ask in your December issue, 1971 — Vol. 2 No. 4, if anyone has '**Oriental Gold**'. I have one and so has Don Hollingsworth, He mentioned last year that he had seeds from it. I've had one for many years and could never get a seed from it until last year. I had two and planted them very late. Will watch to see if they come up. So I'm going to try again this year to see if I can get some seeds.

This plant really intrigues one, as the eyes (or underground buds) are yellowish-green. The plant also is a pale green as it grows but assumes a natural green when full grown. It is not as vigorous as the Saunders hybrid which contains "Mloko" and other so-called yellows. The flower is not like Smirnow pictures it. Not as "gold" but a pale yellow, but the yellow persists longer than other so-called yellows. The flower is of medium size or perhaps a little smaller. The "form" and petal arrangement could be improved. I wish I could put some of '**Prairie Moon**''s vigor and petal texture into it. I'll try again as I said this year. '**Prairie Moon**' will not set seeds, must be sterile.

Have two "Ito hybrids", '**Yellow Heaven**' and '**Yellow Dream**'. '**Yellow Heaven**' bloomed last year but the blossom from a nice big bud was anything but beautiful! It had a nice big seed pod, but nothing in it. That's where I came to the conclusion that thrips from ray daylilies perhaps injured the bud.

I've had the good fortune of having made friends with Brother Charles and Orville Fay and I visit with them at least twice a year. So I have most of the good and best hybrids and of course "Miss Silvia" has sent me many plants and seeds for hybridizing. In my seedling bed I found one which I divided last year which is so vigorous and a strong seed setter which I'm going to work with. It is a single and large but the color is a cerise pink which just glows! Don't know what it is, but it comes from all those mixed hybrids of Miss Saunders.

Perhaps I've spent too many years like the most of us "in quest of the 'Golden Fleece'" — a yellow or golden peony! Perhaps Father Fiala or Roy Pehrson will finally find IT!

God bless you all in your work and keep up "The Paeonia".

Sincerely yours, Father Syrovy

P.S. Have about 21 tree peonies. I like High Noon best among the Saunders Hybrids and I like all the rest, Tama Fuyow, Kenedo Fuyu, etc. Regular peonies everywhere! How many? I don't know!!

SOME OF ROY PEHRSON'S WRITINGS ————

A reader counted the "Ito type" crosses I reported on in the December letter (286) and jokingly chides me for "slowing up". I had made 582 such crosses in 1969.

I'm a little disappointed that this happened. In 1969 many of the crosses were unprotected and I had to grow quite a few non-hybrids to find the few real hybrids among them. Nearly all the crosses shown in the 1971 report were bud-pollinations and all were bagged. This takes more time. Then too I had foolishly dis-budded almost all the lactis and had almost no laterals to work in at season's end.

Things are a little better than they appear to be. I made some crosses on blooms which had already opened. These were not included in the report. There could be some hybrids among these seeds too.

You probably noticed this. In 1971 I had the enormous good fortune to have some Ludlowi pollen; something unlikely to happen again. Mr. Wister writes of the "great and thrilling" breakthrough to come via Potannini. I agree, but believe Ludlowi could provide even greater thrills if only because it won't bloom in most areas. I surely hope that one or more of those seeds are genuine and will grow.

By June I should know the outcome of all this and will make another report. Make all the crosses you can manage this summer!

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It is certain that Mr. Ito was a very careful worker. He pollinated 1200 blooms of a white, pollen bearing, lactiflora with '**Alice Harding**', yet obtained only 36 seeds. Most of these germinated and 9 had tree peony foliage. Apparently 3 of these were not good enough to keep.

My experience has been like this too. Despite my efforts to protect the crosses carefully, I always end up with a big majority of seedlings which are obviously not hybrid.

I have previously explained why I feel sure that all the true hybrids are triploids, and that diploids are impossible in this cross. This makes the hybrid plants about 2/3 tree peony and 1/3 lactiflora. The lactiflora genes are outvoted 2 to1 by tree peony genes. It's little wonder that the seedlings show their tree peony origin so plainly. There are never any plants of intermediate appearance.

Whenever I find a true hybrid among the newly emerged seedlings, I weed out the others nearby to give it room to grow. I'm sure that anyone can recognize these hybrid plants at a glance, once the first one has appeared in his seedling rows.

I found no new ones in 1971. At this writing (May 5) I don't know what I may have this year. It's been a very cold rainy spring and most of my seeds are not yet planted. If I should find some I'll

try to get pictures showing hybrids and non-hybrids growing alongside one another. Then those who may be confused about what they have may write to me for a copy to resolve their doubts.

I believe there will be a few again this year.

Steve Moldovan seems to imply that I have become excessively obsessed with the Ito cross. Says that those five represent no advance in peony quality. I'll buy that! I have not seen them except as a single cut bloom, but I'd be most surprised if it were otherwise with only 5 having been grown. The miracle to me is that they are yellow and herbaceous. He explains too that they are not herbaceous enough to be really satisfactory. Says that they make above-ground buds on stems which freeze back to the ground. They may be prone to winterkill. I must admit that the baby seedlings I transplanted had an appearance that, I think, would seem to support what he says. Maybe we'll have to raise F2 plants or backcrosses before we'll have thoroughly dependable herbaceous ones.

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I have Saunders' "Big Notebooks" so I should have noticed some coincidences before. It took Silvia's story on the Windflowers to ring a bell to wake me up. I'll list in disconnected way some similarities in several crosses, and some speculations which come to me as a result. I'm maybe letting my imagination overcome my preference for solid proven fact. Maybe if all these things were properly hung together by someone who can write better than I do, that a thought producing article might be possible. Tell me if all this makes sense to you.

Now some facts. You're sure to have noticed some, but possibly not all of them. The two Windflower strains consist each of quite a few clones, all apparently almost indistinguishable. The red F2 has been counted and seemingly is a tet. Quite unexpected since the grand-parents were diploids. Does this mean that Windflowers themselves are triploids? It could be. My pink one is a rather coarse leaved and heavy-stemmed plant — oversized bloom too. A seed now germinated has a heavy hypocotyl. F2 seedlings of triploids can be either diploid or tetraploid, so the very small one Silvia still has could easily be a diploid.

Now the strain called '**Halcyon**'. There are, or were, 7 plants from 3 different lacti seed parents, all also almost exactly alike, also very sterile. Both parents again are diploids. Saunders' book tells that 4 F2 plants were set out from the seed beds, but there's no further mention of them. Silvia may have something. I'd expect considerable segregation in color, form, etc. here too. Are the Halcyon plants also triploid though both parents were diploid? Maybe so.

Then the Ito hybrids. All nearly identical. I'd reasoned previously that they were probably triploid. Just another coincidence? How might the F2s segregate? Is all this too tenuous to be accepted as anything more than a 3 way coincidence. What do you think?

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When I walk into a peony showroom I can recognize '**Red Charm**' even at some little distance. The same is true of no other peony. I see thoroughly sophisticated growers finger name tags to identify other varieties. Should the large number of potential hybridizers now known to exist go to work earnestly, eventually the benches would be liberally populated with varieties as easily recognizable as '**Red Charm**'. Then would come the renewed interest in the peony and its

society. Who knows! We might even rival the 18,000 membership of the American Orchid Society.

Chris thinks it would be useful to report on failures as well as successes, so here is one. While going through some of my bags of seeds today (Dec. 29) in order to note progress on the tags I became aware of a coincidence that is puzzling. Five bags of seeds have various tetraploid seed parents, but all were pollinated with "triple F2". Except for one seed — in about 75 — which looks as if it may grow, all are very hard, dry, and wrinkled lengthwise of the seed. They surely won't grow.

I won't speculate on the reason for this beyond guessing that there may be something abnormal about the endosperm. How to overcome the problem? None that I can think of except to waste a minimum of precious pollinating time using this pollen. It's so rare a happening that it's not very important.

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It was a surprise to me to read Mr. Eames' assertion in the Bulletin that "peonies are largely pollinated by beetles". Surely this must be a conclusion reached by a study of flower structure rather than by observation. Could it be that peonies first evolved in some area or time where bees and similar insects were absent?

In my patch honey bees are a complete nuisance. Let the first blossom of the season start to open and they are there in force, followed by their many lesser cousins and even an occasional bumblebee. I've counted seven honeybees in a fresh bloom at once. They manage to pack away almost all the pollen in a short time. I see few beetles of any size or shape. Near the end of the season bees abandon the peonies altogether. Where they go then I don't know.

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CORRECTIONS (AND OBSERVATIONS) BY A LADY WHO LIVES IN NEW YORK

On Page 8 of the Paeonia (March issue), bottom, it should read, I believe;
Lactiflora x (Lutea x suffruticosa) = "Ito hybrids"
The odd thing being (as I understand it) that one finally found the cross between tree and herbaceous could be made by using a tree hybrid (not a Jap tree peony as we would have expected) and what the chromo counts are, I have no idea.

Page 9, bottom - Roy talking of '**Diantha**'. I would say its foliage is not "lush" at all but light green and matt (non-glossy). The flower is a very pretty salmony pink and is quite early — only ' '**Playmate**' and '**Nosegay**', and perhaps '**Roselette**', are as early and they're all very different from each other and from '**Diantha**'.

Page 10 - '**Sable**' - if it is an F2 it is more likely to be tetraploid than diploid, isn't it?
(ED. - I DON'T SEE WHY!)

Page 11 - '**Scarlet Tanager**' is a particularly "good" bright scarlet. Alongside of it the whole Challenger strain looks purple.

Page 11, last line. I must have sent Roy some red-purple plant for '**Belinda**'. '**Belinda**' is Mloko x Peregrina F2 - foliage like '**Diantha**''s in that it is light colored and matt. But the plant is taller - average size I'd guess. Flower is a pale washed out mauve. You have to like these shades to like

'**Belinda**'. She looks like a delicate creature who spends her mornings in the chaise lounge and has her meals sent up on a tray! She should be more useful for breeding than in gardens. But it is not, never was and never will be "red-purple". (ED. VERY POETIC! ALSO SEXY!)

PLANT EXCHANGE AND SEED EXCHANGE

HYBRID SEEDS EXCHANGE AS PROPOSED BY MISS SILVIA SAUNDERS —

Will someone offer to run our peony seed exchange at least for a year or two for the benefit of mankind, or at least that part of it interested in growing peonies from seed. Duties would consist of receiving seeds, re-packaging them into suitable size envelopes (depending on the number of persons wanting each given kind) and mailing them out. The work would be presumably from late August or early September to perhaps late October. Some charge to cover at least the expenses should be made, say $2 per person, should not seem overpaying.

Last year I got big quantities of seed from David Reath and big quantities from Roy Pehrson, of course all precious hybrid seeds, and all labeled. It is too much to ask these busy men to bother with shipping out tiny orders of seeds, or even to sort the seed — but someone who isn't doing anything else special just then could well take it on. I don't see why David, Roy, and maybe other growers wouldn't be glad to have their seeds distributed in this way, and it will make fun for beginning hybridists until they begin to get seeds enough from their own plants and their own crossings.

PLANT EXCHANGE AS ENVISIONED BY MR. DON HOLLINGSWORTH –

I vote for some sort of swap section for plants. Its primary purpose should be to assure that surplus rare plants with breeder or historical significance do not go to waste. It should NOT be organized as a dodge to avoid purchase of plants from our commercial friends specializing in peony plants.
Perhaps in one issue each year, perhaps mid to late summer, both wants and surplus plants would be listed. For the first listing you might set up rather general ground rules, then refine them as experience indicates the need.

Publication of "wants" might be limited to:

1. the species and their varieties, (excepting the lacti or Chinese and Japanese tree peonies)
2. uncommon hybrids which can be specified by established name or pedigree.
3. lacti or tree peony cultivars that are rarely available in commercial lists.

The listing should include both name and address of the inquirer so that suppliers could contact them directly with no more attention required from you.

Listings of surplus plants should probably be limited to species and cultivars that are seldom or never listed by the commercial peony specialists. This would no doubt include all of the species and unnamed hybrids that may reasonably be of value for breeding, plus others. If the supplier has only a few things that qualify, the items might be individually named. However, longer listings should probably be described in general terms and the supplier expected to mail a list upon direct inquiry. Suppliers with qualified plants would be given equal treatment whether commercial or not.

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TWINS AND TRIPLETS

by Fred Cooper of Ottawa, Canada
November, 1971.

In the past I have only come across two or three twin seedlings that I can recall, and these were only regarded as curiosities. However, it is known that among such seedlings a small but reasonable percentage will be of changed ploidy. Thus from a tetraploid plant it is possible to obtain diploids, tetraploids, hexaploids, and octoploids and in addition aneuploids and homozygous plants.

This spring I carefully examined my 1970 crop of seedlings before planting out. In about 1800 seedlings I found 25 sets of twins and 3 sets of triplets -- about 3% overall. However, in some cases the frequency was surprisingly high: e.g. '**Roselette's Child**' x '**Rose Crystal**', 18%; '**Serenade**', open pollinated, 14%; and lacti x *corsica* F-2 selfed, 8%. On the other hand, many yielded no twins at all: e.g. '**Moonrise**', '**Good Cheer**', lacti x lobata, and tenuifolia x daurica. Pure lactiflora gave about 1%.

Even at the hypocotyl state either one or both twins in over half the pairs were "different" from "normal" single seedlings. Generally they were characterized by the slenderness of the hypocotyl, although in one case the hypocotyl was grossly swollen and short in length compared with the "normals". Top growth has pretty well confirmed these observations. I feel fairly certain that I have at least two plants that could be hexa- or octoploid, and one diploid (from a tetra). About 8 others, because of their form, bear close watch. None of the "weak" strains from the few pure lactifloras I had survive. It is possible they were monoploids, and hence had little survival value.

Obviously this method cannot compete with the colchicine technique for increasing ploidy, as we have no control over which plants or strains we would like to utilize. On the other hand it could be quite useful in obtaining haploids, aneuploid and homozygous plants that cannot readily be obtained by other methods.

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QUESTIONS AND ANSWERS FOR ELUCIDATION ON TWINS AND TRIPLETS

CHRIS: Mr. Cooper, how do you identify the twins and triplets and how do you locate them?

NO REPLY FROM COOPER

CHRIS: Roy, (Pehrson) how do you identify the twins and triplets and how do you locate them?

ROY: I can add nothing to Cooper's account about those multiple embryo seeds. Each winter as I've seen twin hypocotyls develop I've resolved to isolate them - properly marked. Then I've just never taken care of it in the big rush to get the spring work done. It's too bad. I'd no idea of the various implications he describes* Guess I've read the wrong books.

How to find them? With just your everyday eyeballs, of course. Surely you are germinating all your seeds in plastic bags during the winter. Surely also, after 12 or 13 weeks you dump the contents of each bag out onto a table and look through them to study progress, not less often than every two weeks. You must. Only one thing can possibly deceive you. Very very rarely you may destroy a root tip just as it emerges from the end of the seed. This can happen sometimes if you should rub off some flake of vermiculite to see if the seed is cracked. No real harm is done, because a replacing tip always forms. Sometimes two new tips so you'll have a bifurcated hypocotyl. If you look closely these are easy to distinguish from the real twins. They are not at all rare and you must surely have some. It's incomprehensible to me that you haven't seen some.

I'm finding a few even in the very small seed groups of the supposed Ito crosses. I transferred about 15 of these bags to the "frig" just yesterday and today and I'm sure I remember at least two sets of twins among these.

CHRIS: This all sounds very proper but because of my problem it just won't work. Here is my problem: Seeds bagged in moist sphagnum moss soon smelled musty. Soaking in Clorox failed to eliminate the problem; roots turned brown and died in the musty sphagnum. This was the 1970 problem. Then last fall the process seemed to be repeating itself. Word came from you that you use vermiculite — not moss! The 1971 seeds just beginning to smell musty were washed. One half of these were then put in vermiculite -- the other half planted out of doors.

A late December check showed that the seeds planted outside were in A-l condition, the other half which was now in vermiculite DIED. Moral to this story: Don't use sphagnum moss for germination process.

How do you find twins and triplets? - "Why with your own eyeballs". Yes, under good conditions I see how this can easily be done — and next fall I hope to get everything right by germinating seeds in vermiculite, etc. To you, Roy, this all may sound stupid but you can now see how detailed information must actually be for the novice!

Send complete information on your method of germinating seeds in plastic bags. Please!

GERMINATING SEEDS IN PLASTIC BAGS

By Roy Pehrson

Step #1.--- Early hybrids and such species as bloom early ripen earlier than lacti. I'll mention seeds of lactiflora. Some of these are ripe enough to harvest beginning about September 1st. A few, such as '**Shaylor's Sunburst**', '**Nippon Brilliant**', and '**Gay Paree**', take 2-3 weeks longer. With your thumbs, open a pod a wee crack and take a peek. If the seeds have changed color from yellow to brown they are OK, If a few of them happen to have a little patch of yellow they're still OK to take. Any which are all yellow, would not ripen off properly after gathering and might fail. I'm sometimes too eager. Opening the nearly mature pod a trifle does not harm. Of course, one should not wait until the pods become dead-ripe and spill the seeds on the ground. This becomes a real mess. Oh yes, the color change with some hybrids is from a bright red - to black. Put seeds in envelopes or paper bags where they can dry out a little more.

Step #2.--- You can bag freshly gathered seed at once. These I think should not have turned brown more than a week earlier. Keep about room temperature. These will probably make some roots in about 5 weeks. You can't keep these until spring so they must be planted out the same fall — before the ground freezes. You can do it as soon as the root is a half inch long it seems. The necessary "cold" period in this case must occur in two parts — before the soil really freezes that fall — and after it thaws again in early spring. The result is that these seedlings emerge much later in the spring than those handled the other way. The planting should be well mulched. I've done a. little of this but don't like it. Many seeds take so much longer than 5 weeks that the ground is starting to freeze. It may be all right for people in say Chicago and southward but I don't try it anymore. I don't think I'd recommend it for you (for Chris Laning).

If kept dry a few weeks longer the seeds become completely dormant, Bagged up between Sept. 25 and Oct. 15 as I do — or even a year later — they require not less than 12 weeks for some to start making a root. Stragglers keep coming for quite a while longer.

Step #3.--- I use vermiculite straight. The size sold as "Terralite" — the trade name. I buy those big bags holding, I think, 4 cubic feet; costs $3.00+. If you buy the smaller boxes be sure it is not the fertilized type. Old man Pehrson has never recommended sphagnum. I've tried vermiculite, shredded sphagnum, Perlite (the plaster aggregate size), "peat moss", and also various mixtures of these, as well as mixtures with redwood sawdust obtained from sawing up boards for stakes. I like moist vermiculite best. Peony seeds have a great store of endosperm so they need no nutrients. Those organic materials merely supply nutrients on which molds can grow. Don't treat the seeds at all. Very few or none will mold if seeds are good. If a few should do so the rest usually are not harmed and the bad ones can be picked out as they appear. Don't put hollow seeds in the bags. If you can't recognize these by color as you harvest them just squeeze each seed - hard - between thumb and finger. The hollow ones will squash.

Temperature? This is most important and I don't know all the answers yet. I've had variable success in different years. Without going into elaborate detail as to reasons, here's what I'd recommend you do, if possible for you. Keep at ordinary ambient temperatures for a very few

weeks. They'll absorb some water fairly quickly. Then — or right from the start — I would try to vary the temperature diurnally between about 80 - 85 and about 70°F. Then after 6-8 weeks I'd cut down to straight ?0° or a little less — say 65° if you have a cooler corner. Finally, after 13-14 weeks, if any bags still show low germination I transfer these to about 55°F. Maybe your house does not provide such a basement temperature, but it will probably make such seeds as lacti x lobata come just fine in 2 weeks or so.

Step #4.--- Length of hypocotyl when placed in the frig, is unimportant, though I prefer that they be at least 1/2". If you wait for most seeds in a bag to germinate some may be 3-4 inches long before you get around to it. Once a hypocotyl appears it can usually tolerate remaining in the "warm" condition for about a month or a little longer. If kept too long it will eventually start to rot away — starting at the tip. No real harm is done but you have to refrigerate it then. It is the total length of time in the frig, rather than the length of the root when placed there which determines how advanced it will be when spring comes.

Step #5.--- Refrigeration ends a few minutes before you plant them. As you gain experience you will try to juggle your temp, somewhere between say 33° and 40°F as spring approaches to get the largest number to just the right stage. Warmer temps speed them up. Ideally — and it will happen with only a few seeds, they will be ½" long, maybe ¾" when placed in the frig. Then they won't get quite as long and tangled and hard to manage when planting. The tiny "bud" should be just barely visible in the slit between the partially withdrawn cotyledons. Some develop a pinkish glow in the area right next to the seed before the plumules show at all, and these will come OK too. Some even slower than these will get a little more "cold" time after early planting and may come too. It's those which have long plumules in the frig, which are a real problem. Seeds stand any amount of handling by their roots but these plumules break off almost, with just a harsh look, and many seeds won't make another. Handle with great care. Cover with the fluffiest soil - or vermiculite - or peat moss. I go out about 10 miles from home and collect soil which is really a completely disintegrated peat - no mineral soil content. Vermiculite or peat moss are fine too if you take care it does not dry out.

Plant any time in reasonably early spring, but not in an unseasonable warm spell. They might come up quickly and be destroyed by a hard freeze. Cold soil however doesn't hurt them, or even light frosts. Guess 25°F may not harm.

Step #6.--- In planting out, depth depends on you. 1" - 3" is OK if covered with fluffy, non-caking material. Shallow is OK if kept moist. Fill trench completely, because the leaf expands as soon as it's above ground. Then if the trench is not full, rains may cover the leaf with mud. Very awkward situation, this.

Is all this specific enough? Good luck. One thing more. Seeds may germinate sporadically through the winter from possibly Dec. 15 to as late as perhaps March 1. It seems that the minimum refrigerator time needed is about 6-7 weeks. Seeds which do not germinate at all can be planted with the others and many are likely to come the next season. The biggest proportion of "Ito" seeds made in '69 did this - emerging in 1971.

Maybe I should send <u>you</u> some twins and then <u>you</u> can observe them. I have one twin of lacti x "tall lutea" which I potted. Thus far only one leaf has come up, but I think another may show up. We'll see!

CHRIS: In step #2 you say "bagged up between Sept,. 25 and Oct. 15". But don't the seeds become dormant in the time between — say Aug. 20 and Sept. 25 through Oct. 15?

ROY: Yes, seeds do get dormant, that is why it takes 3 months to root them. If put in moist medium as soon as barely ripe it may take 5 weeks or less. Then they'd have to be planted out the same fall for they couldn't possibly be held over winter.

CHRIS: Thank you, Roy!

Well, folks, Roy did send me some twins and at least one triplet last week. I know what a twin looks like now and am sure that you too can locate them (twins and triplets) by following instructions. I'm being careful in taking care of these little plants and will report anything unusual about them anytime I observe it. If and when you do look for twins this is what you should expect to see— a seed with two (or three) hypocotyls growing from it. Later you will see two (or three) shoots or plumules beginning to grow. I can make it very clear by saying: 2 plants from one seed equals a twin set.

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EXCERPTS FROM MIDWEST PEONY ROBIN No. 1, FEBRUARY, 1972.

Seed Germination: I will mention only that I am becoming more certain that some peony seeds have a requirement to be held fairly long at high temperature before the root will be released to grow. Yet, once this period has been accomplished the root will still not grow until given a certain lower temperature, usually in the range of 60-70 degrees or lower. The root growth temperature occurs out of doors in the soil about the end of summer. These two temperature factors, if they are genuine, argue for planting of held-over seeds by late spring. Also, seeds to be germinated indoors might best be given several weeks (I am now using 8 to 10 weeks) at 75 degrees or above before reducing the temperature for root growth to commence. This latter fits very well with Roy's plan to have roots emerging in late November or early December.

Secondary Bloom Stems to Improve Seed Production of Doubles: Established plants of '**Karl Rosenfield**' and a bomb double seedling responded well to decapitation by giving blooms with good carpels and, eventually, seeded well. '**President Taft**' and several full doubles did not. The semi-double '**Miss America**' gives secondary stems right along with the primary stems and it is the flowers on the former that usually have carpels which will function normally. This is a characteristic that might well be concentrated in a breeding program. The secondary stems tend to extend the flowering period of this variety.

Pollen Parents: '**Good Cheer**' (P. officinalis alba plena X P. lobata of Perry) gave a better seed yield on everything tried, lactiflora or hybrid, than any other hybrid or species pollen used. Also, the seeds germinated in a shorter time than did those from the same pod by a different pollen. '**Alice Harding**', lutea hybrid, gave almost no pollen for me, too. A friend had a small amount, and I have some left from the previous year, both of which may have given a few seeds. I have a notion that there are a lot of lutea hybrids that are potentially more useful as pollen parents.

- Don Hollingsworth